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JOURNAL OF THE SOCIETY OF
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REVIEW

REPORTS ON PROGRESS IN CHEMICAL INDUSTRY IN 1919.

In continuance of its policy of keeping chemists and allied technologists supplied with up-to-date and authentic information, the Council of the Society of Chemical Industry has decided to publish a fourth volume of its *Annual Reports on the Progress of Applied Chemistry* covering the year 1919. The publication is now too well known to require any detailed description of its nature and objects, and it must suffice to state that the reports take the form of monographs written by acknowledged experts in the various branches of chemical technology. The method of treatment is two-fold in character. In the first place the writers aim at presenting an accurate and reasonably complete, objective account of progress achieved; and in the second, they seek to present a well-balanced survey, throwing the events they record into proper prospective, and, where occasion requires, interpreting them in the light of their individual experience.

The demand for the three Reports already issued (Volume I. has been out of print for some time), and the reception given to them by the scientific and technical press, bear testimony to the success attained by the writers in carrying out the intentions of the Council, and there can be no doubt that the experience gathered with each successive volume will ensure increased efficiency and utility in those that follow. It is satisfactory to note that there has been no duplication or overlapping in the production of reports on industrial chemistry; the Society's publication occupies a unique place in the literature of chemical science, and for this reason alone it should find a place in the library of every worker in this field. Satisfactory as has been the reception of the Reports in the past, it is felt that there is still scope for a wider circulation, more particularly in other English-speaking countries, and we would therefore draw the attention of our colleagues overseas to the imminent appearance of Volume IV., which, it is hoped, will be published during the month of March. The subjects treated and the respective contributors are as follows:—

Plant and Machinery: W. B. Davidson, M.A., D.Sc., Ph.D., F.I.C.
Fuel: J. T. Dunn, D.Sc., F.I.C.
Gas and Destructive Distillation: E. V. Evans, M.B.E., F.I.C.
Mineral Oils: A. E. Dunstan, D.Sc., F.I.C.
Colouring Matters and Dyes: F M. Rowe, M.Sc., F.I.C.
Fibres, Textiles, etc.: S. S. Napper, A.C.G.I., F.I.C.
Bleaching, Dyeing, etc.: S. H. Higgins, M.Sc.
Acids, Alkalis, Salts: T. Ewan, M.Sc., Ph.D. F.I.C.
Glass, Ceramics, etc.: W. J. Rees.
Iron and Steel: A. McWilliam, D.Met.
Non-ferrous Metals: W. G. Wagner.
Electro-chemistry: A. J. Allmand, M.C., D.Sc.
Oils, Fats, Waxes: G. H. Warburton.
Paints, Pigments, etc.: J. H. B. Jenkins.
Indiarubber: D. F. Twiss, D.Sc., B.Sc., F.I.C.
Leather, Glue: F. C. Thompson, M.Sc.
Soils, Fertilisers: E. J. Russell, O.B.E., D.Sc., F.R.S.
Sugars, Starches, Gum: J. P. Ogilvie.
Fermentation Industries: A. Tait and L. Fletcher.
Foods: H. W. Bywaters, D.Sc., Ph.D., A.R.C.S., F.I.C.
Water Purification, Sanitation: Sir A. C. Houston, K.B.E., M.V.O., M.B., D.Sc.
Fine Chemicals, etc.: T. A. Henry, D.Sc.
Photographic Materials and Processes: R. E. Crowther.
Explosives: W. Rintoul, O.B.E., F.I.C.
Analysis: C. A. Mitchell, M.A., F.I.C.

As a preliminary to the issue of the new volume, it is thought that the immediate publication in the Journal of short summaries of some sections dealt with may be of interest and utility to our members and readers. These epitomes are necessarily of a somewhat sketchy character, and they can in no way be regarded as substitutes for the full accounts; they should serve to give the reader a very general, preliminary bird's-eye view of progress made and add interest to the subsequent study of the reports themselves. The short articles which follow in this and the next issue have been contributed by the authors of the reports, with the exception of that on the Fermentation Industries which has been supplied by Dr. A. Slator.

HEAVY CHEMICALS.

The literature of this first year of peace is still dominated by the war. Much of the work done during the war could not be published until after the termination of hostilities, and many interesting details have appeared for the first time during the year. The United States authorities have been more communicative than those in this country, in France or in Germany, although some light on the conditions in the latter country is being afforded by the visits of Allied representatives to the occupied areas. During the war the heavy chemical industry underwent great dislocation; for example, before the war about 3 per cent. of the million tons of sulphuric acid produced annually in this country was used in making explosives; during the war the production increased to $1\frac{3}{4}$ million tons, the greater part of which was used for explosives. A very considerable part of the increased production was in the form of oleum. The obvious impossibility of carrying on modern warfare without a supply of nitric acid forced all the belligerents to devote great attention to the provision of a supply within their own borders. Very considerable progress has, therefore, been made in the fixation of atmospheric nitrogen on a large scale. The very important synthesis of ammonia from its elements can be, as yet, regarded as an established industry only in Germany, where the output appears to have exceeded 150,000 tons of nitrogen in 1918—an extraordinary record considering the complexity of the plant and that operations began in 1913. The cyanamide process was also installed in all the principal countries taking part in the war, but doubts are expressed about its ability to compete commercially under normal conditions. The oxidation of ammonia to nitric acid, which was carried out on a relatively very small scale before the war, has assumed enormous proportions.

The energetic search for new sources of potash to take the place of the Stassfurt supply has met with a considerable measure of success. In America the production in 1918 reached about one-fifth of the pre-war consumption, and in this country it appears that there is sufficient potash in our blast-furnace dust to cover the home demand.

A very remarkable illustration of the facility with which the reputedly rarest substances can be obtained in quantity is afforded by helium, which it is proposed to use in place of hydrogen in airships. It appears that a potential supply of 180,000 cub. feet daily exists in a natural gas in Texas.

It is to be feared that much of the energy expended in devising new processes and in erecting the plant for working them will go to swell the wastage of the war. This applies to ammonium nitrate, the output of which, in this country alone, increased from 100 tons to 3,000 tons weekly; to silicon and titanium chlorides, which were used in producing smoke clouds, and to a smaller extent to chlorine, which entered into the composition of almost all of the poison gases used, and to sulphuric acid.

DYES.

A matter of primary interest and importance is undoubtedly the question of how far British manufacturers have succeeded in their endeavour to render this country independent of German dyes. The answer may be summarised in the statement that progress has been considerable but much yet remains to be done. As a result, little competition is to be feared in the commoner and cheaper dyes, but further development and increased output are necessary with regard to special and more expensive dyes, for the erection of plant has proved unable to keep pace with the progress of technical research. At the present time, the list of dyes which need never be purchased from Germany again is large and ever increasing, whilst the temporary products of the early days of the war have been replaced by standard products of recognised purity and value. (See also this J., 1919, 456 R.) The deficiency in the supply of certain dyes has been met to some extent by the importation from Switzerland of products manufactured largely from British and French raw materials and intermediates, which have replaced similar German materials upon which the Swiss were dependent formerly. The quantity of dyes now imported from Switzerland is only about one-sixth of the quantity which is being made by British manufacturers. The arrival and disposal of the first consignment of our share of the dyes due from Germany under the Peace Treaty should do much to ease the present situation and afford our manufacturers a breathing space in which to continue their development and consolidate their position. Given the plant, increased yields and improved working conditions will naturally follow as a result of practical experience, so that there is every reason to believe that the British colour industry may be established on a satisfactory basis during the next five years.

A few of the important additions to the number of colours manufactured in this country may be quoted here:—Alizarin Celestol, Solway Purple (Alizarin Irisole), Kymric Green (Alizarin Cyanine Green), Coomassie Violet (Formyl Violet S4B), Lissamine Green B (Wool Green S), Gallocyanine BD, Monolite Red R (Lithol Red R), Chloranthrene Red 5G (Algole Red 5G), Chloranthrene Bordeaux R (Indanthrene Bordeaux B), and bases for fur dyeing. Rhodamine will be placed on the market shortly. The annual report should be consulted for a complete record of the progress in technical and theoretical colour chemistry during the year 1919. Outstanding features, in the case of intermediate products, are the further development of processes for continuous sulphonation and the attention which has been devoted to the production and purification of N-alkylarylamines, whilst in the case of dyes a large amount of work has been carried out, principally in the azo-, triphenylmethane, sulphide, indigoid, and anthracene vat classes.

FINE CHEMICALS.

There are no remarkable developments to record in connexion with this group of chemical products in 1919. Much interest has been shown in the question of the supplies of cinchona bark, which for many years past have been drawn almost wholly from Java. A survey conducted in India by Colonel Gage shows that in the districts in which some cinchona is now grown, principally for the use of the Indian Government's small quinine factories, further plantations can be formed, but it it is suggested that cinchona cultivation might be undertaken on a large scale in the Tavoy district of Burma, and that a new quinine factory might be erected there to utilise the bark produced. This question is also receiving attention in the United States, where proposals for the utilisation of South American bark have been made.

In Germany, Morgenroth has investigated the action of a number of homologues of hydroquinine, chiefly with a view to ascertaining the influence of stereoisomerism on their physiological action. This author shows that eucupinotoxine is a more powerful anæsthetic than its structural isomeride eucupine (*iso*-amylhydrocupreine), and from forty to fifty times more powerful than cocaine.

During the war, when "Turkish opium" was unobtainable, Indian opium secured a footing in this country, and also in the United States, for the manufacture of morphine. Although the Indian drug proved to be richer in morphine than was generally supposed, it contains on the average, as marketed in this country, less morphine than Turkish or Persian opium. It is known that opium as rich in morphine as any of the commercial varieties can be and is produced in India, and it is understood that the botanical and chemical investigations now in progress there have already given results which indicate ways in which the average quality of the opium exported can be greatly improved.

Among the minor alkaloidal drugs, considerable progress has been made in elucidating the structure of hyoscine (King) and of scopoline, the basic hydrolytic product of hyoscine (Hess). Further, of seven alkaloids derived from mescal buttons, Späth has shown that one is identical with hordenine and the others closely related thereto.

Further details on the isolation of thyroxine, the active principle of thyroid gland, have been published by Kendall, but no particulars have yet appeared regarding the synthesis of this substance, which is stated to have been accomplished by Osterberg two years ago.

Of the many papers which have been published on essential oils and their constituents, the most interesting from an industrial point of view are those concerned with the utilisation of *p*-cymene, the chief constituent of "spruce turpentine," now available in large quantities as a by-product of the pulp industry. Methods have been devised for the conversion of this hydrocarbon into carvacrol and *p*-aminocarvacrol (the latter is stated to be a promising photographic developer), whilst a method of preparing thymol from cymene has been protected. A number of Japanese essential oil-yielding plants has been examined, some of which may prove to be of commercial interest as sources of citral, geraniol, thymol and carvacrol.

The new synthetic drugs described during the year are for the most part mere variations on well-known types. Interest in organic arsenic derivatives shows no signs of slackening either in this country or in the United States. Perhaps the most notable work done in this connexion during the year is the preparation at the Rockefeller Institute of a series of arsenobenzenes and their intermediate products derived from *N*-phenylglycine-*p*-arsinic acid, all of which have been protected by patents. Judging from preliminary notices in the American medical press, certain of these compounds are likely to be of considerable therapeutic importance.

A considerable volume of patent literature relating to the manufacture from acetylene of acetone and the necessary intermediate products has recently been set free. These deal largely with details involved, but are of general interest as giving a considerable amount of information on obscure points in the series of reactions employed.

The foundation of an industry dealing with the production of organic research reagents has been discussed in this country, but in the United States manufacture on a small scale has actually started.

VEGETABLE OILS AND FATS.

The past year has been one of steady if slow progress. The enormous development of the margarine industry (the output is computed by one authority to have reached a total of 10,000 tons per week) has led to oils being used for edible purposes which a few years ago would have been considered as only fit for the soapmaker. This is in great part due to the expansion of the process of hydrogenation which has brought within the ken of the margarine maker consistent fats from vegetable oils and also fish oils to replace the oleo-margarine from beef fat. Even hardened castor oil has recently been suggested as a foodstuff.

The important subject of the amount and nature of the vitamines contained in oils and fats has received scant attention during the past year, and a reasonably quick and accurate method for determining these somewhat mysterious substances is still to be desired. It may be that the therapeutic effects of codliver oil hitherto supposed to lie in the easy assimilability of the glycerides of the highly unsaturated fatty acids is due to the presence of vitamines. Unfortunately they are probably destroyed by the high temperature required for hydrogenation. For the same reason a process, recently patented, of deodorising by blowing hydrogen through the oil at temperatures up to 300° C. must be regarded doubtfully pending further investigation.

The process of hydrogenation has attracted considerable attention of a scientific nature with the object of discovering the *rationale* of the addition of hydrogen, and on the technical side it has also been the subject of investigation.

The study of the hydrolysing effect of enzymes has been continued during the past year, mainly in the United States. The work done in this field, however, is of a purely scientific nature. Enzymes as a reagent in the commercial splitting of fats have been almost ousted by the Twitchell reagent; that the process is still being worked in some quarters is shown by a recent patent taken out for purifying the glycerin resulting from ferment hydrolysis. Various oils have been tried for their suitability for the manufacture of the Twitchell reagent, and the conclusion has been drawn that hydrogenated castor oil gives the best result as regards the colour of the final product.

A fair amount of work has been published on the determination of the characteristics of new oils and fats and on the re-examination of little-known oils. Some of the latter may become of commercial importance like "benefing oil" and para rubber seed oil, which are capable of replacing linseed oil in some directions. In these cases the natural supply is large, but there is difficulty attending the commercial exploitation owing to high cost of collection and transport; in other cases where the supply is limited, *e.g.*, kernels of stone fruit (plums, prunes, etc.), the extraction of the oil can only be profitably worked as a side issue to some other industry.

Among the marine animal oils our knowledge has been increased of the different species of shark caught in Japanese waters whose liver oils contain highly unsaturated hydrocarbons. The accidental inclusion of a shark liver may explain why the analyst sometimes finds a large amount of unsaponifiable matter in Japanese codliver oils.

A great stride in the commercial synthesis of glycerin has been made by the development of its production by the fermentation of molasses. There is a considerable amount of alcohol produced as a by-product, and as the process is applicable to molasses which are quite inedible there should be a future for it.

MINERAL OIL.

A retrospect of the reaction of petroleum and its products on the European War affords both gratification at the part played by mineral oil chemists in the elucidation of momentous problems and satisfaction that the importance of the chemical investigation of the nature of the raw material is receiving serious attention. When it is realised what progress has been made, for instance, in the unfolding of the chemistry of coal tar, it is somewhat surprising that the nature of the hydrocarbons which occur in petroleum is to a large extent unknown to us. With the exception of the light petroleum fraction and the somewhat sporadic occurrence of solid paraffins, little is known of the vast bulk of the oil, and so far as the writer knows there is scanty evidence that any decisively formulated hydrocarbon has been isolated and its constitution proved by the usual synthetic methods.

The commercial isolation of toluene from petroleum spirit in the form of its mononitro derivative has been a feature of the war. Vast amounts of TNT have been manufactured from this source, and to a large extent this operation has been a deciding factor in the struggle. Investigations in the United States tend to show that the chlorination of natural gas and the lower paraffins will open up an important industry, resulting in the manufacture of carbon tetrachloride, chloroform, acetic esters of the butyl and amyl radicles, and a variety of synthetic products, whilst on the other hand the reactive unsaturated substances which result from the cracking of oils have been shown to contain notable amounts of isoprene and butadiene, and are therefore of potential interest in the rubber industry. It requires little imagination to foresee in petroleum the starting-out material for a great synthetic revival.

Optimistic statements have been made on the important matter of the available quantities of petroleum yet to be exploited. The recent bringing in of highly productive wells in Mexico has called renewed attention to the potentialities of that great producing area, whilst tho Persian fields, at the moment barely "scratched," offer the rosiest possibilities of a great Imperial asset.

The event of the year has been the striking of oil in Derbyshire. Petroleum has long been known to occur in England. The late Sir Boverton Redwood, whose loss is so universally deplored, always insisted on the need for the ultimate test of the drill, and it is perhaps to his persistence in this direction that Lord Cowdray's successful efforts may be traced. The close agreement between the constituents of the Hardstoft oil and those predicted by Mr. J. E. Hackford is an agreeable confirmation of the work that has been carried out on English oil by this observer.

The oil itself is of excellent quality and it resembles a high grade Pennsylvanian oil. High in volatile content, with a residue of first-class lubricating properties, the new crude may turn out to be of prime importance.

Efforts are being made to exploit the native shales, particularly in Norfolk. The first attempts were somewhat discouraging, seeing that the oil possessed high sulphur content, but it is asserted that the shale mined at lower levels yields an oil which is free from this objection. Cannels and other bituminous coals are also likely to be distilled in the near future, and a recently formed combination, the Midland Coal Products Company, proposes to erect a testing station, at which a variety of retorts and retortable material will be investigated.

The past year, therefore, has been one of great promise for the mineral oil industry, and it may fairly be said that a renascence of scientific effort has arrived. For many years the centre of gravity of research in this field had passed into other countries, albeit that mineral oil was first commercially worked in these islands. The munificent gift of the great oil companies to Cambridge University and the establishment of research laboratories in the industry itself are signs that the balance of interest may well return to these shores.

(To be continued.)

THE INTERNATIONAL LABOUR CONFERENCE AND INDUSTRIAL POISONING.

STEPHEN MIALL.

The International Labour Conference, held at Washington in November, 1919, is of some interest to industrial chemists.

The Treaty of Peace with Germany provided that as part of the organisation of the League of Nations there should be an International Labour Office with annual Conferences of four delegates from each country included in the League, of whom two are to be Government representatives, one to represent the employers and one the workpeople. These delegates are accompanied by advisers, and the writer was privileged to attend as an adviser to the employers' delegate from Great Britain, Mr. D. S. Marjoribanks, of the firm of Armstrong, Whitworth and Co., Ltd.

The Treaty of Peace also provided that the first Conference should be held at Washington, and the agenda for that Conference should be (1) the application of the principle of the 8-hour day or the 48-hour week; (2) unemployment; (3) and (4) the employment of women and children in certain respects, including their employment in unhealthy processes; (5) the extension of the Berne Conventions on the employment of women, and the prohibition of the use of white phosphorus. If the Labour Conference comes to a decision on a matter such decision is embodied either in a draft convention or in a draft recommendation, and these drafts are to be forwarded to the Governments concerned, in order that a treaty may be signed, or that appropriate legislation may be introduced, as the case may be.

Delegates from forty countries attended at Washington. The German delegates were invited to attend, and got as far as Rotterdam, where they were delayed until it was too late for them to reach the Conference. The proceedings were conducted in French and English, and were reported in those languages, and also in Spanish. The majority of the delegates and their advisers were well acquainted with the subjects to be discussed, and many of them were experts whose reputation is world-wide. Special Commissions were appointed to consider (a) unemployment, (b) the employment of women and children in unhealthy processes, (c) the employment of women before and after childbirth, (d) the employment of children, and (e) the eight-hour day. These Commissions had protracted sittings, and ultimately their reports were adopted as recommendations by the Conference.

The Commission on the Employment of Women and Children in Unhealthy Processes was presided over by Dr. T. M. Legge, the Senior Medical Inspector of Factories in Great Britain; the Commission included Dr. Glibert, of Belgium, and Monsieur Boulin, of France, both well known as authorities on unhealthy processes. The Commission found that to range over the whole subject of industrial poisoning was impossible, and it confined its attention to plumbism, mercury poisoning and anthrax, recommending that carbonic oxide poisoning should be placed on the agenda for the next Conference, and specially studied meanwhile.

The Conference recommended that women and young persons should not be employed in the following processes:—

(a) Furnace work in the reduction of zinc and lead ores.

(b) Processes in the manipulation, preparation and reduction of ashes containing lead, and the desilverising of lead.

(c) In melting on a large scale lead and old zinc.

(d) In the manufacture of solder and alloys containing more than 10 per cent. of lead.

(e) In the manufacture of litharge, massicot, minium, white lead, orange lead, sulphate, chromate and silicate of lead.

(f) In mixing and pasting of electric accumulators.

(g) In the cleaning of workrooms where the above processes are carried on.

The Conference also recommended that where the employment of women is permitted and there is any risk of plumbism, precaution should be adopted, such as localised ventilation, cleanliness of tools and workrooms, notification and compensation, periodic medical examination, suitable cloak rooms, and special protective clothing, and so forth; and it laid down that where soluble salts of lead could be replaced by those of a non-toxic nature stringent regulations should be enforced where noxious substances continue to be used.

The statistics of plumbism in Great Britain, submitted by Dr. Legge, show a very gratifying reduction in number. Thus:—

The cases of lead poisoning in the smelting of metals declined from 34 in the year 1900 to 15 in 1918; in the white lead industry the cases were 358 in the year 1900, 17 in the year 1917, and no case was reported in the year 1918; in the china and earthenware industry there were 200 cases in 1900, and only 11 in 1918, the reduction being largely due to the use of fritted lead instead of white lead and red lead; in all the industries included in the returns the cases of plumbism reported were 1058 in 1900, 601 in the average years 1903 to 1905, 381 in 1915, and only 144 in the year 1918. These figures show how much may be accomplished by wise regulations, methodical inspection, and cordial co-operation between the Home Office, the employers and the workers concerned.

The Conference considered that the use of nitrate of mercury by hatters' furriers was unnecessary, and recommends the next Conference to consider its abolition.

The anthrax problem is a difficult one, but progress seems to have been made in the disinfection of wool. The Bradford Committee is of opinion that infected wool is rendered sterile by agitation in warm water with a little soap and sodium carbonate and treatment with a 2½ per cent. solution of formaldehyde in the manner described by it, and the Conference at Washington recommends that international action be taken to ensure the disinfection of suspected wool in the country from which it is infected.

The problems of unemployment and the application of the eight-hour day are complex and a discussion of them would involve a good deal of space. It is hoped that the foregoing very brief account of some of the activities of the International Labour Office will show the importance of its work and the need for all who are interested in industrial progress to study themselves the great problems which surround us so as to be able to help future Conferences to obtain those just and reasonable solutions which the world properly expects.

ARTIFICIAL NITROGENOUS FERTILISERS.

E. J. RUSSELL.

Synthetic nitrogenous fertilisers have been of interest to chemists ever since Sir William Crookes made his famous announcement to the British Association, in 1898, that the world was faced with a serious food shortage unless it could somehow increase its stores of fixed nitrogen. Sir William indicated the solution of the problem, which chemists actively followed up. Synthetic fertilisers were produced in quantity and tested by agriculturists in the field. During the war the subject has been brought into high prominence and great developments have occurred.

There are now three synthetic fertilisers available for agriculture—ammonium nitrate, calcium nitrate, and cyanamide. Of these ammonium nitrate is the most concentrated and probably also the most active, but it is also the most expensive. At the termination of hostilities the belligerent governments had large stocks on their hands which were offered to farmers at low rates: in our own country the price was £25 per ton, packed in barrels. Sulphate of ammonia was at the time being offered at £16 15s. per ton and nitrate of soda at £20 per ton. Worked out as cost per unit of nitrogen (1% per ton—the unit in terms of which the farmer thinks) the prices were 14s. 4d. per unit for nitrogenous nitrate of ammonia, 16s. 9d. as sulphate of ammonia, and 25s. as nitrate of soda. Nitrate of ammonia was therefore much the cheapest, and there was no question as to its value to farmers at this price.

Events have shown, however, that £25 per ton is not an economic price for nitrate of ammonia, and the supply at this price is now exhausted; the Disposal Board is unable to accept further orders from farmers. The question therefore arises, What price is the farmer justified in paying for nitrate of ammonia? Sulphate of ammonia is obtainable at prices advancing from £21 per ton in December to £22 per ton in March, April, and May; nitrate of soda will be offered next spring at £2?—£22 per ton according to locality. On the basis of equal unit price nitrate of ammonia should be offered at about £40 to £41 per ton. Chemists have frequently inquired whether nitrate of ammonia has any value over and above that of the mixture of nitrate of soda and sulphate of ammonia to which the unit system equates it. Numerous field experiments have been made; they indicate a slight advantage but no marked superiority of nitrate of ammonia over nitrate of soda and sulphate of ammonia when comparison is made on the basis of equal nitrogen content. Experiments are recorded in this Journal by Hendrick (Vol. 37, 1918, 146 R) on hay when nitrate of ammonia gave results up to 4 per cent. better than those obtained from nitrate of soda or sulphate of ammonia. In the Newton Rigg experiments, on the other hand, the nitrate of ammonia was less effective than nitrate of soda; the results were:—

	Yield per acre. 1913.	Yield per acre. 1914.
	Tons.	Tons.
Nitrate of soda	[illegible]	[illegible]
Nitrate of ammonia	[illegible]	[illegible]

The low result of 1913 is difficult to understand and is not typical of results usually obtained. The Rothamsted experiments conducted during the season of 1918 with nitrate of ammonia supplied by the Ministry of Munitions gave the following results:—

Stackyard Field, Mangolds. 1918.

Seed sown May 29; Roots carted December 9 to 12.

Manure.	Weight of mangolds. Per plot (1/20 acre).	Per acre (mean of two plots).
	Cwts. qr. lb.	Tons.
Superphosphate, salt and sulphate of ammonia.	13 1 8	15·6
	17 3 20	
Superphosphate, salt and nitrate of ammonia.	20 2 20	23·3
	25 3 18	
Superphosphate and salt ..	13 2 20	[illegible]
	17 3 16	

Manuring.—

All plots received a dressing of dung at the rate of 10 tons to the acre.

The other manures at rate of—

Superphosphate	4 cwts. per acre	
Salt	2 „ „	
Sulphate of ammonia	2 „ „	
Nitrate of ammonia ..	145 lb.	„ (equivalent to 2 cwts. sulphate of ammonia).

West Barnfield: Potatoes. 1918.

Variety "Arran Chief," planted May 9; 27 rows in each plot of 1/20 acre.

Plot.	Manure.	Tubers roughly cleaned. Weight per acre.	Tubers roughly cleaned. Mean per acre.
		Cwts.	Cwts.
9	Superphosphate & sulphate of ammonia	175·4	175·4
11	Superphosphate and nitrate of ammonia	178·9	174·5
14		170·0	
13	Superphosphate alone	146·8	160·9
10		175·0	
15	No artificials	144·3	144·3

A dressing of dung was applied over the whole field in the winter, and ploughed December 10 to January 3.

Rates per acre of artificial manures:—

Superphosphate	4 cwts.
Sulphate of ammonia	2 ,,
Nitrate of ammonia	145 lb.

Little Hoos Field: Wheat. 1918.

Variety, "Red Standard" (after clover).
Seed sown, November 3 to 5, 1917.
Crop cut, August 12 and 13, 1918.
Artificial manures applied, April 26, 1918 (by hand), consisting of:—
2 cwts. superphosphate per acre, or
1 cwt. sulphate of ammonia per acre, or $72\frac{1}{2}$ lb. nitrate of ammonia per acre (these contain equal quantities of nitrogen).

	Dressed grain per acre.		Straw per acre.	Total produce per acre.
	lb.	bush.	lb.	lb.
Experiment I.				
Unmanured	2,195	33·9	4,030	6,443
Superphosphate only	2,492	38·6	4,550	7,310
Sulphate of ammonia and superphosphate	2,630	41·3	5,250	8,178
Nitrate of ammonia and superphosphate	2,822	44·7	5,070	8,120
Experiment II.				
Unmanured	2,325	35·8	4,450	7,057
Superphosphate only	2,198	34·6	4,520	7,025
Sulphate of ammonia and superphosphate	2,585	40·1	4,830	7,775
Nitrate of ammonia and superphosphate	2,400	37·7	5,050	7,830

On the other hand, nitrate of ammonia has some disadvantages in comparison with nitrate of soda; it is not so easily handled by the farmer; it has to be stored in casks, not in bags, and it is not readily applied by the ordinary drill. These are essentially minor disadvantages, but they off-set any slight advantage the nitrate of ammonia may possess over nitrate of soda, and probably no farmer would purchase it if he could obtain nitrate of soda at the same unit price. So long as nitrate of soda is obtainable at £20 per ton farmers are not likely to purchase nitrate of ammonia unless it could be obtained at about £35 per ton, or less.

Calcium nitrate.—This substance is now manufactured on a large scale and is producible at prices comparable with that of nitrate of soda. Further, it is already fairly well known to agriculturists; it is in charge of a competent propagandist agent and is a really useful fertiliser. Experiments designed to compare it with nitrate of soda are recorded in this Journal for March 15, 1917 (Vol. 36, pp. 250—261), and in Vol. 37, 1918 (p. 146 R), and no important difference has been discovered. The percentage of nitrogen differs, nitrate of soda containing 15·5% and nitrate of lime only 13%, corresponding to 76·2% pure calcium nitrate, the rest being mainly water with traces of calcium oxide, carbonate, etc. This is in favour of nitrate of soda. On the other hand, nitrate of lime has the advantage that the calcium is never hurtful in the soil, while the sodium sometimes is, though also the sodium is sometimes an advantage. On the whole, farmers would probably be willing to pay nearly as much per unit for nitrate of lime; and, assuming that nitrate of soda were available at £20 per ton, they would probably pay up to £16 or £16 10s. per ton, though, of course they would purchase more freely at a lower price.

Cyanamide.—Cyanamide presents the characteristic that it is not at once available for plants, but has to undergo change in the soil whereby ammonia is formed, which subsequently nitrifies. The whole value of the material, therefore, depends on the rate at which this change proceeds. In some soils it goes on rapidly, and here cyanamide is very effective. In others, however, it proceeds more slowly. It is a first essential that the change should be fully investigated, so that it can be fully understood; there is reason to suppose that the production of ammonia takes place in two stages, the first of which is purely chemical and the second bacterial; further, that the agent producing the chemical change is not always present in sufficient quantity in the soil. It would be an obvious advantage if a chemist could say beforehand of a given class of soil whether or not it were likely to decompose cyanamide. Work with this purpose has been carried out at Rothamsted, and the results are very promising.

The results of all published field trials show that the three fertilisers—nitrate of soda, sulphate of ammonia, and cyanamide—when compared on the basis of equal nitrogen content have the following values:—

Nitric nitrogen	100
Ammoniacal nitrogen	97
Cyanamide nitrogen	90

But these include cases where the cyanamide nitrogen could have had no proper chance of acting. Under better advice, such as is now obtainable, the farmer could have been warned beforehand, and the use of the cyanamide kept to those numerous cases where it can decompose rapidly and act well. In these circumstances the value of the cyanamide nitrogen might rise well above 90, and, what is more important, the risk of failure might be considerably reduced. Under present conditions farmers would be unlikely to pay more than about £18 or perhaps less per ton for cyanamide containing 20% nitrogen if sulphate of ammonia were obtainable at £21. When the decomposition is better understood, however, experts will be in a position to advise more confidently; the fault lies less in the material than in our uncertain knowledge of some of the fundamental points.

On the other hand, the makers must obviate the presence in the commercial article of dicyanodiamide, which is actually harmful to vegetation. This is a factory problem, but chemists will not readily believe it to be insoluble.

REVIEW OF THE SPELTER SITUATION.

H. M. RIDGE.

In 1913 the world's spelter production amounted to 982,000 tons, of which 32 per cent. was made in the United States, 28 per cent. in Germany and 20 per cent. in Belgium; in Great Britain only 6 per cent. was made, although the consumption amounted to 23 per cent. of the metal produced in the whole world, while in the whole of the rest of the Empire only 3700 tons was produced. As a consequence an acute shortage of metal was experienced during the war and prices rose phenomenally. Schemes were prepared for increasing the output, but with the whole of the smelting capacity of the United Kingdom in operation only 80,000 to 85,000 tons could now be produced annually.

During 1919 the world's production amounted to about 520,000 tons, including 410,000 tons in the United States, but only about 20,000 tons in Great Britain, where the output has been limited by shortage of ore and by labour troubles. Belgium only recommenced smelting towards the middle of the year, and was hindered by shortage of ore and the difficulty of securing sufficient shipping tonnage even at high prices. During 1919 British imports of spelter amounted to 94,226 tons.

At the present time production is progressing satisfactorily in America, but Belgium is producing only 6500 tons a month or 39 per cent. of the pre-war output, and Germany 3500 tons or 14 per cent., and Great Britain 2000 tons or 40 per cent. It is obvious that until conditions improve we are dependent on American supplies. Owing to the necessity of preference being given to the shipment of foodstuffs, wool and other essential commodities, zinc ore is being shut out, and there seems no prospect of the British or Belgian works being able to run their furnaces at full capacity during the coming months, but even then the output in the United Kingdom will be limited by the amount of plant available. If we are to become independent of foreign supplies of spelter the extension of existing plants and the erection of new works are necessary.

During the war zinc smelting was classified as one of the important key industries, but no steps have yet been taken to make the country self-supporting, although ample supplies of ore are available within the Empire.

For the ten years before the war the average price of g.o.b. spelter in London was £23 16s. 5d. Since then the average prices have been:—

1914	£23 6 8
1915	£66 13 8
1916	£68 18 11
1917	£52 3 6
1918	£52 4 0
1919	£42 5 3

On the technical side important improvements have been made in recent years. Ordinary wet methods for the concentration of zinc ore have been superseded by the flotation process, electro-magnetic separation being now used only quite exceptionally. Flotation has necessitated finer crushing, but it has been found that higher recoveries are obtained, while the grade of the concentrate is improved owing to more complete elimination of the gangue.

In the treatment of zinc concentrates no radically new methods have yet proved suitable. Electrolytic precipitation has been tried in a number of works in the country, but all of these have been shut down, including the Hoepfner process plant at Winnington, from which such a good product was obtained for several years. It is interesting to note that at the same time electrolysis has been adopted for the new plants in Tasmania, Canada and at one works in the United States, but in each of these cheap power is available. The demand for high-grade zinc will be large in future, but it can now be obtained cheaply by new means which were worked out during the war. Much progress has been made with the electric furnace reduction in Norway, Sweden and France, and the troubles experienced in the condensation of the zinc vapour have been largely overcome, but here also cheap power is essential.

Hand-rabbled furnaces for roasting are rapidly being replaced by mechanical furnaces, and these are already satisfactorily in operation in several works in the country. The saving in labour is important, and at the same time a more regular product is obtained and the consumption of coal decreased. The even supply of sulphur fumes materially facilitates the working of sulphuric acid plant, and avoids the losses of nitre which take place when hand furnaces have to be worked intermittently.

Pot-making machinery was in the past obtained from Germany, but during the war complete plant for this purpose was designed and manufactured here, and has given entire satisfaction. Novel apparatus for more efficiently mixing the different clays has proved successful. Clay for pot-making used to be imported from Belgium, Germany and Austria, but the war stimulated experiments with British clays, and these can be used as well as the imported materials, giving a good pot life when working at a high temperature. After drying and burning the red-hot pots have to be taken to the furnace and put into place. Even in this arduous operation hand labour is replaced by a simple semi-automatic apparatus, and a good deal of delay to the furnace is being saved by this means.

The results obtained with improvements in the design and construction of the zinc distilling furnaces are worth recording. To reduce 10 tons of ore 14½ to 15 tons of coal was formerly required for heating. In a plant built during the war the coal consumption has been reduced to under 8 tons, a figure which constitutes a world's record. The furnaces are built with counter-current recuperators, and there are no reversing valves requiring attention; the heat in the waste gases is so efficiently utilised to preheat the air that the temperature of the gas going to the chimney stack is reduced very much below what was formerly considered possible.

Weighing, mixing and transportation of the charge to the furnaces is now done entirely mechanically, so that much labour is saved and supervision facilitated.

Charging the pots in the furnace probably used to be the most laborious work of the zinc smelter, and this has been overcome with the aid of charging machines. These are driven electrically, and are much more efficient than hand charging, the pots being more uniformly charged and the charge denser. The duration of the manœuvre is shortened by about two hours, and the time for working off the charge is increased correspondingly, because 14 tons of charge can be fed into the pots in less than twenty minutes.

The more extensive use of machinery reduces the number of men, and at the same time makes the management more independent of the skilled workmen.

The outlook for the zinc industry in Great Britain is not promising unless the existing works can be brought up to date and the smelting capacity increased by the construction of additional works. New plant built during the war has demonstrated that zinc smelting can be carried on efficiently, economically and profitably provided that the best designs and apparatus are adopted, and in view of the large demand for metal in the Empire it is to be hoped that means will be found so that it will become unnecessary to rely upon imports from foreign countries.

SODIUM AND SODIUM COMPOUNDS IN 1918.

A report recently issued by the United States Geological Survey (Mineral Resources of the United States, 1918, Part II., Pp. 198) contains many statistical tables dealing with the production, exportation and importation of all the important commercial sodium compounds, together with analyses of natural products, information concerning uses and manufacturing processes, and in some cases the names of manufacturers. The data supplied relate mainly to the American products, but some particulars of production etc. in other countries are also included. The report also contains a bibliography dealing with natural sodium salts.

The total quantity of sodium salts derived from natural sources amounted to 6,999,920 short tons, valued at $20,836,044 in 1917, and to 7,262,797 short tons, worth $27,933,149, in 1918. The imports of sodium salts during 1917 were 3,601,655,180 lb., valued at \$62,527,007, and 4,223,449,559 lb., valued at \$90,939,431, in 1918. Of these imports by far the greater part was sodium nitrate, of which 3,456,780,000 lb. (\$60,727,100) was imported in 1917, and 4,138,758,400 lb. (\$90,216,935) in 1918. The domestic exports of sodium salts were valued at \$1,320,963 in 1914 (July 1 to December 31), at \$7,725,034 in 1915, at \$17,571,439 in 1916, at \$23,384,969 in 1917, and at \$22,291,735 in 1918. In 1915 foreign sodium salts were re-exported to the value of \$40,358, and during succeeding years to the respective values \$193,086, \$25,632, \$73,402. It is considered probable that pre-war prices for potassium compounds will not be reached for a very considerable time, and it is anticipated that most of the substitutions of potassium salts by sodium salts which have occurred under the stress of war conditions will be permanent. The principal producers of alkali in the United States have organised an Export Association, with offices at 171, Madison Avenue, New York City, which aims at securing uniform and favourable conditions in the export trade, especially in regard to foreign banking facilities and ocean freight rates.

Production of sodium and sodium compounds in the United States during 1917 and 1918.

	1917. Quantity (short tons).	1918. Quantity (short tons).
Sodium (metal) *	—	264
Sodium acetate	1,049	2,622
Sodium benzoate	—	203
Sodium bicarbonate	119,177	118,535
Sodium bichromate and chromate ..	22,446	28,334
Sodium bisulphite and sulphite ..	13,707	16,362
Sodium bromide	—	574
Sodium carbonate:		
Soda ash	1,390,625	1,390,628
Monohydrate and sesquicarbonate ..	55,035	22,678
Washing soda	77,939	82,465
Sodium chlorate and perborate ..	2,915	2,413
Sodium chloride:		
Salt in brine	2,890,583	2,830,600
Rock salt	1,605,025	1,683,941
Evaporated salt	2,482,584	2,724,203
Sodium cyanide, iodide and peroxide..	9,694	9,086
Sodium ferrocyanide	4,173	4,525
Sodium fluoride, acid fluoride and fluosilicate	1,424	1,228
Sodium hydroxide	488,056	513,363
Sodium nitrite	861	1,701
Sodium phosphate (all)	13,305	15,620
Sodium silicate	254,011	317,161
Sodium sulphate:		
Salt cake	183,909	141,054
Glauber's salt	47,757	50,715
Nitre cake	387,821	143,155
Sodium sulphide	49,494	43,490
Sodium tetraborate (borax)	32,089	26,673
Sodium thiosuphate	26,598	26,868
Miscellaneous sodium compoumds ..	4,563	381
Total	10,164,825	10,198,842

* The output of sodium metal for 1917 is included in that of miscellaneous sodium compounds.

With regard to individual products it is noted that sodium bichromate has come into extensive use in the tanning industry within recent years in place of potassium bichromate, and has been found equally efficient. The manufacture of soda ash is confined almost entirely to the States of New York, Ohio, Virginia, Michigan, California and Kansas. Of nine companies manufacturing soda ash, five utilise salt brine, three have deposits of natural salt and one company incinerates the ash from spent pulp liquor. Soda ash manufactured by the ammonia soda process is of exceptional purity, running 99·0—99·7% of sodium carbonate, and that made from cryolite is stated to be very pure. A number of pulp and paper mills, employing the soda process of making fibre, recovers sodium carbonate from the spent liquor, effecting a saving of from 80—90 per cent. of the soda ash required. The Hargreaves-Bird process of making sodium carbonate by the electrolysis of salt solution, the cathode solution being carbonated, is employed by at least three firms. The natural deposits of soda in the Western States have been worked commercially in a number of places, and methods of extracting the potassium salts from the deposits are being elaborated. Favourable conditions for the production of sodium carbonate exist in the case of the waters at Owens Lake. The lake water is merely evaporated in open vats until a deposit of trona is formed. A large number of patents has been issued in recent years for the separation and utilisation of the several salts occurring in the natural deposits of soda.

Sodium chlorate has supplanted potassium chlorate to a considerable extent in medicine, and is employed in the manufacture of dyes, matches, and high explosives. The practice of returning the cyanogen content of cyanides in terms of equivalent potassium cyanide results in very impure sodium cyanide being sold as 97—98% potassium cyanide, but recently the sodium compound has been sold on its actual sodium cyanide content, the highest grade being 96—98% sodium cyanide equivalent to 51—52% cyanogen. The Bucher process for cyanide production from soda ash, powdered coke, iron ore and air is now under investigation by Government agencies. Restriction of imports imposed by war conditions has resulted in the greatly-increased domestic production of sodium ferrocyanide, which now largely supplants the potassium salt. All domestic requirements can now be met by home supplies.

Proposals for the erection of plant for the manufucture of caustic soda, in order to meet foreign demands, are numerous. The Brunner, Mond, Company's plant at Amherstburg, Ont., has already been referred to in these columns (J., 1919, 85 R, 435 R). Plants for the electrolytic production of caustic soda are in course of erection in Peru, Brazil, China and Japan. The Brazilian Government offers pecuniary assistance to the three firms first commencing operations. The Loewig process of making caustic soda consists in heating soda ash with ferric oxide, whereby sodium ferrite and carbon dioxide are formed. The ferrite is decomposed by water, yielding a concentrated solution of sodium hydroxide, and iron oxide, which is used over again. Many samples of nitrate-bearing material have been examined, but the results do not foreshadow the possibility of successful commercial exploitation. Sodium permanganate is made by the electrolytic oxidation of sodium manganate, and has largely supplanted potassium permanganate in use. The output of sodium phosphate was 2,340 short tons in 1899, 12,290 tons in 1909, 15,387 tons in 1914, and 13,305 and 15,620 tons, respectively, in 1917 and 1918.

Experiments have shown that superphosphates containing 15 per cent. of available P_2O_5 can be readily produced from Florida pebble phosphate by grinding and mixing with nitre cake, the application of heat being unnecessary. Nitre cake in a friable form can be made by adding sodium carbonate or any substance that evolves a gas to melted nitre cake. The application of natural sodium sulphate in an increasing number of directions is recommended. Experimental work has been carried out on the production of anhydrous sodium sulphate from the deposits of natural sulphate near Valmont, New Mexico, and commodity rates have been granted to shipments of the product.

Crude natural borax (tincal) occurs in San Bernardino County, Cal., in saline lakes and plazas in Nevada, Oregon, and in the hot springs of Yellowstone Park. Borax is manufactured from the mineral colemanite ($Ca_2B_6O_{11}.5H_2O$) by treatment with sodium carbonate. The Amercian Trona Corporation contemplates the production of from 20—30 tons of refined borax daily from the water of Searles Lake, and it is understood that production from this source is now under way. New deposits of boron ores have been located at Muroc, Kern County, Cal. No borax is now imported into the United States, and the quantity of boric acid imported during 1918 was the smallest for many years, with the exception of 1912. Deposits of boron ores are being actively worked in Chile, Argentina, Bolivia, Peru, Germany, Italy, Turkey, Russia and Tibet.

NEWS FROM THE SECTIONS.

CANADIAN PACIFIC.

The first meeting of the session was held on October 28 at the University Club of Vancouver. During the afternoon the new Laboratories of the Dominion Department of Health were open to visiting members. After the customary dinner, a business meeting was held when matters concerning the organisation of the Society in Canada were discussed.

The November meeting was held in the same place on the 27th. In the afternoon, at the Convention of the Canadian Mining Institute, Mr. Horace Freeman, a member of the local Section, read a paper on "New Methods in the Hydrometallurgy of Gold and Silver." The manufacture of sodium cyanide from calcium cyanamide by the process patented by Mr. Freeman was referred to and the superior advantages of the product emphasised. Mr. Freeman then reported his recent discovery of the use of a metallic sodium-lead alloy to replace zinc dust in precipitating gold and silver from cyanide solutions. By the action of this alloy the sodium cyanide solution is regenerated, while the presence of the lead facilitates the recovery and refining of the precious metals.

During the evening the members had the pleasure of a very instructive discussion with Dr. A. B. Macallum, Chairman of the Advisory Council for Scientific and Industrial Research of Canada. Dr. Macallum described the successful and progressive work resulting from the establishment of the Council and referred to the proposed legislation for a National Research Institute for Canada, which among other functions would assist the organisation of Trade Guilds for Research among the industries. Much interest was evinced in the announcement that the Council proposed to investigate a number of local problems, especially the utilisation of the great quantities of wood and fish waste, and of the production of iron and steel from British Columbian ores.

BIRMINGHAM.

Mr. L. P. Wilson presided at the meeting held at the University Buildings, Edmund Street, on December 11, and extended a cordial welcome to Prof. G. T. Morgan, who has succeeded Prof. P. F. Frankland in the chair of chemistry at the University.

Mr. James O'Sullivan read a paper "On the Influence of the Temperature, Concentration, Duration of Mash, and Slackness of Malt on the Starch Products of the Extract of Malt." Experiments proved that cane sugar is not inverted in the process of mashing, and that invertase is not present in malt. The absence of invertase, also of lipase, made the way clear for determining the influence of varied conditions of washing on the starch transformation products of malt. The author gave the results of a series of experiments with "thick" and "thin" wash at varying temperatures. From parallel experiments with "dry" malt containing 3·9 per cent. moisture and a "slack" malt containing 10·7 per cent. moisture, the author had little doubt that the difference between the extracts was due to the fact that the "slack" malt did not grind as finely, under like conditions, as the "dry" malt.

A paper on "The Erosion of Lead," by Messrs. J. F. Liversedge and A. W. Knapp, was read by Mr. Knapp. The erosion test with which the paper dealt was devised by Dr. Houston. The experiments were made with Birmingham water, a faintly alkaline natural water which dissolves very little lead, but which has, in the untreated condition, the power of eroding lead, so that scales forming on it fall away and leave a fresh bright surface open to attack. Experiments were made to investigate the effect of light, volume of water, area of water exposed to air, bacteria, exposure to glass, and of dissolved gases, liquids, and solids. The authors conclude that erosion is due to the action of oxygen in the presence of water, and occurs readily in waters containing no carbon dioxide. Such variations as occurred naturally in the percentage of oxygen or carbon dioxide had no appreciable effect on the erosion, but the presence of from 1 to 2 per cent. of carbon dioxide cause a sudden change from "erosion" to "plumbo-solvency." Calcium carbonate is the most effective preventive of erosion, as little as 2 parts per 100,000 being generally sufficient to inhibit it.

GLASGOW.

The Glasgow Section held a joint meeting with the local section of the Institute of Metals on December 16 in the Royal Technical College. Prof. C. H. Desch was in the chair.

Mr. Greer and Mr. Langlands congratulated the chairman on his recent appointment to the chair of metallurgy in Sheffield University. Mr. J. A. Gardiner then read a paper on "The Solidity, or otherwise, of Gunmetal Castings."

The paper was a judicious admixture of theory and practice, and due credit was given to the art and craft of the practical moulder. Although in the present stage of foundry evolution the technical worker lacks the experience that the older foremen possess, the time is not far distant when the value of science will be fully recognised and its dictates put into practice. Cores, vents, gates, and risers each have an effect on the solidity or otherwise of the alloy. With regard to impurities, aluminium, bismuth, and manganese are bad; arsenic in small quantities and lead up to 2 per cent. are not objectionable; phosphorus gives fluidity to gunmetal, but its constant return in the scrap and borings makes it undesirable. Bad gating gives improper feeding to the casting and its effects are "drawn" holes due to liquid metal shrinkage, pocketed air holes, and the working into the casting of portions of the moulding sand. By judicious gating the cooling effects on thick and thin sections of a casting can be controlled. In summing up, a questionable metal can be more readily made to give solidity by judicious moulding than a good metal in the hands of a questionable moulder.

A dinner was held in the St. Enoch Hotel, on December 18, to enable the members to meet Mr. John Gray and Dr. Longstaff, who had come North to visit the Scottish Sections. In an informal talk with the members the progress of the Society in the past and ways and means of increasing its usefulness in the future were discussed. Mr. Moore (the chairman) thanked the President and Dr. Longstaff for their presence, and assured them of the active co-operation of the Section.

NEWCASTLE.

At a meeting held on December 17, at Armstrong College, the chairman, Prof. P. P. Bedson, announced that the Council had accepted the invitation of the Section to hold the next Annual Meeting in Newcastle, at some date in July. He also proposed a vote of thanks to the Newcastle Gas Co. and the Bede Metal Works Co. for allowing parties of members to visit these works, and this was carried.

The main item on the agenda was an address by Dr. J. H. Paterson on "The Theory of Gas Producer Reactions, with special reference to the rate of gasification." In explaining the elementary principles of gas producers, the author expressed his dissatisfaction with some of the assumptions made in text-books, *e.g.*, that there are separate zones of oxidation and reduction in a gas producer, and that carbon monoxide is not the first product of the reaction between the carbon and the air. From the standpoint of economy, a gas producer burning fuel at high rates, say, 50—100 lb. per sq. ft. of grate area per hour, was preferable to a low duty producer in that the capital cost of the plant was less and the upkeep and labour cost lower. The former kind must of necessity be supplied with fuel of low ash content, and the problem of eliminating or reducing ash was a very urgent on , which should be dealt with at the colliery rather than at the furnace. Dr. Paterson then described a very compact, high duty producer, designed by Col. J. D. Smith, which had been used successfully for the propulsion of motor lorries. It was worked on the suction principle with a high rate of fuel consumption, from 80 to 90 lb. per square foot per hour, was entirely automatic in action, and had a flat bar grate of the shaking type, which had proved efficient under trial. There was an extremely shallow fire bed, sometimes as low as two inches thick, and the designer claimed that when using bituminous coal the distillation zone disappeared entirely, and a nearly tar-free gas was produced. The opinion was expressed that this type of producer would come into general use. A good discussion followed the address, and Dr. Paterson announced his intention of writing a lengthy paper on the subject.

LIVERPOOL.

A meeting of the Section was held at the Adelphi Hotel on December 19 last, with Dr. Armstrong in the chair.

Mr. R. Thomas contributed a paper on "The Mechanism of the addition of Hydrogen to Unsaturated Glycerides in the Presence of Finely Divided Nickel." The first portion of the paper dealt with the mechanism of the addition of hydrogen to unsaturated glycerides. The author pointed out that the use of finely reduced nickel as a catalyst in chemical reactions involving the addition of hydrogen to unsaturated compounds was first established by Sabatier and Senderens in 1897, but that none of the numerous investigations then or since dealt with the subject from the dynamical standpoint, although the velocity of the reaction was a most important consideration for manufacturers. He showed certain equations derived for the rate of the addition of hydrogen to mixtures of unsaturated glycerides, using nickel as a catalyst. He considered that the reaction between pure hydrogen, maintained at a constant pressure, and an unsaturated glyceride was of the first order. The more highly unsaturated glyceride (linolin) took up hydrogen at a much greater rate than olein. Using olive oil as the starting point in his investigations, as it was the nearest approach to a chemical entity among vegetable or animal oils, he found that the addition of hydrogen at constant pressure gave a unimolecular reaction, and he showed that the agreement between the observed values of the hydrogen absorption and those calculated from the equations justified this assumption. In Part 2 of his paper, the author discussed the function of the catalyst, its action being attributed by Sabatier to the alternate formation and decomposition of an unstable nickel hydride, while Armstrong and Hilditch compared the action of nickel in fat hardening to that of an enzyme in the hydrolysis of glucosides. He described the results of experiments on the influence of the pressure of hydrogen, and of temperature, on the velocity of the reaction, and showed that the rate of saturation of olein (containing three double bonds) was proportional to $p^{1.5}$, where p is the pressure of the hydrogen. This agrees with the view that the hydrogen becomes active through its absorption by the catalyst—Sieverts having shown that such absorption is proportional to p—with a dissociation of the hydrogen molecules into atoms. The temperature coefficient of the velocity was found to be small, thus suggesting a photochemical reaction, the molecules of olein being brought into an active condition by the absorption of infra-red radiation emitted by the catalyst.

In Part 3 Mr. Thomas dealt with the influence of foreign gases on the catalyst and on the velocity of hydrogenation. He pointed out that the mode of action of gaseous catalyst poisons may be a purely physical one, or it may be chemical in that the poison is capable of reacting either with or in the presence of the catalyst. He described three experiments which were conducted with hydrogen containing (A) nitrogen, as typical of gases which undergo no chemical action with or under the influence either of the catalyst, glyceride, or hydrogen; (B) carbon monoxide, as typical of gases which undergo a transformation with hydrogen in the presence of the catalyst; and (C) hydrogen sulphide, as typical of gases which unite with the catalyst.

LONDON.

A meeting of this Section was held on January 5 at Burlington House, Mr. Julian L. Baker being in the chair. Mr. E. V. Evans and Dr. G. S. Walpole, who have recently returned from tours in Germany, took as the subject of their addresses the present position of chemical industries in that country.

The first speaker, Mr. Evans, who was chairman of the British Mission to German Chemical Works, drew a vivid picture of the great Rhineland organisation as it appeared at the time of the visit. He depicted a huge organisation consisting of many factories, efficiently and lavishly fitted with plant in excellent repair, yet temporarily paralysed owing to the need of raw material and the requisite labour. Particular attention was drawn to the favourable geographic and economic situation of the chemical works in the Rhine valley, and to the advantages accruing to the industry owing to the fact that it has received the support of the nation, the Government, the banks and the universities. The factors which were thought to attribute essentially to the past supremacy of the industry received consideration, the speaker laying stress on the fact that the results obtained were not due to witchcraft, but to collaboration between chemist, physicist, engineer, and commercial director. He emphasised the valuable part played by engineering in the industry, and by scientific method in the organisation of the undertakings. The success attained by the organic chemical industry in Germany was the result of the combined effort of 40 years or more, whilst in this country only the last few years had been seriously devoted to this work, which even then had been carried out under the retarding influence of war conditions. The speaker emphasised the necessity for immediate Government protection, in view of the fact that there existed in Germany an organisation capable of producing almost the whole of the world's pre-war requirements in dyestuffs, whilst at the same time, America, Switzerland and France were making a determined effort not only to supply their own requirements in these organic products, but also to create an export trade.

Dr. Walpole next addressed the meeting on "The Collective Effort of German Chemical Industry." He considered that the fundamental distinction between the situation in Germany and this country was the striking superiority of what may be called the "staff work" of the German industry. He remarked upon the curious paradox that the English, who in sport "play for their side" should in business exhibit such an invincible bias towards individual effort, whereas the German with his deficient sporting instinct always favoured, in business, a highly developed system of combination of interests. The essential factor of German success in chemical industry was the policy of united effort which took cognisance of, and extended its control to every detail. The consequence of this highly elaborated co-operation of interests was the abolition of useless competition amongst its component parts, while the Government on its side offered every inducement to municipal bodies, railways, inland revenue authorities, harbour trusts and so forth, to frame their regulations in accordance with the needs of chemical industry. Dr. Walpole then sketched the system underlying the training of the great body of chemical workers in Germany, and showed how such training is arranged for them by the very industries which were ultimately to reap the reward of their expert services. Stress was also laid on the fact that chemical plant, which in this country is so often the product of unspecialised and unskilful improvisation, is in Germany the speciality of numerous engineers who have devoted their whole attention to the manufacture of plant minutely adapted to specific ends. Machinery of this nature was not purchased haphazard with a view to secure some temporary gain, but as part of a co-operative policy previously thought out with care and thoroughness which took the world market as its main consideration.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

On December 17, at the Institute of Chemistry, London, the President, Mr. S. M. Jenkinson, presented on behalf of the members testimonials to Mr. W. F. J. Wood, the first president of the society, and to Dr. W. E. S. Turner, the secretary, in token of appreciation for the work they had done in founding the society and in bringing it to its present position of influence. Part of the testimonial to the former took the form of a cheque, which the recipient had decided to invest and to devote the interest to the foundation of an annual prize to be awarded to a student in the Department of Glass Technology of the University of Sheffield.

The paper on "The Glass Industry of North America," announced to be read by Dr. Turner, was distributed in proof as the author was unable to read it on account of illness. Notes dealing with the same subject were contributed by Mr. J. Connolly, Dr. M. W. Travers and Mr. W. F. J. Wood, each of whom had recently returned from a tour in the States. The chief points dealt with by the speakers were: Raw materials for glass making, batch mixing; glass-melting furnaces and producers; annealing; pyrometric control; bottle and jar manufacture; electric light bulb manufacture; chemical and scientific glassware, optical glass, glass rod and tubing; chemical and optical glass; and refractory materials. Great stress was laid by all speakers on the development of the use of automatic and semi-automatic machinery in glass manufacturing in America and the consequent increase and economy in production. A large number of specimens of glassware, raw materials, etc., illustrative of American conditions and workmanship was on view prior to the meeting and aroused considerable interest, as did also a dividing machine shown by Messrs. Munro.

PERSONALIA.

Mr. Frank Merricks has been elected president of the Institution of Mining and Metallurgy for the present year.

Dr. F. W. Keeble has been elected to the Sherardian professorship of botany in the University of Oxford.

Sir Richard Glazebrook has been appointed to the Zaharoff chair of aviation at the Imperial College of Science and Technology.

At Leeds University the chair of mining has been filled by the appointment of Mr. Granville Poole, who has been an inspector of mines under the Government.

Prof. H. G. Greenish, Professor of Pharmaceutics to the Pharmaceutical Society of Great Britain, has received from the University of Paris the degree of doctor, *honoris causa*.

Dr. E. Ardern has resigned the post of chief chemist to the Rivers Committee of the Manchester Corporation and has accepted that of consulting chemist to the same body.

Dr. F. Paneth, who formerly worked on radioactivity in the laboratories of Prof. F. Soddy at Glasgow, and Sir E. Rutherford, at Manchester, has been appointed professor of chemistry in the University of Hamburg.

Prof. R. Robinson, lately professor of organic chemistry in the University of Liverpool, has taken up his duties at Huddersfield as director of research in the dyestuffs department of British Dyestuffs Corporation, Ltd. (Huddersfield).

Dr. S. R. Wells has succeeded Sir Cooper Perry, now Principal Officer, as Vice-Chancellor of London University; and Mr. C. Grant Robertson, of Magdalen College, Oxford, has been appointed Principal of Birmingham University, in succession to Sir Oliver Lodge.

The first list of New Year Honours, published on January 1, includes the following: Peerage of the United Kingdom: Sir Albert Stanley, late President of the Board of Trade. Order of the Bath, K.C.B.: Sir Richard T. Glazebrook, late director of the National Physical Laboratory. Baronetcy: Mr. A. F. Bird, a director of Alfred Bird and Sons, Ltd.; Mr. J. T. Cargill, chairman of the Burmah Oil Company; Col. J. Roper Wright, chairman of Baldwin's, Ltd. Knighthood: Col. W. A. Churchman, Ministry of Munitions, Explosives Department; Mr. F. G. Ogilvie, assistant controller in Trench Warfare Research Department, Chemical Warfare Department; Prof. A. Schuster, late secretary of the Royal Society.

NEWS AND NOTES.

SOUTH AFRICA.

Industrial Notes.—*Manufacture of sheet lead.*—A Capetown firm has completed the erection of a plant for the manufacture of sheet lead, which it is understood is competing successfully with the imported article. Besides sheet lead this firm is turning out lead pipe, solder, and other articles.

South African Sugar Association.—After negotiations extending over a period of two and a-half years an amalgamation of the sugar planters' and millowners' organisations has been accomplished, resulting in the formation of the South African Sugar Association. The view of both sections is that this amalgamation of interests should be of the utmost value to the industry.

Annual Mining Exhibition.—The Chemical, Metallurgical and Mining Society of South Africa has arranged for the resumption of the annual mining exhibitions, which were discontinued during the war. It is proposed to hold the next exhibition in January, 1920, but as it will not be possible to arrange for this exhibition to be on the same scale as in former years, it is intended that on this occasion it will be primarily for exhibiting the many devices and materials manufactured locally on or for the mines during the war as substitutes in place of supplies usually imported.—(*S. Afr. J. Ind., Oct.*, 1919.)

Pretoria Iron Works.—An "African World" cable announces that these works are being reconstructed by the National Industrial Corporation, which is associated with the National Bank of South Africa. The Bank has underwritten £1,500,000 for working capital.

AUSTRALIA.

Manufacture of High-Grade Steel in Western Australia.—A company known as the "Australian Electric Steel Limited," of Sydney, is about to establish works at Guildford, Western Australia, for the manufacture of high-grade steels, such as chrome and manganese. This company was formed in 1916 and established works at Alexandria, New South Wales, where it has met with considerable success. Its capital has been increased from £40,000 to £160,000, and employment has been found for a considerable number of operators. It is estimated that the output of the Western Australian factory will be about £50,000 worth of steel of different grades, special attention being given to the production of high-grade manganese steel as used in mining. The company is one of the largest consumers of electric current supplied from the Government power plant at East Perth, and it has purchased about 15,000 tons of scrap metal from the Government Railway Workshops.

Up to the present the company has been able to carry on successfully with the assistance of the protection afforded by war conditions. But with the resumption of normal trade conditions it is stated that it will be necessary to remove some of the tariff anomalies at present existing, *e.g.*, on ordinary steel casting there is a duty of 35 per cent., while higher grades of steel, such as chrome and manganese, are admitted free.

The Powell Process for Timber Treatment.—The High Court of Australia recently gave judgment in favour of the Western Australian Government in the matter of termination of the Powell Company's patent.

The case had been referred to the High Court by way of appeal against the decision of the Court of Western Australia on the issue whether Subsection 2 of the Patents Act could apply to a State patent. The Western Australian Court had decided in favour of the company, but the High Court, in reversing this judgment, found that the State Government is under no legal obligation to pay the £51,550 royalties, which was the amount involved in the termination of the contract.

The contract which was the subject of the above appeal was one entered into by the State Government with the Powell Process Company some years ago for the treatment of Karri timber for the prevention of dry-rot and attack by white ants when the timber is used in contact with earth, and involved certain royalties payable to the company for every cubic yard of timber treated by its process.

BRITISH INDIA.

The Proposed Indian Chemical Service.—In the *Gazette of India* for November 15 the Government published a "resolution" concerning the creation of a Chemical Service and an Indian Store Department, which, although it merely stated that committees are being formed to deal with these subjects, was nevertheless accompanied by a hundred foolscap pages of annexures. The proposal to form a chemical service, put forward at a conference at Lahore in January, 1918, by Sir Thomas Holland and elaborated in the report of the Industrial Commission published in November last, met with the general approval of chemists in the service of the Indian Government. In the past chemists and other scientific experts have generally been engaged each on a separate agreement, the terms of which, however, do not as a rule materially differ. In nearly every instance the maximum pay is about Rs.1000 *per mensem*, which seems fairly satisfactory to young men commencing service, but, as is stated in the report of the Commission (p. 87):—"Many of the scientific specialists quickly reach their maximum salaries, and, witnessing the gradual rise in pay and position of their contemporaries in other services, naturally grow discontented, and consequently become of reduced value to the country. In view of the fact that no quantitative standard can be established to gauge scientific research, no one can say what the country loses by discontent among its scientific staff." Nevertheless, in its proposals for the establishment of the Chemical Service (p. 255) the Commission proposes only the appointment of one chief chemist at a salary of Rs.3000, and he is apparently to be recruited directly from England. The maximum salary of other chemists still remains at about Rs.1000.

Practically all the regular services, such as the Public Works Department, the Forest Service, the Police and the Education Department have either received recently, or are about to obtain, substantial increases of pay in consideration of the rise in the cost of living. It is interesting to compare the rates for chemists with the new scale for the engineers of the Public Works Department as announced in the *Gazette of India* for November 1. Their pay starts at Rs. 450 *per mensem*, and rises continuously to Rs. 1500 in the 20th year of service and Rs.1600 in the 23rd, but by that time a man would probably be a Superintending Engineer drawing Rs.1750, rising to Rs.2150; and some must rise to be Chief Engineers on Rs.2750 to 3000. The new rates for the Forest Service are very similar.

One of the suggestions of the Industrial Commission was that the chemists of the proposed service should be seconded for periods of five years to special appointments, such as agricultural chemist in a province or professor of chemistry in a university. A conference of agricultural chemists objected to this on the ground that it took a man a considerable number of years to become familiar not only with agricultural chemistry generally, but also with the conditions of a province, which are, as a rule, quite different to those in another province. This suggestion has consequently been dropped, and hence, as a rule, a chemist will be appointed to do work of one specific kind during the whole of his service, unless his special experience is required for the central Government or for some other work

In the *Gazette of India* for November 18 there is also an announcement of revised rates of pension, but many of the chemists will derive no benefit from these.

FRANCE.

Industrial Notes.—*Chemical Industry.*—The importation of German chemicals has begun on a scale large enough to allow a few chemical industries to be run at a fairly normal rate of production. Doubts are expressed in certain quarters if this new state of things can last long owing to the unsettled industrial conditions in Germany, which the winter is not likely to improve. No great reliance is placed on Italy either—whence France gets either directly or through England such products as aluminium salts, borax and boric acid, sulphur, sulphates, citric and tartaric acids, oils, etc.—on account of the great social unrest prevailing there, which has at its root the shortage of the most vital raw materials. Under such circumstances, and to meet her own great wants, France will have either to find substitutes for all these intermediates or develop new processes if she is to cope with her great economic difficulties, which can only be solved by intensive production. This effort she is prepared to make, but many difficulties are in the way, for, apart from the shortage of raw materials and of intermediates, and a still disorganised railway system, there is considerable labour unrest. Another factor retarding production in the chemical industries is a lack of co-ordination between the different factories, each trying to turn out as many different products as possible, thus dispersing instead of concentrating effort. The importance of organised specialisation is better understood now, and the evident results it will have on working costs will lead to its adoption.

Alsace-Lorraine.—The development of the natural resources of the recovered provinces is a favourite topic. Recent prospecting has revealed that the potash beds of Alsace can produce 300 million tons of pure potash, which represents an amount 300 times greater than the world's annual consumption before the war. The oilfields of Alsace are also eliciting great interest. They are chiefly located to the north-west of Strasbourg around Pechelbronn, extend over an area of 44,000 hectares, of which 14,000 can yield petroleum on a commercial scale, and are worked on very scientific lines. Quite recently oil was struck in a new boring on a quite virgin part of the oilfield, and this is estimated to give a daily yield of 30 tons. The current opinion on the iron-ore of Lorraine is that, although very abundant, its high phosphorus content will compel manufacturers to produce specialised goods, such as rails, joists, and section iron. Coal supply will be a great difficulty owing to the remoteness of the sources of fuel—North of France, Belgium, and Germany. Another drawback will be the shortage of labour, and recourse will have to be had to foreign workers.

Coal and Transport.—Production is improving in a very noticeable manner in the coalfields. The official figures for September amount to 1,687,000 tons, to which must be added 151,000 tons from the coalfields of Lorraine. The production for November—Lorraine excluded—will probably exceed 1,800,000 tons. Labour is abundant and especially so on the coalfields of the Central Plateau, where the rate of raising coal has doubled. Prospecting is rife all over France with a view to locating extensions of the different coalfields. This policy is dictated by the fears which the recent strikes in England and the United States have inspired. The various railway lines are being restored with great speed. On the Northern railways practically all the stations are now open to traffic. On the Eastern railways abundant snowfalls in November had a retarding effect, but work is progressing very favourably. On December 1 less than 100 kilometres out of the 367 kilometres of canals and waterways which at the time of the armistice were unnavigable remained to be open to navigation again.

Colonies.—Great interest is shown in the development of the graphite beds of Madagascar, which are reckoned to be superior in value to the potash deposits of Alsace. Mining began in 1910, and the production rose from 6572 tons in 1913 to 27,838 tons in 1917. The development of the industry was retarded by the badly prepared state in which the material was marketed, but methods of purification have been improved at no great expense, and the quality of the new grade determines a ready sale. Mining is easier than in Ceylon because the deposits can be worked in the open. Indo-China is also rich in graphite, and from Annam 8000 tons was recently exported to America and 15,000 tons more are ready for shipment.

Of all the French colonies Tonkin is the richest in coal, the output in 1916 having reached 695,000 tons. Fresh deposits of anthracite have just been discovered. New Caledonia also has rich deposits which have hardly been touched, and the same applies to the lignite of Madagascar. Yet, in spite of these natural resources, 600,000 tons of coal was imported into the French colonies, not including those of North Africa.

The production of phosphate in Algeria and Tunis for 1920 is estimated at 1,400,000 tons, which will be distributed thus: 700,000 tons to France; 247,600 to England; 355,000 to Italy; 14,700 to Portugal; 3600 to Belgium; 550 to Switzerland; and 73,600 to Spain.

UNITED STATES.

American Ceramic Society.—The annual meeting of this society will be held at Philadelphia from February 23 to 26. The headquarters will be at the Bellevue-Stratford Hotel, where rooms are available for general and sectional meetings, and where social functions will be held.

Dietetic Values.—As a part of its extension work, the University of Illinois is distributing a "Home Meal Calendar" which enables households to keep a daily record of their consumption of protein, starch, fats, sugars, and organic acids and mineral substances. The desirability of having all five groups represented in the diet is pointed out.

Compulsory Licensing of Engineers.—The State of Michigan has introduced an innovation in the form of a law compelling engineers, including chemical engineers, to be licensed. Applicants will be required to prove their competency as regards knowledge of fundamentals and ability to solve technical problems correctly on paper. The experiment will be watched with great interest by the chemical profession.

Rare Earths for the Incandescent Mantle Industry.—Surveys in the Southern States have revealed the frequent occurrence of these rare earths in ground which has no agricultural value. These minerals would doubtless not have been discovered but for the impossibility of importing the purified earths during the war. Incidentally the explorations have led to an increase in the output of meso-thorium, for which there is an active demand.

New Method of Food Dehydration.—On December 5, Dr. K. G. Falk, of the Harriman Research Laboratory at New York, explained the new method of food preservation elaborated at that institution before the New York Section of the American Chemical Society. The method consists, briefly, in dehydrating the food (meat, eggs, vegetables, fruits) in a comminuted state in a vacuum drier at a temperature well below that at which changes incidental to cooking occur. No preservatives or bleaching agents are required. A variety of meats and vegetables dried by this method had been shipped to different parts of the world with successful results.

The American Petroleum Institute.—It is anticipated that this Institute will soon complete the organisation of its Division of Research and Statistics, and that it will receive annually a sum of $500,000 obtained by a levy on the gross business of the producers and refiners of petroleum. The director of the Division will have the assistance of an advisory committee composed of representatives of the Government Departments directly interested, the national engineering societies, the National Automobile Chamber of Commerce, the American Chemical Society, and the National Research Council.

A New Therapeutic Agent.—Drs. Young, White, and Swartz, of Johns Hopkins Hospital, have carried out a series of studies with a view to the discovery of a therapeutic compound which would be germicidal, relatively non-toxic and non-irritating, while possessing unusual penetrating qualities. Such a substance has been found in dibromoxymercuryfluorescein or its sodium salt, the latter carrying approximately 26 per cent. mercury. A considerable number of observations has been made, and the experimenters, in summing up their conclusions, state that the new germicide, which is for use in the genito-urinary tract, has practically fifty times the germicidal strength of acriflavine, and that a solution of one in one thousand kills *B. Coli* and *Staphylococcus aureus* in one minute in urinary media (presumably *in vitro*). The new drug is tolerated for from one to three hours without irritation by the human bladder, and injections of a 1 per cent. solution in the renal pelvis are likewise free from pain. Studies of the comparative value of this drug and acriflavine are not yet completed, but it is considered certain that methods of great value in the treatment of certain diseases with both drugs have been discovered.

Metallurgical Notes.—It is reported that each of the various high speed steels emits a characteristic spark upon coming into contact with an abrasive wheel. These sparks vary in size, shape, and colour, and the method is in use for sorting scrap.

The large quantities of copper-nickel scrap now existing have given rise to attempts to use it for brass and bronze manufacture, the nickel, it is said, replacing some of the tin content. Preliminary work has in some cases given satisfactory results.

A committee has been formed in the Division of Engineering, National Research Council, to investigate and improve the method for the magnetic testing of ferrous metals. The need for testing methods which are reliable and yet do not involve the destruction of the sample calls for special attention.

Large spangles having been found to increase both the non-corrosive qualities and appearance of galvanised iron, experimenters have been busy devising ways that would insure a larger percentage of large spangled sheets. By using a titanium alloy in the manufacture of the steel employed, it is claimed that 75 per cent. of the sheets are to be found with the desired formation of the zinc crystals.

Arrangements have been completed so that work may begin at once on fatigue phenomena of metals at the University of Illinois under the auspices of the National Research Council and Engineering Foundation. Metallurgists are co-operating, especially in supplying proper samples for the tests. The subject makes a wide appeal, and there is every reason to expect important results. Professor Moore is in immediate charge.

Sugar Industry of the Philippine Islands.—In 1893 the Philippine Islands exported 260,000 tons of sugar. As a result of the Spanish-American War this export dropped to 63,000 tons in 1900, but has since exhibited an upward tendency, reaching 101,000 tons in 1905. There is even good reason to anticipate, in time, a possible annual output of at least 1,000,000 tons; for the area of the Philippines is double that of Java, with an annual output of 1,000,000 tons. Further, the soil is good, the climate favourable, and labour cheap; also sugar cane can be grown in nearly every part of the Islands. Up till now the industry has been so primitive and the methods of manufacture so antiquated that the yield of crude sugar has never exceeded 1·25 tons of crude sugar to the acre. To-day efforts are being made to do away with these unfavourable conditions as far as possible, and this is to be achieved mainly by a system of co-operation, the formation of central mills and the production of more centrifugal sugar, in place of the native muscovado and pilon sugar, the demand for which is, in fact, slackening. The cost of producing a ton of good centrifugal of 96° polarisation is practically no more than the cost of making muscovado or pilon sugar, whereas prices obtained for the former are double those of the latter. Already many small planters are selling their muscovado to large mills or "centrals" for the purpose of having it converted into centrifugal sugar, the export of which has increased from 47,234 tons in 1917 to 64,018 tons in 1918.—(*U.S. Com. Rep., Oct.* 23, 1919.)

JAPAN.

Paper from Seaweed Pulp.—H.M. Commercial Secretary in Yokohama reports the formation of a company with a capital of 2,000,000 yen (approx. £200,000) to manufacture pulp from seaweed (ajimo) and papers of all kinds.—(*Bd. of Trade J., Dec.* 4, 1919.)

Japanese Celluloid Manufacturers.—The Acting Vice-Consul at Osaka reports that the amalgamation of eight Japanese celluloid companies into the Dai Nippon Celluloid Company with a capital of yen 12,500,000 (£1,276,000) has been effected. The object is to bring about a more economical use of the available supplies of camphor by the concentration of manufacture in the factories of four of the companies so as to secure the advantages of keeping both machinery and operatives working full time.

The annual production of celluloid is now 6,000,000 lb., worth £1,300,000, and is three times the pre-war output. Three-quarters of the raw camphor (which is a Government monopoly) produced in the Japanese Empire comes from Formosa, where efforts are being made to increase the output. The remaining one quarter is produced in Japan itself. Owing to exports, only one quarter to one half of the total production is available for celluloid manufacturers. Future German competition is feared, as it may be possible to effect economy by the use of artificial camphor.—(*Bd. of Trade J., Dec.* 18, 1919.)

GENERAL.

Ramsay Memorial Fund.—The Ramsay Memorial Fund has received from Prof. H. Kamerlingh Onnes the very substantial sum of £1571 9s. 5d., which has been given or promised by donors in Holland. These generous contributions are evidence of the sympathy felt in Holland for British science and scientists, and the respect so widely felt in Holland for the memory of the late Sir William Ramsay. Among the subscriptions are : Philips Gloeslampenfabriek, £500; Fransch Hollandsche Cliefabrieken, Delft, £300; Nederlandsche Gist and Spiritusfabriek, Delft, £300; Van den Bergh's Fabrieken, Rotterdam, £300; and Lym and Gelantinefabriek, Delft, £100.

The Hiding Power of Pigments.—An instrument for which the name of "Cryptometer" (κρυπτω, conceal; μετρον, measure) has been proposed places in the hands of the paint technologist a means whereby the long-felt want of a simple method of determining the hiding power of pigments can be carried out in the laboratory without undue introduction of the personal element. Hiding power or opacity of pigments has hitherto been carried out by finding the weight of paint necessary to produce obscuration of black lines or alternately-placed squares on a white background by application of successive coats of the paint under examination. Apart from its tedium, the method was at best approximate in accuracy, mainly on account of the difficulty of securing equal distribution of the coating. It required, moreover, for anything like successful application the services of a skilled craftsman. The simplicity of the cryptometer favours its rapid adoption in works' laboratories, where this most important factor in the valuation of pigments has hitherto been in many cases left undetermined. It is to be hoped that quantitative evaluation of white pigments in terms of opacity by this instrument will replace the meaningless analyses so often figuring as standards in specifications of white pigments and paints. (See also this issue, p. 34 A).—(*J. Franklin Inst., Nov.*, 1919.)

Proposed British Beet Sugar Industry.—The present and prospective shortage in the supply of sugar for home consumption, largely brought about by the disorganisation of the industry in Germany and Austria which formerly provided 53 per cent. of our imported supplies, again raises into importance the possibility of establishing a home industry in this essential commodity. An abortive effort to establish a beet sugar factory at Lavenham, in Suffolk, was originally made some fifty years ago. The enterprise was strongly supported by Lord Denbigh, who, some twenty years ago, carried out experiments with a view to proving that sugar-beet, of which farmers knew nothing, could be grown profitably in this country. The next step was the formation of the National Sugar-Beet Association, strongly supported by the Duke of Bedford aud other leading agriculturists. This carried out much useful experimental work right down to the commencement of the war, an attempt being made in 1912 by means of a factory erected at Cantley in Norfolk to put the industry on a working basis. Unfortunately the necessity of providing a substantial area of suitable land for the production of roots adjacent to and under the control of the factory was overlooked. Production was left entirely to the enterprise of the farmers, who failed to provide the roots in quantities sufficient to make the undertaking a success.

In 1918 the British Sugar-Beet Growers' Society, Ltd., formed in 1915, purchased the Kelham Estate, near Newark, Nottinghamshire, a portion of which was subsequently sold to the Board of Agriculture to be developed as a farm colony under its Land Settlement Scheme. The remainder, some 2,800 odd acres, is worked as a large farm with the ultimate object of introducing sugar-beet as the main crop as soon as a factory can be erected. Meanwhile the land is devoted to cereals and stock, with a small area of sugar-beet for feeding and for seed production. The manager of the estate is Mr. Sidney Colyer, formerly farming assistant to Sir Daniel Hall, and he acts under the control and direction of a Joint Committee of the Board of Agriculture and the Sugar-Beet Growers' Society. The latter has now brought the enterprise to a point where, to establish it on a sound commercial footing, a large outlay of capital is required. With this object in view it is now proposed to form a public company, and the Government contemplates taking up a portion of the capital. The title of the proposed company will be "Home Grown Sugar, Ltd.," and the nominal capital £1,000,000; half of this will be issued, and it is proposed that the Government will take up £250,000, and the remainder offered to the general public. It is believed that such a company will be in a position to pay a remunerative price to the farmers for their roots and to sell the sugar at a price which, even allowing for a heavy fall in the market, will afford a substantial interest as an industrial proposition.

From a national point of view, the success of this undertaking is greatly to be desired. Not only does it provide an ultimate means of making the country more self-supporting in regard to the beet sugar supply, but it will confer great benefits on agriculture. It may be remembered that under the Finance Act of 1919, sugar produced in this country will enjoy a preference over foreign imported sugar of £6 4s. 5⅓d. per ton, and of £1 18s. 10 ⅔d. per ton over sugar imported from British Dominions and Colonies. Before the war more than 90 per cent. of our sugar came from foreign countries. It has already been proved that we have the soil and the climate to produce sugar-beet to the best advantage; it would therefore appear to be only a question of enterprise on the part of the farmers and support from the general public to carry the project to success.

Neon.—In a recent communication to *Nature*, Mr. F. W. Aston, of Cambridge University, announced that by using a new and more powerful method of positive-ray analysis, he has succeeded in obtaining indisputable evidence that atmospheric neon (atomic weight 20·200, O = 16) is a mixture of two isotopes having the atomic weights 20·00 and 22·00 respectively.

Argon.—The boiling points of argon and oxygen being different by about 4° C. only, and those of oxygen and nitrogen by 13° C., any impurity in the liquid oxygen collecting at the base of an air rectification column consists mainly of argon. The proportion of this impurity is increased somewhat by regulation, and the liquid is then passed into a special column, where it is subjected to a further rectification before being gasified to furnish the oxygen product. The impurities are withdrawn from the system, (1) as a gas containing 60—65 per cent. argon and 1—4 per cent. nitrogen (the remainder being oxygen) at the rate of 600—700 litres per hour, and (2) as a gas consisting of nitrogen, with a trace of oxygen. After removing the oxygen from the three component mixture, by combustion with hydrogen, an argon-nitrogen mixture is obtained containing only a small proportion of nitrogen.

Within the last few years a use has been found for argon in the electric lamp industry. It had been thought that the most perfect vacuum was necessary in lamps, not only to prevent oxidation of the filament, but also to prevent heat losses by conduction and convection. It was subsequently found that the volatilisation of the filament was diminished in an atmosphere of nitrogen, thus permitting a higher temperature and a better lighting efficiency, the gain in intensity of illumination far outweighing the loss of heat. Later it was discovered that argon further retarded volatilisation, thus allowing of a still higher filament temperature. There has consequently arisen a considerable demand for argon, and the British Oxygen Co. has now installed at its new Wembley works a plant for extracting argon from the air, and a second at its new factory in Birmingham.—(*Ind. Gases, Dec.*, 1919.)

Gums, Bitumen, and Limestone in Mesopotamia.—The small shrubs which yield gum tragacanth grow throughout the entire mountainous region on the north-west frontier of Mesopotamia, and are tapped by the Kurds, who make incisions in the roots after first burning the leaves off the bushes. The first tapping gives white gum of the best quality; that from subsequent tappings is inferior and of a yellow colour. The chief collecting centre is Suleimanaya, whence the gum is sent to merchants in Baghdad, who export it to foreign countries (130 tons in 1887, 39 tons in 1890). Another gum called "elk" in Arabic is obtained as an exudation from incisions made in the trunk of the tree (known as "buttom" by the Arabs and "gykraswan" by the Kurds), which grows, but only in the valleys, in the part of Kurdistan now occupied by the British. Most of this gum is exported directly from Suleimanaya to Aleppo, where it is used for sizing cloth, and some goes to Baghdad to be used locally for the same purpose and in the preparation of sweets, etc. Both gums are produced in the Mosul Vilayet, but there is no organised trade in them in that district, partly on account of the imperfect roads.

Almost unlimited deposits of crude bitumen and of limestone impregnated with bitumen occur round Hit, but the secrets of lime burning and of refining the bitumen are jealously guarded by the local experts, without whose co-operation nothing can be done in the absence of scientific advice. The possible monthly outputs of lime and of refined bitumen are, respectively, 300 to 150 tons and 600 to 300 tons, calculated from the figures given for the amount of the fuel "siyalla" (a highly-oxidised bitumen) available monthly, but more of this fuel is probably obtainable.—(*Bd. of Trade J., Nov.* 20, 1919.)

Agriculture in Jamaica.—The year 1918 was, on the whole, a satisfactory one for agriculture in Jamaica. The institution of central co-operative sugar factories under Government guarantee, but managed by planters, is calculated to lead to satisfactory results. Such a system should secure equal rights to all, a fair division of profits, and prevent the development of large capitalistic combinations. It is thought that with remunerative prices for sugar, and the security afforded by Imperial preference, bananas will give way to sugar to a greater or less extent in areas favourable for sugar production. The market for cacao showed some improvement during the year, the exports being valued at £154,000, as against £117,000 during 1917. With the Imperial preference of 7s. per cwt. for cacao a distinct encouragement to this product is now afforded, and the planting of cacao by small settlers should again be taken up with vigour. Pimento was in fair demand, and this should increase with the opening of the markets of Central Europe. Ginger, which is chiefly a small man's crop in Jamaica, had another good year with an export value of £85,000, as against £70,000 in 1917 and £30,000 before the war. Annatto, another minor product, did very well with an output of about 450 tons, valued at £18,000.—(*Rept. of Dept. of Agric., Jamaica*, 1918–19.)

Copper Smelting in Peru.—H.M. Commercial Secretary in Lima reports that a well-known American company has decided to construct a new smelter at Oroya at a cost of approximately £2,000,000. The present smelter has five blast and four reverberatory furnaces, and the additions are to include two furnaces of each kind with a capacity double that of the old. The smelting capacity will in this way be increased from about 1,500 to 2,500 tons of ore. The new plant is expected to be completed in two years.—(*Bd. of Trade J., Dec.* 25, 1919.)

Coal Storage in Carbon Dioxide.—A novel method of storing coal in carbon dioxide has been adopted recently at Dortmund, in Germany, in order to prevent the possibility of spontaneous ignition. The storage arrangements consist of three cylindrical bunkers, with semi-spherical tops and bottoms, each bunker holding 2,500 tons of coal. There are three outlets in each bunker for withdrawing the coal, and three holes in the top for receiving it, the lower outlets closing gas-tight. There is a slight leakage of carbon dioxide during the withdrawal of the coal, but this can be replenished without difficulty.—(*Gas. J., Dec.* 16, 1919.)

Comparison of German, American and English Coke-Oven Plants.—In an article appearing in the *Zeitschrift des Vereins deutscher Ingenieure* for Nov. 8, 1919, it is remarked that whereas American coke-ovens are, as a rule, erected near foundries, in Germany they are situated in the neighbourhood of coal mines. The American practice assures that the blast foundry is supplied with the class of coke desired by the owner who exercises some supervision over the operation of the coke-ovens. The following table gives data relative to the respective coking installations in Germany, the United States and England:—

	At end of 1914.			At end of 1918.		
	Germany.	United States.	England.	Germany.	United States.	England.
				(apprx.)	(apprx.)	(apprx.)
Yearly throughput of coal in by-product coking ovens (million tons)	35	26·5	15	41	50	21
Number of by-product coking ovens ..	20,173	6,438	7,813	22,003	9,940	9,827
Yearly throughput per oven (tons).. ..	1,750	4,100	1,900	1,800	5,030	2,130

It is contended that America's advantage in the matter of cheap coke production can only be met by imitating the American mode of installation. In 1918 by-product coking-ovens contributed 45 per cent. to the total coke production. As only about 60 per cent. of the by-products is recovered in bee-hive ovens, compared with 82 per cent. in the modern by-product coking-ovens, America economised to the extent of about 13,000,000 tons of coal in 1918 compared with previous years.—(*Z. angew. Chem., Nov.* 25, 1919.)

Outlook for Professional Chemists in Germany.—The "Verein deutscher Chemikerinnen" (Society of German Women Chemists), which is affiliated to the "Verein deutscher Chemiker," has recently sanctioned the publication of a cautionary notice against the choice of chemistry as a profession under present economic conditions. During the next few years the absorption of present students of chemistry, whose number is steadily increasing, will be impossible; and the many chemists accredited with war service will have first call on the industry. The sphere of work of a female chemist is very restricted, and this, together, with hygienic and mental considerations, leads the Society to advise women to avoid the profession. The "Bund angestellter Chemiker und Ingenieure" has recently issued a brochure dealing with the difficult position of the industry and the danger of its becoming overcrowded. Students are accordingly strongly urged not to take up the study of chemistry. The *Zeitschrift der angewandte Chemie* directs attention to the false assumption that underlies the calculations made in the publication, namely, that the number of chemists in Germany before the war was 15,000; this figure, it states, is quite 50 per cent. too high.—(*Z. angew. Chem., Nov.* 11, *Dec.* 9, 1919.)

Partition of the Austro-Hungarian Industries.—Of the total output of pig iron of the former Austrian Empire, amounting to 14,293,884 cwts., that associated with the new Austria is 5,500,000 cwts., and that with Czecho-Slovakia 7,000,000 cwts. The shares of Poland and Trieste amount to 1,700,000 cwts. and 300,000 cwts., respectively The iron industries of Prague, Kladno, Witkowitz and Mahrisch-Ostrau are included in the new Czech state where large extensions are being undertaken, *e.g.*, by the firm of C. T. Petzold at Komorau. In the new Austria, except for a number of small firms such as the Sulzau-Werfen ironworks at Salzburg, there are only the Alpine Montangesellschaft with its works at Donawitz and two others. The annual output of ore in Austria amounts to 18,600,000 cwts., while that of Czecho-Slovakia is not quite 7,000,000 cwts., therefore in this matter the relative positions of the two States are reversed. The ouput of the Styrian mines formerly constituted two-thirds of the total production of the Austrian Empire, so that in default of being able to secure supplies elsewhere, and this has now been the case for some time, Czecho-Slovakia will be compelled to derive its supplies of iron ore from Austria. The ores themselves are very pure and also contain tho necessary flux in the form of limestone.

The zinc industry is now located in the Jugo-Slav region. Zinc ores, even those mined in the Tyrol, were formerly brought to Unterkötting near Cilli to be smelted and the zinc production therefrom in 1915 was 40,253 cwts. Very little zinc occurs in the southern Slav regions, and its smelters will therefore not be employed to the same extent as formerly. German Austria must therefore provide itself with a smelting industry. The Polish region has its own zinc smelters at Trzebinia, and also zinc sheet mills, which produced, in 1915, 54,470 cwts. of spelter and 19,672 cwts. of zinc sheets. In the old Austrian Empire. one works only is of importance, for the production of metallic tin, namely the works at Teplitz, now alloted to Bohemia. Copper works are located practically entirely in the new Austria. The output of the Mitterberger Kupferaktiengesellschaft of Ausserfelden (Salzburg) amounted in 1915 to 28,965 cwts. refined copper, 20,095 cwts. electrolytic copper. and 86 cwts. of copper sulphate The output of lead ores in the last year of peace amounted to 257,511 cwts. of which 177,553 cwts. was obtained from Carinthia, 5,054 cwts. from the Tyrol and 71,434 from Galicia; 75 per cent. is therefore obtainable from German regions, the remainder from Poland. Red lead, white lead and litharge were obtained from works in Klagenfurt in the old Austrian Empire, and in normal times in sufficient quantity to supply the needs of the whole Empire. There is therefore every prospect of the possibility of German Austria exporting these materials. Antimony ores, of which the output was 12,701 cwts., are found in the Jugo-Slav region. The ores of uranium and tungsten are mined in German Bohemia. In the year preceding the war manganese ores were mined to the extent of 165,400 cwts., of which 157,090 cwts. was obtained from the region of Czernowitz, the remainder from Laibach. Sources of bauxite in the old Empire are confined entirely to the southern Slav region.

Czecho-Slovakia leads in the enamel industry, possessing an output equal to 90 per cent. of the factories of the old Austrio-Hungarian monarchy; nine factories are located in Czecho-Slovakia, four are in the New Austria, and three in Bohemia. The Polish and Illyrian regions each possess one factory. The most important enamel undertaking on the Continent is the A.-G. Oesterreich, with headquarters in Vienna, and whose works are situated in German Austria and Czecho-Slovakia. With sufficient supplies of raw materials the works in Austria will be able to meet the demands of the State. The export of enamelled vessels which in normal times absorbed 60 per cent. of the enamel produced will be in the hands of Czecho-Slovakia in future. (*Handels-museum*, also *Schweiz-Chem. Zeit.*, *Sept.* 24, 1919.)

Uses of Manganese Dioxide Ore.—Estimates of the consumption of high-grade manganese dioxide ore for other than metallurgical uses vary from 25,000 to 50,000 tons per annum. The ore most in demand is the best pyrolusite, which is used chiefly in the production of dry cells, as a dryer for paint and varnish, and for decolorising glass.

In dry cells the function of the ore is that of a depolariser, and for this purpose it must have a high content of available oxygen and be free from metals electronegative to zinc, such as copper, nickel, cobalt, and arsenic. Of these metals copper is by far the most objectionable, but little harm results if the metals are present in a form insoluble in the electrolyte employed in the cell. If present in a form soluble in the electrolyte, however, they are finally deposited on the zinc of the cell, thus causing local corrosion, which is greatly intensified when the cell is in use. Before the war Caucasian pyrolusite containing from 80 to 85 per cent. of MnO_2 and less than 1 per cent. of iron was used. When this material, which was of uniform composition and purity, was no longer available makers of dry cells had to utilise ore from other sources containing 70 to 80 per cent. of MnO_2 and as much as 3 or 4 per cent. of iron. Experimental work has indicated how material of this character can be made to give results almost as good as those obtainable with the purest Caucasian ore. The physical condition of the ore is of considerable importance in dry cell manufacture, porosity and moderate hardness being the most desirable properties. Such an ore is preferable to a very hard and dense material even when the latter contains a somewhat higher content of available oxygen. Careful sizing of the particles is also required, very fine powder being often removed as it will hold considerably less of the electrolyte than material which has been ground only to pass a 10 or 20 mesh screen. It is thus evident that many ores of an earthy character, such as wad, are not suitable for use in dry cells.

Manganese dioxide is more often used than selenium, nickel, or cobalt for neutralising the green tint produced by the presence of iron in glass. Pre-war specifications usually required 80 to 85 per cent. of MnO_2 and less than 1 per cent. of iron. Carbonaceous pyrolusite is objectionable, but the silicious variety is permissible. Powdered ore is usually employed where the glass is made in pots, whilst the lump or granular variety is frequently employed when tanks are used for the melting. The amount of manganese dioxide added varies from 2 to 15 lb. per 1000 lb. of sand in the batch. An ornamental black glass has been produced by adding about 3 per cent. of the ore to the glass mixture. Manganese dioxide is also used in the preparation of purple glazes and enamels.

Manganese dioxide, either natural or artificial, is extensively used as a "dryer" for linseed and other oils. The quantity added rarely exceeds 0·5 per cent., but it is stated that even this amount tends to darken the oil; this objection, however, does not hold in the case of certain salts of manganese, such as sulphate, borate, oxalate, resinate, and linoleate, which are also largely used.

Manganese dioxide also finds application in the preparation of the chloride, used in dyeing cotton cloth brown, and in the production of potassium permanganate.—(*United States Bureau of Mines Min. Invest. Series No.* 16.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Import Restrictions.

Sir A. Geddes, replying to Sir D. Maclean, said that, in view of the Sankey judgment (this J., 1919, 481R), the Customs have been instructed, pending reversal on appeal or legislative action, to allow the importation of all articles affected thereby. Early next Session the Government will press forward legislation for the purpose of reimposing restrictions of the limited scope indicated in the Imports and Exports Regulation Bill. At present the Government is not in a position to restrict importation from countries affected by a collapse in exchange.—(Dec. 18.)

In reply to Mr. Hogge, Mr. Bonar Law stated that the Government had not decided to abandon the above-mentioned Bill.—(Dec. 22.)

Cement.

In answer to Mr. J. Davidson, Mr. Bridgeman said he understood that prohibitions on the export of cement are in force both in Germany and in Denmark. However, there are ample supplies available in this country, and there should be no necessity to import it.—(Dec. 18.)

Oil Fuel Locomotives.

Mr. Neal, replying for the Minister of Transport, informed Major G. Palmer that the railway companies are considering the question of the use of liquid fuel in place of coal. Liquid fuel was used successfully by one company from 1886—1906, when its use was abandoned on account of the price. There is no doubt that some of the railways will commence using it again as soon as it is economical to do so.—(Dec. 18.)

Cardigan Metal Mines.

Replying to Mr. W. Thorne, Mr. Bridgeman confirmed the statement that during the last 100 years over 260 metalliferous mines have been operated in Cardigan, 194 lead mines in Derbyshire, and 259 mines extracting tin, lead, copper, and zinc ores in Cornwall. At the present time there are working 4 mines in Cardigan, 2 in Derbyshire, and about 50 in Cornwall. The decline in the industry is now the subject of investigation by a Departmental Committee.—(Dec. 19.)

Dyes.

Asked by Mr. Sugden as to the facilities for obtaining certain essential dyes which have not been manufactured in this country, and if he would expedite their delivery, Sir A. Geddes said that arrangements have been made for obtaining supplies from Germany in advance of the formal ratification of the Treaty. About 350 tons have actually arrived, and further quantities are in transit.—(Dec. 22.)

Fertilisers.

Questioned by Lieut.-Col. Sir N. Griffiths as to the Government's intentions with regard to the decontrol of fertilisers, Sir A. Boscawen explained that apart from the imposition of maximum prices for basic slag and sulphate of ammonia, and certain arrangements made (also in the case of superphosphates) in connexion with their production and distribution in home markets, these fertilisers are now free from control. Control of the exportation of fertilisers is still necessary in order to safeguard supplies for home consumption, but licenses therefor are freely granted, and it is hoped to discontinue this control as soon as practicable.—(Dec. 22.)

Palm Kernels.

Sir H. Craik asked the Minister of Food if he would consider the advisability of removing the prohibition on the export of palm kernels imported from British Possessions in view of the fact that Brazilian babassu kernels and shea nuts were imported without restrictions.

Mr. Roberts replied that the Brazilian materials were imported only in small quantities and were not yet staple raw materials for margarine manufacture. The re-export of West African palm kernels would not only tend to congest the ports still further, but would take up British shipping required for other purposes.—(Dec. 22.)

Storage of Petrol.

The Home Secretary, in reply to Viscount Curzon, said he was advised that bulk storage of petrol in underground tanks was by far the safest, most convenient, and most economical method, and that it should be encouraged. He believed it was the policy of his Department to increase the amount of storage in this country for oil fuel of all kinds. —(Dec. 23.)

Industrial Courts Act, 1919.

A Bill introduced by the Minister of Labour to promote arbitration or conciliation in industrial disputes, and to maintain wages at the war standard until September next, received the Royal Assent on November 20 last. The measure places on a permanent basis the Interim Court of Arbitration which was instituted in January last, and which had before it some 853 cases, all of which, except three, were settled without a strike. Under the new Act a dispute in any trade may be referred by the Minister of Labour to a Court of Arbitration or a Court of Inquiry, but only with the consent of the parties concerned. The decisions of a Court are not legally binding.

Trade Marks Act, 1919.

The Trade Marks Bill received the Royal Assent on December 17 last, after the amendments made by the House of Lords had been agreed to. These amendments included one to Clause 2, making it clear that the Registrar is not compelled to institute a search before accepting a mark intended for Register B; and in Clause 6 the following words were added: "No word which is the only practicable name or description of any single chemical element or single chemical compound, as distinguished from a mixture, shall be registered as a trade mark." A new clause concerning the registration of assignments was introduced in place of Clause 11. The Act will come into operation on April 1, 1920.

Electricity (Supply) Act, 1919.

After drastic alterations in the House of Lords, the Electricity Bill was passed by the House of Commons and received the Royal Assent on December 23. The alterations comprised the deletion of the proposal to institute district boards empowered to provide electrical power and to acquire existing generating stations and main transmission lines within their areas. Electricity Commissioners are, however, to be appointed, and these will have power to veto proposals for extending existing generating stations, and in the event of an adequate scheme not being forthcoming, they may formulate, and, if necessary, enforce a scheme of their own. Power is given to them to incur a total expenditure of £20,000,000 in the construction of necessary generating stations. The Government has announced its intention to re-introduce the proposals concerning district boards at an early date.

The Patents and Designs Bill.

On December 17, the Solicitor-General moved the Lords' amendments, the more important of which are: (1) In Clause 1, dealing with provisions for the prevention of abuse of monopoly rights and in Clause 2 dealing with "Licences of Right," a licensee is entitled to institute proceedings for infringement in certain circumstances and to make the patentee a defendant; the amendment provides that a patentee thus made a defendant shall not be liable for any costs unless he enters an appearance and takes part in the proceedings. (2) Clause 7 of the Bill provides that when considering a petition for the extension of the term of a patent the Court may take into account any loss or damage occasioned to the patentee by hostilities between His Majesty and any foreign State, except in cases where the patentee is the subject of any such foreign State; the amendment considerably broadens this provision by including under the term damage, loss of opportunity of dealing in or developing the invention owing to engagement in work of national importance connected with such hostilities; furthermore, the application for extension, when hostilities form the basis thereof, may be made by originating summons instead of by petition, thus avoiding certain costs. (3) Clause 8 of the Bill is eliminated by the amendment, that substituted differing mainly in that when a Government Department has used an invention and the Court, or arbitrator instructed by the Court, considers what compensation is due to the patentee, it or he shall have regard to any compensation which may have been already granted by Mr. Justice Sargant's Commission at present sitting, and as a corollary the Clause is not to come into force until that Commission has completed its work. (4) Clause 16 of the Bill deals with registration of assignments, etc.; the amendment is a re-drafting of the clause by Lord Moulton, the chief change in substance being a proviso that notwithstanding entries in the Register of Patents, any equities in respect of a patent may be enforced in like manner as in respect of any other personal property. (5) Under the heading Minor Amendments of the Principal Act is one that excepts the reading of a paper by the inventor before a learned society or the publication of the paper in the society's transactions, from among the publications which will invalidate a patent granted to the inventor subsequently to such publication.

The various amendments were adopted. With certain exceptions, the provisions of the Act came into operation on December 23 last.

GOVERNMENT ORDERS AND NOTICES.

PROHIBITED EXPORTS.

The Board of Trade (Licensing Section) has removed, as from December 24, 1919, the following articles from List A and/or B of Prohibited Exports:—Cotton seed; feeding stuffs containing molasses; soya beans; patent and proprietary cattle foods of all kinds; all cakes and meals which may be used for forage or food for animals, with the exception of cottonseed cake and meal, linseed cake and meal, maize germ meal, maize meal and flour, husk meal, all of which are to remain on List A.

The heading "Coal Tar, all products obtainable from and derivatives thereof, etc.," on List A, has been deleted and the following substituted:-

(A) Coal tar, all products obtainable therefrom and derivatives thereof, whether actually so obtained or derived from other sources (including all mixtures and preparations containing such products and derivatives), suitable for use in the manufacture of dyes or explosives.

LEGAL INTELLIGENCE.

Claim for Damage to Glucose in Transit. *Reynolds and Sellers v. Great Eastern Railway Co.*

In the King's Bench Division, on December 16, Lord Justice Bankes disposed of an action brought by Messrs. Reynolds and Sellers, of Mincing Lane, London, against the Great Eastern Railway Company, as carriers, to recover £502 in respect of damage to a number of bags of glucose chips in course of transit from Norwich to London.

The case for the plaintiffs was that Messrs. A. J. Caley and Son, Ltd., glucose manufacturers, of Norwich, had handed the goods to the railway company in a perfectly dry condition, but that upon delivery at Wapping 85 of the 200 bags were damp and torn, and the contents damaged by moisture. The defence contended that the goods when handed over at Norwich were in a damp condition, and that even if they were not, the railway company was excused because there was "an inherent vice" or tendency in glucose chips to absorb moisture from the atmosphere, and that occurred on this occasion.

Scientific evidence was given on both sides as to the effect on glucose of exposure to the atmosphere.

Lord Justice Bankes, in giving judgment, said that it was possible that damage could be caused by exposure to the natural atmosphere, but he was satisfied that such exposure had not occurred when the goods in question were under the charge of the railway company. The action was accordingly dismissed with costs.

Corrosion of Ship's Plates by Dissolved Copper Sulphate.

In the Admiralty Court, on December 19, Mr. Justice Hill gave judgment in an action brought by the owners of a mixed cargo of copper sulphate in bags and cotton yarn, on board the small steamship "Yorkshire," built in 1893. They claimed damages for alleged breach of contract owing to the unseaworthiness of the ship. The defence of the shipowners was "perils of the sea."

In the course of his judgment Mr. Justice Hill said that the case turned upon the question of the seaworthiness of the ship. The plaintiffs said that owing to the failure of a lead pipe and to a defective storm valve in the ship's side, sea water entered the hold and, dissolving the copper sulphate, produced a highly-corrosive acid solution which damaged the cargo; also that the acid attacked and ate through some of the bottom plates which were already thin and corroded before the voyage was undertaken. The defendants contended that the pipe was sound, but had cracked owing to stormy weather, and that the valve was reasonably fit for its purpose; also that the bottom plates were sound, and that the corrosion was due entirely to the acid and wholly caused during the voyage.

His Lordship thought that the lead pipe probably became cracked on the preceding voyage, but the matter was left in doubt, and the onus was on the plaintiffs. The crack was the initial cause of the damage, and the latter was greatly aggravated by the invasion of water through holes in the bottom plating. The cause of the holes was the acid produced by the solution of the copper sulphate. There was most conflicting expert evidence as to the time it would take for such a solution to corrode the plate. Looking at the evidence as a whole, he drew the conclusion that in this case the acid had acted with unusual rapidity, but he could not say that the plates must have been so unsound before the acid reached them as to make the ship unseaworthy. The onus being on the plaintiffs, he was unable to find that there was evidence either that this ship was unfit for the voyage in so far as it had a weakened or cracked pipe prior to sailing, or that it had bottom plates which were not able to stand the ordinary risks of the voyage. He held that the defence of "perils of the sea" had succeeded, and there must be judgment for the defendants with costs.

COMPANY NEWS.

POWER-GAS CORPORATION, LTD.

The annual meeting was held in Manchester on December 18 last. Mr. E. Lloyd Pease, who presided, referred to the fact that the profit available from the past year was the best in the history of the company. The net profit for the year ended September 30 last was £6,662 up at £33,561, and it was proposed to carry forward £26,308, out of which two years' excess profits duty was payable. (Capital £300,000.) During the past financial year the company had resumed its normal manufacturing business, but the proportion of general engineering work to power-gas work was greater than in the past. The position for the latter type of work is still unfavourable, partly owing to the very high cost of steel structures, and partly because the selling price of by-products has not kept pace with the cost of materials and labour. There has been a considerable development in the manufacture of small gas plants for producing gas for manufacturing and power purposes. Existing conditions, which are unfavourable to large undertakings, are favourable to the adoption by smaller industrial works of self-contained plants involving only a small capital outlay. The chief reason for this lies in the great increase in the cost of town gas and of fuel generally. The most suitable fuel for such small plants is coke or anthracite, of which there should be an abundant supply. Mr. Pease then reviewed the policy of erecting central electric "super-stations," and the relative merits of gas and electricity, adducing data which indicated that when town gas and coke or anthracite can be obtained, heat from gas will cost about one-third, and power from coke about three-quarters, of the cost of similar services from a central power station.

SCOTTISH OILS, LTD.

Sir Charles Greenway, in presiding at the statutory meeting of this company in London, on December 30, reviewed the objects of and the circumstances attending the formation of the company (this J., 1919, 358 R, 461 R). The offer of the Anglo-Persian Oil Co. had been accepted by 99 per cent. of the ordinary shareholders of the Scottish shale oil companies, and the reorganisation of the industry on more up-to-date lines is being proceeded with. The joint sale and distribution of the products of the Scottish industry, and also of the imported products is now in the hands of one organisation, the Scottish Oil Agency (Limited). The prosperity of the Scottish companies ceased with the termination of hostilities, owing to the reductions in the prices of imported oils, to which the Scottish products had to conform, and to the increased costs of production, due largely to the Sankey Award. The statement made by Mr. Adamson in the House of Commons (this J., 1919, 180 R) that the workers in the shale industry had not received the increase of 2s. per day under this award was entirely incorrect; this advance had entailed an additional burden on the industry of about £260,000 per annum. The addition of 6s. per ton to the price of coal involved a further cost to the company of about £210,000 per annum, and then the industry became hopelessly unprofitable. That was the position when the shale oil workers put forward their claim to a reduction in the hours of labour. The oil companies were compelled to refuse this claim, which would have meant an additional cost of about £200,000 per annum. After a short period of closing down the Board of the new company was able to arrive at a temporary arrangement with the representative of the workers, whereby the industry is still kept going, although not yet at full capacity. The position of the Board is that if the 7-hour day can be adopted without sacrificing a reasonable return on the invested capital, it will be conceded.

ENGLISH OILFIELDS, LTD.

The annual meeting was held in London on December 30, 1919. After a short address by the chairman, Sir James Heath, Bart., who stated that H. M. Petroleum Executive had agreed to give the company an exclusive licence to bore for liquid petroleum over a very extensive area, Dr. W. Forbes-Leslie, managing director, dealt at length with the recent activities of the company in regard to railway construction, equipment, brickyards, drilling operations and the character of the geological strata encountered on the property in Norfolk. *Inter alia*, a contract has been given for a by-product plant capable of dealing with 20 million cub. ft. of gas per 24 hours, with power to extend up to 30 million. An 11 ft. seam of shale has been struck containing a heart of torbanite material which yields on analysis 85—95 galls. of oil per day. The productive shale measures have been practically proved to be of greater thickness than 500 ft., and distinct evidence of the occurrence of liquid oil has been obtained. Deep-drilling operations have disclosed the existence of a mineral formation hitherto quite unknown in England, which, as it contains valuable metals and mineral substances, may prove to be of industrial importance.

Dr. E. Burnet, chemical adviser to the company, said that the Norfolk shales were very rich in volatile matter. Whereas the average amount of oil produced from Scottish oils was about 23 galls. per ton, that of the Norfolk seams was approximately 60 galls. Owing to the high organic content of the latter it was not found, as in Scotland, that the yield of ammonia varied inversely with the yield of oil. As much as 60—70 lb. of ammonium sulphate had been recovered from Norfolk shale, and the spent material from the retort should prove very valuable for making Portland cement. The breaking strain of a specimen of such cement was found to be 523½ lb. per sq. inch (the standard being 450), and a cement containing 75 per cent. of sand gave a breaking strain of 373½ lb., or 86 per cent. above the normal standard. The question of devising a suitable retort for distilling Norfolk shale had been under investigation, and the speaker hoped to be in a position shortly to publish the details of such a retort. Norfolk crude oil has a reddish-brown colour and a garlic odour; its specific gravity is 0·998, and on fractional distillation yields 10—20 per cent. of gasoline and 40—50 per cent. of kerosene, leaving a residue of about 40 per cent. boiling above 270° C. On distilling this residue up to 300° C., there is left a bituminous material of sp. gr. 1·170, m. pt. 82° C., of which nearly 90 per cent. is soluble in carbon bisulphide; this should be of great value as a binder in road-making. The average refining loss for Norfolk shale oil is estimated to be about 25 per cent., or a little more.

PERUVIAN GUANO SETTLEMENT.—The shareholders of the Peruvian Corporation have been officially notified that, subject to ratification by Congress, a settlement has been arrived at with the Peruvian

Government whereby the Corporation cedes the right to the Government to extract and export 762,872 tons of guano still due to it in return for payment of £3,501,488.

BWANA M'KUBWA COPPER MINING CO., LTD.

At the ordinary general meeting, held in London, on December 20, the chairman, Mr. R. Littlejohn, stated that the results of the trial treatment of the company's ore (in Rhodesia) by the Minerals Separation Company's process had so far been highly satisfactory. The results for 51 days' run were:—Tons of ore treated, 3,676; assay value, 5·3 per cent. copper; concentrates produced, 544 tons; value, 26·2 per cent. copper; recovery of copper contents of the ore, 78·1 per cent.; value of tailings, 1·46 per cent. copper. The trial test operations are being continued. The capacity of the plant is 100 tons of ore per day.

AMALGAMATIONS.—*British Glass Industries, Ltd.*, has entered into a contract to acquire a controlling interest in a number of firms manufacturing glass, including lamp-blown glass for scientific purposes.

The *Castner-Kellner Alkali Co., Ltd.*, has received an offer from Messrs. Brunner, Mond and Co. to purchase not less than 75 per cent. of the shares not already held by them, the payment to be made in ordinary shares of the latter company in the proportion of two shares for one Castner-Kellner share.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for December 25, 1919, and January 1, 1920.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, Westminster, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the department mentioned and quoting the specific reference number.

Locality of firm or agent.	Materials.	Reference number.
Australia	Galvanised iron sheets	*363/2/12
British India ..	Alcoholic beverages, preserved food	1
British West Indies	Alcoholic beverages, mineral waters	3
" " "	Rubber	4
Canada	Electrical porcelainware ..	‡
"	Glue	‡
Belgium	Asbestos	1279
Italy	Resistance wire for electric lamps china insulators ..	12
"	Chemicals, metals	13
Switzerland ..	Hides, skins, tanning materials, oil-seeds, lard, tallow, edible oils, mineral oils essential oils paraffin wax, rubber ..	1290
" ..	China glass crockery	17
Palestine	Window glass lamp glasses, china	1291
Morocco	Perfumery inks	1293
United States .	Oils greases	1295
Peru	Oils, greases, rubber .. .	1297

* Official Secretary, Commercial Information Bureau, Australia House, Strand, W.C. 2.
‡ Canadian Government Trade Commissioner, 73, Basinghall Street, E.C. 2.

MARKETS SOUGHT.—A firm with head office at Novorossisk, South Russia, and branches in the Near East desires to get into touch with U.K. importers of old rubber overshoes, benzine from Gormaia, and potash for soap manufacture. These commodities are now ready for export at Novorussisk. [1288].

TARIFF. CUSTOMS. EXCISE.

Australia.—A proclamation, dated October 15, 1919, prohibits the import of food containers the inner surfaces of which (A) consist wholly or in part of lead or zinc, or (B) consist of any metal alloy containing more than 10 per cent. of lead or zinc, or (C) are tinned with a metal alloy containing more than 1 per cent. of lead, or (D) contain enamel or glaze or indiarubber or guttapercha which yields lead on boiling with vinegar, or (E) contain more than ¼ of a grain of arsenic per lb. of alloy enamel or glaze.

Brazil.—The proposed revision of the customs tariff affecting paper, stones, earths, minerals, china, glassware and certain metals may be seen at the Department, 73, Basinghall Street, E.C. 2.

British Guiana.—An approved form of certificate of origin for goods entitled to admission under the preferential rate of customs duty is given in the issue for December 25.

France.—A new tax of 5 centimes per unit has been levied "for the development of foreign trade" on all articles subject to the statistical tax as from August 25 last. The tax does not apply to goods in transit through France.

Germany.—The decree relating to the payment of duties in gold is temporarily suspended.

Netherlands.—Export prohibitions have been temporarily raised from, *inter alia*, magnesia, hides, tanning materials, gums, matches, paper, fusel oil, iron and steel scrap, peat, tin-foil, "Haarlem oil," black lead, aloxite, alundum, emery, carborundum, and malt.

Portugal.—The full text of the decree for the control of exports and imports is set out in the issue for January 1. The provisions of the decree entitle the Government to double the present import duties and surtaxes on all articles in the schedule annexed to the Decree No. 5612 of 1919.

South Russia.—The revised list of goods which may be imported free of Customs duty includes malt, starch, vinegar, manure, animal fats and oils, hides and skins, copra, medicinal plants, stone, asbestos, acid-proof stoneware, raw rubber, Stassfurt salts, sulphur, antimony, boric acid, borax, ammoniacal preparations, saltpetre, soda, potash, chloride of lime, certain acids and chemicals, medicinal and pharmaceutical preparations, phosphorus, ether, chloral, chloroform, opium, vegetable oils, glycerin, tanning materials, dyes, certain pigments, some metals, ores and alloys, vegetable fibres and margarine.

Spain.—The decree for the control of the manufacture and sale of pharmaceutical specialities may be seen at the Department, 73, Basinghall Street.

TRADE NOTES.

BRITISH.

Forthcoming Industrial Fairs.—*United Kingdom.*—The British Industries Fair, 1920, organised by the Board of Trade, will be held simultaneously in London, Birmingham, and Glasgow from February 23 to March 5. At the London fair (Director, 10, Basinghall Street, E.C. 2), to be held at the Crystal Palace, the exhibits will include glassware of all kinds, china and earthenware, scientific instruments, photographic appliances and requisites, drugs and druggists' sundries. There are 2½ million cubic feet of stands, and the exhibition will be the largest ever held in this country. The Birmingham fair (Secretary, The Chamber of Commerce, 95, New Street) will include exhibits of paints, colours, varnishes, and painters' requisites, tubes in copper, lead, brass, and steel, pipe fittings, etc. The Corporation of the City of Glasgow (General Manager, Kelvin Hall of Industry, Glasgow) will show, amongst other goods, chemicals (light and heavy), and domestic chemical products.

Bâle.—It has been arranged to hold the fourth annual sample fair from April 15 to 29 next.

Bandoeng.—An industrial fair, under private auspices, will be opened at Bandoeng, Netherland East Indies, on May 20, 1920, and will last for two or more weeks. Among the eight groups of articles is "Chemicals and Nursery Appliances."

Barcelona.—From April 2 to 12, inclusive, an international business organisation exhibition will be held in the Palaccio de Bellas Artes, and will be continued annually. The Barcelona international fair will be held from May 15 to 30.

Bordeaux.—The period fixed for the fourth annual trade fair is June 5 to 20.

Brazil.—The British Chamber of Commerce at Sao Paulo has organised a series of British industry fairs in order to stimulate the importation of British manufactures into Brazil. The fairs will be open until February 28, 1920.

Brussels.—The municipality of Brussels has organised an international commercial fair, to be held in that city from April 4 to 21 next. The exhibits will comprise chemical industry and products, pharmaceutical products and drugs, leather, ceramics, glassware, metals, and photography. (Executive Committee, Grand Place 19, Brussels.)

Johannesburg.—The annual mining exhibition, held by the Chemical, Metallurgical and Mining Society of South Africa, will be held at the School of Mines, Johannesburg, from January 21 to 31.

Leipsic.—This fair is in future to be held in two sections—the general sample fair from February 29 to March 6, and the technical fair from March 14 to 20, 1920. The former will include exhibits of glass and ceramics, metal goods of all kinds, goods of leather, rubber, cork, and celluloid, soaps and perfumes, chemical-pharmaceutical wares, optical goods, etc. At the technical fair will be shown machinery, tools, and apparatus of all kinds, factory equipment, safety appliances, measuring instruments, balances and weights, optical instruments, chemical plant, etc. Thus chemical industry will be represented in both sections, the general idea being that materials required for the household shall be shown at the general fair, and those which supply technical needs, at the technical fair. Associated with both fairs will be an exhibition of raw materials and semi-manufactured goods.

Lyons.—The international (spring) fair will be held from March 1 to 15. (British agent: A. Rousset, 69, Wood Street, E.C. 2.)

Milan.—The 1920 international fair will be open from April 1 to 15. Only Allied and Neutral exhibits will be shown. There is said to be a good market for chemicals in Italy. It is proposed to hold the fair twice yearly, in the spring and autumn.

Paris.—An exhibition of samples is to be housed permanently in the Musée Commercial Universal in Paris, where space has been allotted for 1200 exhibits. Branches are to be established in Italy, Spain, Belgium, Switzerland, Poland, and the Far East.

Sweden.—Fairs are to be held this year in Sundsvall and Malmo. A new organisation is planning a fair to be held in 1921 and thereafter in Gothenburg.

Utrecht.—The fourth annual national industries fair will be held from February 23 to March 6. (General Secretariat, Jaabans, Administratiegebaw, Vredenburg, Utrecht.)

FOREIGN.

United States Foreign Trade in Glycerin.—The trade of the United States in glycerin has been completely revolutionised by the war. Annual imports ranging from 10,000 to 20,000 short tons prior to 1914, dwindled to 500 tons in 1919, when not only was sufficient glycerin produced for home consumption but 10,500 tons in 1918 and 6,500 tons in 1919 were exported. No accurate data are available concerning the production of glycerin in the United States since the census taken in 1915, but the estimated output in 1917 was 35,000 tons, crude. The world's total output before the war was 40,000 tons. Figures representing imports of glycerin into the United States have been separately enumerated since 1884. The record quantity of glycerin imported was 20,590 tons in 1910. In the following table the total annual imports for a number of years are given in tons, together with the average price per pound:—

Fiscal year ending June 30.	Short tons.	Average price per lb. s. d.
1884	2,916	0 5¼
1894	4,160	0 3
1904	15,539	0 4
1914	18,205	0 6
1915	8,810	0 6
1916	5,310	0 10
1917	2,061	1 3½
1918	937	1 9¼
1919	585	1 3⅛

The United Kingdom and France were the leading suppliers of glycerin up to 1916, when exportation ceased, to be resumed in 1919, when the former exported 51 tons. The following table gives the exports of glycerin from the countries named to the United States, expressed in percentages of the total imports of glycerin for the year:—

Fiscal years ending Jun 30	Austria-Hungary.	Belgium.	France.	Germany.	Italy.	Netherlands.	Spain.	United Kingdom.
1884	1·6	1·0	60·6	21·5	1·5	1·7	—	10·9
1894	0·1	12·0	56·1	2·6	9·2	0·6	15·7	1·9
1904	0·6	4·4	46·1	1·8	5·7	5·6	4·3	24·5
1914	0·7	7·3	30·8	5·2	2·4	7·0	·6	29·0
1915	0·7	2·9	22·5	0·3	0·9	4·5	0·9	44·7
1916	—	—	16·5	—	—	8·7	24·0	8·1

Glycerin made in the United States was exported to 54 countries during the fiscal year 1918 (the first year for which it was separately shown in the export schedule), 91 per cent. of it going to Europe. Of the total 10,073 short tons exported to Allied countries, 9,443 tons went to Italy, 718 tons to Canada, 104 tons to England, 50 tons to France and 40 tons to Japan. The following table shows the amount and destination of glycerin exported during the year ended June 30, 1919:—

Destination.	1919. Tons (short).	Per cent. of total exported.
United Kindgom ..	3,420	52·5
Japan	1,258	19·8
Italy	857	13·2
Canada	511	7·8
Norway	131	2·0
Argentina	72	1·1
Cuba	44	0·67
China	33	0·55
British India	21	0·33

Total to all countries, 6,509 tons, valued at $6,833,432.

There was a striking decline in the export trade during the last six months of the fiscal year as compared with the first half, *viz.*, 1,350 tons, against 5,159 tons.—(*U.S. Com. Rep.*, *Nov.* 10, 1919.)

REVIEWS.

THE PROFESSION OF CHEMISTRY. *By* RICHARD B. PILCHER. *Pp.* xi. + 199. (*London: Constable and Co., Ltd.*, 1919.) *Price* 6*s*. 6*d*. *net*.

Although intended by the author to provide box-room chemists, their parents and schoolmasters with information regarding the profession it is their ambition to enter, this book will be read with very considerable interest by chemists themselves. The latter will probably be astonished to find that there is so much to say, but they will agree that nobody is better qualified to say it than Mr. Pilcher, whose long and loyal service to the Institute of Chemistry commands the gratitude and admiration of the whole profession.

The opening chapter, on Preliminary Education, automatically leads to the inevitable comparison between classics and science as instruments for cultivating the mind, and the author crystallises our creed in the following words: "The demand for more science in general education was not necessarily associated with the idea of neglecting classical study and literature, but was made in order to secure that all classes of the community should be given the opportunity of knowing sufficient of the fundamental principles of mechanics, physics, chemistry and biology to enable them to appreciate their value in the affairs of everyday life." It is this opportunity of a balanced education which has been denied us in the past by our classicists who, in accusing us of "too early specialisation," ignore the fact that it is they themselves who have hitherto specialised most unblushingly. It is probable that, in consequence of this, not one per cent. of parents travelling on the Underground each day could give their sons a coherent sketch of the energy transformations involved. Fewer still, although we are all engaged from breakfast to bed-time in organic chemical operations of the greatest subtlety, have the slightest conception of the food-materials which they assimilate. It is the yawning gaps in our understanding of everyday life typified by these examples, acting on minds eager for distraction, which stimulate the demand for ephemeral literature; how much happier and better the world would be if only schoolmasters realised how little nature-study need be given to enable boys and girls to prefer, for instance, those delightful essays comprised in "Science from an Easy Chair" to "Snappy Snips."

Basing his hopes upon an interesting historical discussion of the words chemist, druggist, apothecary and pharmacist, the author looks forward with patience and moderation to the day when enlightened public opinion will remove the present absurd anomaly from our commercial nomenclature, a misfortune which has exerted incalculable influence in retarding the appreciation of chemistry in Great Britain. Pharmaceutical practice represents a communal factor much too necessary and honourable to require the supposed assistance of a misnomer, and a pharmacist cannot be a better pharmacist for calling himself a "cash chemist." There is at least one pharmacist in London who describes himself as a "continental chemist"; probably his claim to continentality is more easily imagined than stated.

The chapter on Professional Training is a comprehensive guide to the various institutions at which the study of chemistry may be pursued, and should prove extremely valuable to the aforementioned parents and schoolmasters, who will also scrutinise with some anxiety the Prospects and Conditions of Practice. Becher's description of chemists as "a strange class of mortals impelled by an almost insane impulse to take their pleasure among smoke and vapour, soot and flame, poison and poverty," is not entirely out of date. Hitherto there has been one singular resemblance between Holy Orders and the practice of chemistry—the practitioner is supposed to receive part payment from his temperamental delight in the subject itself. Whilst there may be ethical objection to substantial fees for spiritual guidance, there is no similar obstacle to the due recognition of chemical advice, and it is deplorable that this is still incompletely appreciated because the responsibility of the chemist is not realised. On this point the author makes the following appropriate observation: "The public analyst who makes a mistake suffers in prestige. In the law, judges may frequently express the opinion that the litigants have been badly advised; for instance, that a case should not have come into court. This is a matter between solicitor and client. In medicine, eminent physicians may make a faulty diagnosis, and scarcely anyone hears of it. In architecture mistakes can often be rectified before the building is completed. The public analyst, however, whose practice as such consists largely of investigations bringing usually but a small return, is answerable as a public official, and his reputation is at stake on any lapse from accuracy, though it may be the result of an accident—for instance, through a confusion of samples, or lack of uniformity of a sample unevenly mixed."

The book includes a long and admirable chapter on Industrial Chemistry, and a shorter one on the relation between Chemistry and the State. It is a thoroughly commendable work, carefully written, full of sound common-sense presented in an attractive manner.

M. O. FORSTER.

PRACTICAL LEATHER CHEMISTRY. *By* A. HARVEY. *Pp.* 207. (*London: Crosby Lockwood and Son.* 1920.) *Price* 15*s*. *net*.

The author describes his work as "a handbook of laboratory notes and methods for the use of students and works chemists," and as such the book will be useful.

It consists of twenty chapters, each chapter dealing with the method of analysis of each of the important substances used in connexion with tanning and leather dressing. The chapters deal with the analysis of water, lime, alkaline sulphides, the estimation of nitrogen, analysis of used lime liquors and limed pelt, deliming agents, single and two bath chrome liquors, egg yolk, soap, oils, fats and waxes. In this chapter a list is given of the most important constants in connexion with the oils used for leather dressing, together with some information as to the interpretation of the values. A chapter dealing with the qualitative reactions of the various tannins gives some useful and simple tests for the better known substances. The quantitative methods of tanning analysis, including both the iodine and Löwenthal processes, as well as the official method, are also described; and a comprehensive list of the average analysis of most tanning materials is provided in tabular form. The analysis of used tan liquors, leather analysis, finishing materials, natural dyestuffs and coal-tar dyes are considered in subsequent chapters, and some useful tables are given in the appendix.

Mr. Harvey does not attempt to deal with either the principles underlying the methods of analysis, or the interpretation of results, but confines himself to outlining the most common methods for the analysis of the material under discussion, giving in nearly every instance equations and the detailed method of calculating results with typical examples. In fact, a considerable amount of space is taken up by examples of calculations which, in a book of this nature, might have been omitted.

The volume contains just a little more information than the "Leather Chemists' Pocket Book," but at the same time is not sufficiently complete to make it a full laboratory text book. It will, however, be of considerable use to every chemist in a leather works, and also to students, although the latter will not be able to use this volume except in conjunction with larger works giving alternative methods.

Mr. Harvey is a clear writer, and describes each process in simple and clear language. The addition of blank pages bound between each chapter for notes will be found useful. There are not many illustrations, but those which are supplied are excellent and simply prepared.

When the author comes to revise this volume for a second edition it will be well for him to consider whether he should not cut out the unnecessary examples of calculations and so make it into a pocket book or, on the other hand, the volume could be enlarged with advantage, thus bringing it up to the standard of an analytical text book, for which, at the present time, there is a distinct want.

The book is well printed and well got up, and is quite equal to this well-known publisher's usual standard.

J. Gordon Parker.

Commercial Oils: Vegetable and Animal. *With special reference to Oriental Oils.* By I. F. Laucks. *Pp.* 138. (*New York: John Wiley and Sons, Inc. London: Chapman and Hall, Ltd.*, 1919.) *Price* 6*s. net.*

The primary object of this little book is to give those connected with the oil trade a description of the nature of oils, their uses, and the methods used in their examination, with sufficient details to enable a non-technical reader to understand the meaning of an analysis. On the whole the author has succeeded in this object, although in some places the explanations of technical points have been omitted. For example, on p. 34 mention is made of the "yield of hexabromides," but no description is given of the meaning of the term. Incidentally it may be mentioned that the application of the term to glycerides is misleading. The insoluble bromides separated from certain oils are probably the bromides of mixed glycerides and are certainly not linolenic hexabromide. Another omission to be noted is in connexion with rancidity. It is a matter of great importance to check the action of enzymes prior to expression of oils, and the meaning of enzymic action might therefore have been dealt with in a non-technical manner.

The value of this book for English chemists is that it includes in a form convenient for reference the tests and specifications drawn up for different oils by the United States Army, the Chicago Board of Trade and various commercial associations. There is also a useful chapter on the methods of sampling oils. The constants of Oriental oils typical of those now being imported into the United States were determined in the author's laboratory and are given here in tabular form. These differ very considerably from recorded values for the same kinds of oils of different origin, and it is cogently suggested that new standards should be fixed for these oils. In the short tables in the text the usual upper and lower limits for the values of oils are given, and exceptional values are excluded.

C. A. Mitchell.

PUBLICATIONS RECEIVED

Elementary Practical Chemistry. *Part I. General Chemistry.* By F. Clowes *and* J. B. Coleman. *Seventh edition. Pp.* 241. (*London: Messrs. J. and A. Churchill.* 1920.) *Price* 6*s.*

Qualitative Analysis. *By* F. Clowes *and* J. B. Coleman. *Ninth edition, with* 84 *illustrations. Pp.* xvi.+400. (*London: Messrs. J. and A. Churchill*, 1920.) *Price* 12*s.* 6d.

Applied Chemistry. *A Practical Handbook for Students of Household Science and Public Health. By* C. K. Tinkler *and* H. Masters. *Vol. I. Pp.* 292. (*London: Crosby, Lockwood and Son*, 1919.) *Price* 12*s.* 6*d.*

Popular Chemical Dictionary. *By* C. T. Kingzett. *Pp.* 368. (*London: Baillière, Tindall and Cox.* 1920.) *Price* 15*s.*

Report on the Present State of Knowledge Concerning Accessory Food Factors (Vitamines). *Compiled by a Committee appointed jointly by the Lister Institute and Medical Research Committee, National Health Insurance, Medical Research Committee. Special Report Series, No.* 38. (*London: H.M. Stationery Office.* 1919.) *Price* 4*s.*

The Manufacture of Glue in the Tropics from Tannery Refuse. *By* Kalyan C. Srinivasan. *Pp.* 24. *Indian Department of Industries.* (*Madras: Government Press.* 1919.)

Manurial Experiments with Sugar-Cane. *By* H. H. Tempany, *Department of Agriculture, Mauritius. Pp.* 28. (*Port Louis: The Government Press.* 1919.)

Further Trials with the Cultivation and Manufacture of Reunion Tobacco. *By* H. H. Tempany *and* G. G. Auchinleck. *Department of Agriculture, Mauritius. Pp.* 20. (*Port Louis: The Government Press.* 1919.)

Rapport sur le Commerce et l'Industrie de la Suisse, 1918. *Pp.* 524. (*Zurich: l'Union Suisse du Commerce et de l'Industrie*, 1919.) *Price* 9 *francs.*

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- Sand and Gravel in 1918. *By* R. W. Stone.
- Manganese and Manganiferous Ores in 1917. *By* D. F. Hewett.
- Quicksilver in 1918. *By* F. L. Ransome.
- Arsenic, Bismuth, Selenium and Tellurium in 1918. *By* James M. Hill.
- Gold, Silver, Copper, and Lead in South Dakota and Wyoming in 1918. *By* Charles W. Henderson.
- Gold, Silver, Copper, Lead and Zinc in New Mexico and Texas in 1917. *By* Charles W. Henderson.
- Building Operations in the Larger Cities in 1918. *By* Jefferson Middleton.
- Coal in 1917. *Part B. Distribution and Consumption. By* C. E. Lesher.
- Peat in 1918. *By* C. C. Osbon.

Corrigendum. In the issue for December 31, 1919, p. 486 R, col. 1, line 39-40, read "indigotin."

THE REPORT OF THE NITROGEN PRODUCTS COMMITTEE.

H. A. HUMPHREY.

No more important scientific report has ever been published by the Government than that of over 350 pages presented in May last to the Minister of Munitions by the Nitrogen Products Committee of the Munitions Inventions Department. The Committee, composed of some of our most able scientists and technical men, each an expert in one or more subjects, has spent three years in collecting information on the nitrogen situation from all sources, many of which would not otherwise have been accessible, and has tabulated, weighed, adjusted and adjudicated, with the sound judgment derived from wide experience. In thus bringing expert knowledge to bear on the questions involved, the Committee has contributed the most up-to-date and authoritative information on the nitrogen problem in the form of a report, which by reason of the care bestowed on its final preparation by those who are noticed in the concluding remarks therein, is a model of clarity and, typographically, sets up a new high standard which might well be followed by all Government Departments.

The responsibility resting on the Committee was a heavy one. If its findings and recommendations are not accepted and acted upon, there will be a still heavier responsibility on the Government.

The issues raised in the report are vital to the interests of the nation. There are hopeful prospects mixed with grave warnings, but many will be disillusioned of long-cherished ideas. The Committee has mapped out certain lines of action which the nation can only refuse to follow at its great peril, and it is for readers of this Journal to do their full share in seeing that the utmost possible good shall result from the valuable work done by the Committee.

The present article is an attempt to throw into relief some of the salient features of the report and to comment briefly on them.

Nitrogen products are chiefly of importance to the world because, without them, the crops on which we live could not be grown. Nitrogen combined as nitrate and sulphate forms the basis of fertilisers for all plant growth and therefore, if indirectly, of practically all food. Nitrogen is also an essential constituent of nearly all our explosives and is therefore the basic weapon with which modern war is waged. Without an abundant supply of nitrates we should have lost the war. In fact, had the enemy been capable of maintaining a fleet to cut off our supplies of Chilean nitrate we must have been defeated. At one time the sinking of ships bringing nitrate to this country was serious enough to force us to start building a factory to make nitrates synthetically in this country. Germany was making synthetic nitrates before the war, developed her manufacture during the war, and would have been reduced to impotence at a much earlier date if, by synthetic means, she could not have kept pace with her requirements for nitrogen products. It is an amazing fact that before the armistice was signed Germany was producing synthetic ammonia at the rate of 650 tons per day, approximately equivalent to 500,000 tons of ammonium nitrate per annum! Contrast this with the fact that the only synthetic ammonia produced in this country was a few pounds weight per day—the product of experimental apparatus at University College, London. Under present conditions, if we had the misfortune to be at variance either with Chile or with a country capable of preventing supplies of Chilean nitrate reaching England we might be compelled into acquiescence because we should have insufficient explosives to warrant a threat to use force.

Let us return, however, to the question of combined nitrogen and see first how matters stood before the war, both as regards the world position and the position of this country, and in doing so we may remember that 70 per cent. of the total output is required for fertilisers.

The world's consumption of Chilean nitrate was naturally greater than that from any other single source. because in the vast deposits of sodium nitrate in Chile there was available a source of supply only needing to be dug out, purified, and shipped.

In 1903 the world's consumption was 1,429,150 tons. In 1913 it had risen to 2,464,540 tons, showing an increase of 1,035,390 tons per annum in a period of 10 years. Of this amount the British imports were in 1903, 116,715 tons, and the price was £9 10s. 10d. per ton; in 1913, 140,926 tons, and the price per ton was £11 1s. 8d. In 1917 the price rose to £27 per ton! British imports during the war were, of course, much larger, and indeed were only limited by the possibility of sparing ships (from a greatly depleted tonnage) urgently needed for bringing food and for transporting men and material. The Allies collectively imported over 2,000,000 tons of Chilean nitrate in 1915, and nearer 3,000,000 tons per annum in 1916 and 1917.

Germany imported 833,112 tons in 1913 or, say, six times our own consumption. During the war, thanks to our fleet, her imports were *nil*, yet she managed entirely to replace the loss and at the same time to establish an industry of the utmost post-war value.

The next nitrogenous fertiliser in order of importance is sulphate of ammonia, of which the world's production prior to the war was, in 1903, 540,200 tons per annum; in 1913, 1,389,810 tons per annum, showing an increase of 849,610 tons per annum in 10 years, during which there was a steady rise every year. The price was variable, and ranged from £11 5s. to £14 7s. 9d. per ton in England. Seeing, however, that sulphate was sold in this country 22 years ago for £7 10s. per ton, the general upward trend is evident. During the war it rose to £17 10s. per ton, and would have soared higher but for Government control.

Of the above quantity of sulphate, Great Britain in 1913 produced 439,540 and Germany 549,558 tons. Ammonium sulphate is mostly derived from gas works and coke ovens, and both countries did all they could to increase their output from these sources during the war. Owing to adverse circumstances the British increase was quite small. Germany, however, succeeded in raising her by-product output to about 700,000 tons. Greater attention was paid to the simultaneous extraction of benzol and toluol, because both were required for explosives, the latter being used for making TNT (trinitrotoluene). It should however be noted that much of the TNT we used during the war was derived from the distillation of imported light oils. Some people still think we fought the war on explosives made from by-products of the gas industries; that is quite a mistake, although such products played a most important part.

Before the war Great Britain not only supplied her home requirements for sulphate, but in 1913 exported some 325,000 tons. At one stage of the war this valuable export trade had to be stopped because the ammonia was needed for warlike purposes and to meet the increased agricultural requirements. The British export trade was the largest of any country and was rapidly growing. In the ten years 1903—1913 our exports of sulphate doubled, and, if we are to continue to hold our markets abroad, it can only be done by manufacturing cheap synthetic ammonia.

Reserving comments on the above facts, let us examine the Committee's figures for the production of synthetic nitrogen products. Omitting, for reasons of space and not for lack of interest, all reference to partly developed processes, it will be assumed that readers are familiar with the established methods of nitrogen fixation. The chief methods and their primary products are:—The arc process, producing nitric acid; the cyanamide process producing calcium cyanamide; and the Haber process, producing ammonia. As the products differ, it is desirable to compare the processes on the basis of their combined nitrogen content. The commercial products have nitrogen contents approximately as follows:—Nitric acid (as 100%) 22·2%, ammonia (liq. sp. gr. 0·88) 29·3%, calcium cyanamide 17·5%; and for comparison we may add Chilean nitrate 15·6%, and ammonium sulphate 20·2%.

The three leading processes differ greatly in their requirements for power and in the capital cost of the respective plants, as will be seen from the following table:—

Process.	Kw.-Year per ton of combined nitrogen.	Primary product.	Capital cost per ton of combined nitrogen per annum.	Cost of producing one ton of combined nitrogen.	Cost of producing one ton of primary product.
			£	£	£
Arc process ..	8·41	Conc. nitric acid	178·4	51·8	11·51
		Nitrate of lime..	178·6	58·8	7·65
Cyanamide Process ..	2·13	Calcium cyanamide	45·4	24·0	4·69
Haber process	0·42	Ammonia ..	54·0	20·6	17·0
		Ammonium sulphate ..	68·7	29·3	6·03

Metric tons are used in the above figures, and it is assumed that steam power costs £3·75 per kw.-year. The figures are on a pre-war basis and paragraph 32 of the original report should be consulted for details of the charges included. Similar figures, based on water power, are also given in the report.

It is evident that in a country like ours, where no large water-power schemes exist, the arc process may be practically ruled out, leaving as suitable for development the cyanamide and Haber processes. Apart from the fact that cyanamide contains less nitrogen than ammonium sulphate, there is little doubt that the latter is the better fertiliser for most purposes. Both processes should be established in this country, but, all things considered, the Haber process appears best suited to British requirements.

The Haber process differs from all manufacturing processes established in this country in that it involves the use of red-hot gases at the very high pressure of 150—200 atmospheres. Further, it needs very pure hydrogen and nitrogen. Unless the hydrogen is pure, the catalyst, which brings about the direct union of the two gases to form ammonia, becomes poisoned and ceases to be active. But for these facts the process would be incomparably superior to all others. However, the difficulties have been overcome in Germany, where the process is now established on an enormous scale. Single catalyst units producing 20 tons per day are in regular operation and, as already stated, some 650 tons of ammonia have been produced per day, and from two works only. This enormous output has been made under the pressing necessities of the war, but it menaces the world's markets after peace has been concluded.

The development of the Norwegian nitrate industry was so hindered during hostilities, that although the war produced marked change in the form of the products yet the total output remained almost stationary. Thus there was a decrease in the production of nitrate of lime and of calcium cyanamide and an increase in ammonium nitrate, the output of the latter rising from 9167 tons in 1913 to 63,578 tons in 1917.

Both France and Germany largely increased their plants for cyanamide products during the war, as the following figures show:—

Country.	Cyanamide produced in 1913.	1917.
France	7,500	100,000 tons
Germany	24,000	500,000 tons

But the most significant growth in Germany's nitrogen industry is in the Haber process output, which rose from 30,000 tons (as sulphate) in 1913 to 500,000 tons in 1917, and the plant capacity is now probably over 800,000 tons.

The annual capacity of the German plants may now be placed at the following approximate figures:—

From by-product ammonia ...	700,000 tons (as sulphate)
From cyanamide process ...	500,000 tons (as cyanamide)
From Haber process	800,000 tons (as sulphate)
Total	2,000,000 tons of products

The actual German production in 1917 was 1,600,000 tons of products containing 320,000 tons of combined nitrogen, or say 28 per cent. of the world's post-war capacity, including Chilean nitrate. During the war the world's capacity for producing nitrogen products has increased by over 40 per cent.

What relation have such figures to possible peace requirements? It is rather astonishing to find that the world's increase in productive capacity over the war period does not appear to be greater than would have been the case under normal conditions had the ordinary pre-war rate of increase been maintained, for the total requirements were doubling every 10 years. Over-production therefore need not be seriously feared. What concerns us intimately and vitally is: Where will our Empire stand with regard to its own production and consumption?

The United Kingdom alone is expected to require for agricultural purposes combined nitrogen equivalent to half a million tons of ammonium sulphate per annum, an increase of nearly 150 per cent. compared with pre-war figures. Our farmers use little more than half the chemical fertilisers per acre as compared with German practice, and the larger amount is undoubtedly a paying proposition at pre-war prices.

Then there is our export trade, valued before the war at £4,000,000 per annum, which should be greatly increased. In order to render the United Kingdom independent of imported nitrogen and at the same time to enable a large export trade to be maintained, the total home production of ammonia nitrogen alone would have to be increased to 125,000 metric tons per annum to satisfy the immediate visible demand, and to 182,000 tons per annum to meet the estimated demand of the near future. In other words, the present scale of production would require to be augmented at an early date by the equivalent of about 155,000 tons of ammonium sulphate per annum, and by 440,000 tons per annum in the near future, corresponding to increases of about 33 and 100 per cent. respectively upon the 1917 output.

We had markets in neutral countries which Germany will try to capture, and there are our own grain-growing Dominions and Colonies to be supplied. Is Germany to capture this trade, or a part of it? It is not easy to answer this question, but evidently it depends on policy and prices.

Leaving matters of policy to others, let us turn to prices, which are dealt with in considerable detail in the report. We have already seen that the price of nitrogen fertilisers has been steadily rising. This country produces its sulphate almost entirely from by-product ammonia, and, based on the market price of crude ammonia liquor for 1911 to 1913, it costs £13 6*s*. to produce a ton of sulphate. Compare this with the Haber cost figure of £5·67, and one sees at once the great possibilities of the Haber process. If the prices ruling in May, 1919, be taken the comparison is £17 10*s*. and about £11.*

From these figures certain outstanding conclusions may be drawn:—

(1) There is room for a large increase in the output of nitrogen products in this country.

(2) It is of the greatest importance that the cost of production should be as low as possible so that the use of nitrogen products may be stimulated and we may retain and extend our export trade.

(3) Only by manufacturing ammonia by the cheapest synthetic process can we meet the requirements of (2).

(4) The price of by-product ammonia must fall to meet competition.

With reference to the question of international competition, cheap synthetic nitrogen processes will control 30 per cent. of the world's supply of fixed nitrogen in the near future. How will that affect us and others? Possibly the price of sulphate of ammonia will have to drop to the lowest level hitherto recorded, say to £7 10*s*. per ton, equal to £37 per ton of combined nitrogen.

Calcium cyanamide can be made abroad where cheap water power is available at, say, £4—£5 per ton. Allow for packages, etc., and we have a factory cost of say, £5·75 per ton, equal to £29 per metric ton of combined nitrogen at the factory.

The trade in Chilean nitrate will suffer unless the Chilean export duty is so reduced and the working methods of extraction so improved that the product can be produced for about £7 10*s*. per ton, equal to £47 per ton of combined nitrogen.

Nitric acid is likely to be produced in Norway at less than £8 per ton (calculated as 100%), but there will be the difficulty of transport to be faced. In Great Britain nitric acid cost before the war £22 per ton, whereas it could have been made here, by the oxidation of cheap ammonia, at £11 per ton nine months ago.

Nitrate of lime and sodium nitrate, made by the arc process with cheap water power, may be able to compete with Chilean nitrate even allowing for a substantial fall from the pre-war price of the latter product. The cheap nitric acid of the arc process may enable combined nitrogen in the form of these products to be produced at £30 per metric ton.

To sum up, the Haber and cyanamide processes are likely to determine prices in the future and may well bring them down to the level of £7 10*s*. per ton for ammonium sulphate and £6 10*s*. for cyanamide.

Incidentally the dangerous rise in the price of coal may be mentioned with reference to the possibility of producing cheap power for synthetic processes in this country, for a rise of only 2*s*. 6*d*. per ton, from the assumed basis of 7*s*. 6*d*., increases the cost per kw.-year from £3·75 to £4·51, *i.e.*, an increase of over 20 per cent.

These considerations bring us back again to the Haber process, and we are led to ask what is being done to establish the process in this country. The answer is satisfactory up to a point, for the Committee is able to direct attention to the organisation it created under the Munitions Inventions Department, the staff it appointed to carry out a programme of experimental work, and to the splendid results achieved. Under Dr. J. A. Harker three principal branches of investigation were formed to deal respectively with ammonia synthesis, ammonia oxidation, and the production of gases suitable for the synthesis of ammonia. The heads of these three branches were Lieut. H. C. Greenwood, Capt. J. R. Partington, and Capt. E. K. Rideal, and they have been ably assisted by others who all deserve to be named individually.

The experimental work has mostly been carried out at University College, London, in laboratories made available by the willing co-operation of the Provost and the directors of the Ramsay Laboratories. Other experiments have been conducted at King's College and at gas works able to provide special facilities. No more scientific, thorough, or successful programme of work has ever been carried through by any Government Department, and the highest praise is accordingly due to the Munitions Inventions Department and its staff.

It took Germany over five years to develop the Haber process, and its secrets were most jealously guarded; the research staff of the Munitions Inventions Department, a small but brilliant body of experts, worked out the whole process in half that time and in some respects is ahead of Germany to-day as regards efficiencies obtained. Valuable discoveries, covered by over twenty patents, have been made during these investigations, and although the opportunity of putting the results into actual commercial use is still awaiting decision, yet this country has been brought abreast of German results so far as semi-technical work is concerned.

At a time when difficulties were increasing rapidly and the transport of Chilean nitrate to this country was becoming more and more precarious owing to shortage of ships and sinkings by enemy submarines, the Department of Explosives Supply decided that the work done by the Munitions Inventions Department was sufficiently complete to warrant the erection of a large factory in Durham to manufacture 60,000 tons of ammonium nitrate per annum by the Haber process. The synthetic ammonia stage was to be followed by the oxidation of part of the ammonia (by the catalytic method) to nitric acid, and a combination of the other part with the acid to yield ammonium nitrate.

A site was chosen at Billingham, some 3½ miles N.E. of Stockton-on-Tees, and work was started; but lack of high priority, and the subsequent drain on the D.E.S. staff for the still more urgent production of poison gas in overwhelming quantities, prevented the work from being completed. When the armistice was signed building operations had not advanced very far, although a considerable amount of plant had been ordered. Whatever decision may ultimately be reached with regard to the future of this development it is a matter of vital importance that this beginning of a new industry in our country should not be allowed to drop. If it is not to be revived as a Government measure, then it should proceed as a private enterprise.*

One of the features of the war was the use made by us of ammonium nitrate explosives. This material constituted by far the greater weight

* Recent advances in the cost of coal and labour have seriously affected the power problem and production costs generally. In this article, as in the Report, estimates of costs have for the most part been based upon pre-war figures.—Ed.

*Early in November, 1919, the Secretary of the Ministry of Munitions announced that the Government had decided to leave further development to private enterprise, and that the Minister of Munitions was prepared to receive offers for the acquisition of the partly constructed factory from persons or firms in a position to develop successfully the fixation of atmospheric nitrogen.—Ed.

of the total explosives used. In peace time, and on a large scale, it should be possible to produce a ton of ammonium nitrate *via* Chilean nitrate for £30. It actually cost us, under war conditions, double this figure. If we had possessed Haber plant sufficient to meet our needs for ammonium nitrate, the cost per ton, even assuming as an extreme case twice the pre-war basis, would have been £22 per ton—a saving of £38 per ton. At only 400 tons per day (and we used more) we should have saved nearly £1,000,000 every two months and could have used our Chilean nitrate transport fleet for other purposes.

Again, we used imported Chilean nitrate to make the enormous quantities of nitric acid used in the manufacture of other explosives, *i.e.*, for propellants, TNT, etc. Nitric acid so produced cost us about £30 per ton (100%). By the process intended for Billingham it could have been made at half the cost; indeed, the calculated pre-war basis was as low as £9 10*s.* per ton of acid.

At the time and under the conditions then existing, the Explosives Department had no choice and was obliged to base its production on imported nitrates, but never again must that occur. It is essential to national safety that we should be independent of imported products required in any future war. The United States, France, Italy and Japan all recognise that the same necessity applies to them individually, and they are taking the necessary steps by establishing synthetic processes. England must lead the way and not lag behind.

There has been a close *liaison* between the Allies over all technical war matters, and the greatest admiration has been expressed at the valuable work done by the British scientists and technical men of our Government staffs. The United States has decided to have a permanent organisation to continue technical work of this kind under Government auspices and cordially hopes we shall do the same. Unfortunately for such a prospect, however, the Munitions Inventions Panel, of which the members of the Nitrogen Products Committee formed a strong section, was disbanded even before the Committee's far-reaching and influential report was published! Truly we are a wonderful nation, and it is not surprising that we puzzle our Allies.

One of the most important sections of the Nitrogen Products Committee's Report deals with the cost of production of electric power in this country, chiefly in connexion with power plants operating on continuous full load as required for chemical factories such as those producing synthetic ammonia. For the first time we have an authentic review of all the systems of power production available for use on a large scale, and the numerous charts and tables given in the report are of the greatest interest. Some of the results will come as a shock to holders of pet ideas on the subject. We are all familiar with the notion that as nitrogen products can be obtained from the destructive distillation of coal, and still better by its gasification in producers, that all coal for power purposes should be submitted to one or other of these processes, or that distillation should be followed by gasification of the resulting coke. Experts in these matters were already aware to what extent the promises based on these ideas would have to be discounted, but in this report we have the facts put to the test of cold, unbiassed figures. Every technical man interested in power production will closely scrutinise these tables and charts for himself, for they cannot be briefly summarised. Some broad conclusions can, however, be stated.

One kilowatt-year can be obtained at the switchboard of a 100,000 kw. station with:—

I. Direct coal fired boilers and steam-turbo-generators for an expenditure of 6·5 tons of coal.

Using other systems to generate the steam by gas-firing and giving the same electrical output (1kw.-year) the coal consumptions would be as follows:—

II. High temperature carbonisation of coal: 9·4 tons.

III. Low temperature carbonisation of coal: 8·6 to 9·0 tons.

IV. Complete gasification of coal in recovery producers: 12·3 tons.

V. Low temperature carbonisation of coal followed by complete gasification of the resulting coke in recovery producers: 14·3 to 16·2 tons.

The cumulative effect of the thermal losses in the various stages of a complete power scheme utilising by-product recovery processes is such that the total consumption of coal becomes from 32 to 150 per cent. *in excess of that required for direct firing.*

The pre-war cost per kw.-year with the direct coal-fired station and coal at 7*s.* 6*d.* per ton is taken at £3·75, full details being given to show how this figure is arrived at. Assuming certain yields of by-products, and their probable market value, the revenues and working expenses for the other systems (Nos. I. to V.) are set out in full detail in a number of tables.

The capital outlay in each case is given as follows, per kilowatt (available) of plant:—

I. Direct coal-firing	£10·26
II. High temperature carbonisation system ...	£16·45 to £20·63
III. Low temperature carbonisation system ...	£17·04 to £17·35
IV. Complete gasification in producers	£19·20
V. Low temperature combined scheme	£28·79 to £31·82

Therefore the *additional* capital expenditure in applying a by-product recovery process to a large electric power station represents a capital increase of from 60 to 200 per cent. according to the system adopted.

Still, in spite of the obvious disadvantages due to greater coal consumption and working and capital charges, the financial results are not so bad, and may even be favourable in certain cases, *provided coal is cheap.* With coal at 10*s.* per ton there is, compared with direct firing, a loss in cases II. and IV., a gain in case III., and either a gain or loss in case V., according to which of two low temperature schemes is adopted. Naturally the results will vary with coal prices and with the prices obtained for the by-products, but the tables and charts in the report show clearly how the ultimate cost of the electric energy is related to such variations. The financial results with direct coal-firing are less sensitive to changes in the price of coal than are the results of any other schemes.

From the national point of view the question is: Are we justified in using from 32 to 150 per cent. *more* coal in order to employ a process which yields us the by-products from the coal used? If coal at the central station is going to cost anything approaching £1 per ton then the whole problem will settle itself, for carbonisation and gasification will not pay and dear coal will have killed a promising development. If we ever have the great advantage of cheap coal again then carbonisation and gasification processes will require close investigation, especially if the possible developments outlined in the report should mature.

The report does not consider the case of a combined gas and electricity distribution station from which gas is sold outside, though this is in some respects a still more favourable proposition.

Regarding the use of gas engines, the Committee states that it would at the present time be entirely impracticable and uneconomical to employ gas engines for power stations of the size necessary for the competitive operation of nitrogen fixation processes under British conditions. For small blocks of power the position is much more favourable both as regards capital cost and operating costs, the latter being as low as, or even lower than, the corresponding cost for steam engine plant.

These considerations have an important bearing upon one aspect of the nitrogen problem to which the Committee has devoted much attention—namely, the possibility of utilising peat as a source of power and fixed nitrogen by gasifying the material under ammonia recovery conditions and using the surplus gas as fuel for a gas-engine electric station. The crux of the problem lies in the possibility of excavating and drying raw peat in large quantities throughout the year under varying climatic conditions at a cost which will permit of the economic use of the resulting low grade peat fuel. Plants abroad, where the climate is more favourable than in Great Britain, are operated with fair success, for the peat bogs are drier than in our country and the peat has a high nitrogen content, but artificial drying has to be employed for large plants.

The difficulties to be faced may perhaps best be realised by considering the following facts. Raw peat in the bog contains only about 15 per cent. of solid material, the remaining 85 per cent. being water. For every kw.-year produced by a steam-turbo station of 5000 kw. capacity using gas-fired boilers, the gas being derived from the peat, 25·7 tons of theoretically dry peat is required, or the equivalent of 171 tons of the raw peat. If the gas is used in gas engines, the exhaust from which is used to raise steam, then only 10·8 tons of dry peat, or 72 tons of raw peat, is needed per kw.-year. Even when using gas engines this means that the 5000 kw. station will, with 100 per cent. load factor, require 360,000 tons of raw peat per annum and the quantity is more than doubled if a steam-turbo plant is used.

If the peat fuel is fed into the producers with a moisture content of 35 per cent., then 132 tons of water has to be dried out of the peat prior to its use in the producers for every kw.-year distributed from the station when using steam plant; or 55 tons of water must be dried out when using gas engines. Still in spite of these formidable difficulties there is a promising future in isolated cases where coal is expensive, and a much wider field would be opened if mechanical means of removing water from peat, to a much lower limit than is now attainable, were invented.

In concluding this review of the report a few of the other important observations and conclusions of the Committee may be given in the Committee's own words:—

"Two years' expenditure upon imported raw materials at war prices would alone more than cover the estimated pre-war capital outlay for synthetic installations capable of furnishing the same output.

"Very serious risks are involved in relying upon overseas shipments of raw materials.

"Imperial defence is too vital a matter to be subordinated to other considerations, but a wise policy in regard to defence could to a very large extent be made a sound economic policy.

"The conclusion seems evident that considerations of national safety, of finance, and of utility would force a country to resort to the policy of adopting synthetic methods as an insurance against future emergencies, instead of placing reliance on the importation of the Chilean nitrate.

"The diversion of a large portion of fixed nitrogen to munitions for a period of several years has been to the great detriment of the world's food supply.

"The food problem has become the most important consideration for all the belligerents."

The recommendations of the Committee include minimum provisions for safeguarding the future, *e.g.*, the establishment of the cyanamide process on a scale sufficient to produce 60,000 tons of cyanamide yearly, of the synthetic ammonia process to furnish 10,000 tons of ammonia, and of the ammonia oxidation process to provide annually 10,000 tons of 95 per cent. nitric acid; but these, and also the more detailed conclusions at the end of each section of the report, should be read in full.

The cry of "Wake up, England" is needed to ensure that not one of the Committee's conclusions goes unheeded, and to what body of influential men can they appeal to in greater force than to the habitual readers of this Journal?

In this article only the broad facts have been touched upon, but the report is so full of interesting data, especially on the economics of the subject, as to make it in effect the most modern textbook on nitrogen fixation. No technical man can afford to be without a copy for his own reference, for the data it contains have never before been collected. Most earnestly it is hoped that this treatise, for it is nothing short of this, on nitrogen products, will be officially revised from time to time and kept up to date so that it may remain, what it is to-day, *the* work of reference on the subject.

REPORTS ON PROGRESS IN CHEMICAL INDUSTRY IN 1919.*

THE GAS INDUSTRY.

Whilst the gas industry has played an all-important *rôle* in aiding the nation to carry out its main responsibility during the years of war, it has itself suffered by virtue of the shortage of raw material and men; not only has progress been greatly retarded, but even the maintenance and renewal of plant and apparatus have been markedly inadequate. Signs are evident that the lines on which reconstruction in the gas industry is to be carried out are fundamentally sound, but many difficulties are encountered in carrying into effect such schemes of reorganisation, and to these the labour question and the shortage of material are in no way unimportant contributors.

The question of primary importance to the gas industry at the present moment relates to the nature of the gas which, in the best interests of the consumer and manufacturer, should be distributed. This is an intricate and involved problem and one on which there is naturally a diversity of opinion. The experimental work recently undertaken at the University of Leeds at the instigation of the Institution of Gas Engineers affords some useful evidence towards the elucidation of the problem, and particularly valuable is the general conclusion arrived at from these investigations, namely, that the value of the gas to the consumer is approximately proportional to its calorific value. Following the enunciation of this principle, one of the London gas companies published a scheme showing that gas could be sold upon a calorific basis, rather than by volume. Shortly following this proposal, important and, indeed, almost revolutionary proposals were made in a report issued by the Fuel Research Board. Whilst the main recommendation of this report related to the sale of

* Continued from p. 4 R of the last issue.

gas upon the basis of its calorific value, recommendations were made to the effect that a gas undertaking, subject to certain stipulations, should be free to deliver to its consumers any mixture of combustible gases free from sulphuretted hydrogen, and not containing more than 20 per cent. of inert constituents for two years, not more than 18 per cent. for the succeeding two years, and not more than 15 per cent. thereafter. It was proposed also that under normal conditions a gas undertaking should supply gas in any main or service pipe of over 2 in. diameter at a pressure of not less than 2 in. of water.

These proposals have received the approval and support of the main representatives of the gas industry.

An important contribution has been made by Sir Dugald Clerk, in collaboration with Professors Smithells and Cobb, which presents a careful and comprehensive analysis of the thermal efficiency of the carbonisation process, and in this interesting paper comparisons have been drawn between the efficiency of the coal carbonisation process and of other methods of producing light, heat, or power. In the majority of cases these comparisons are distinctly in favour of the gas industry. Emphasis is also placed upon the value of the chemical by-products obtainable from the gas industry and their value from a national standpoint.

Additional information on the steaming of vertical retorts has been furnished by various workers. The Gas Investigation Committee of the Institution of Gas Engineers reported on the conditions and yields under this system at Uddingston and found that in general practice a yield of 30,000 cub. ft. of gas of 385—394 B.Th.U's. per ton of the particular coal carbonised was obtained, together with increased yields of tar and ammonia. Other results obtained under this system of carbonisation have been reported, and the economic value of the process has also received attention.

Important work has been carried out in studying the effect of inert constituents of the gas upon efficiency during combustion, and generally the work of investigation in the gas industry bears directly upon the question of the nature of the gas to be manufactured in the future.

The work of reorganising the financial basis of the gas industry is over-delayed, and during the year directors and administrative staffs of gas undertakings have been largely concerned with these matters.

IRON AND STEEL.

The past year has been typically a period of transition from the manufacture of the greatest possible quantities of material for the purposes of war to the ultimate manufacture of the materials required for peace times, and the consequent irritability of the human being has produced disagreements in number and severity that have overshadowed technical difficulties. The general uncertainties have accelerated the tendency to establish large self-contained units that can produce within themselves as nearly as possible everything required to complete the finished articles ready for sale to the user. Several examples in Great Britain could be cited, and probably some of the most interesting features of the time are the present developments of the Tata Iron and Steel Co. in India, and the planning of the State Iron and Steel Works in Australia.

Basic steel has been put recently to progressively diverse uses. The total quantity made in the United Kingdom has increased by about 2,000,000 tons, derived almost entirely from British ores. During the war it was found safe to make high-explosive shell from basic instead of acid steel, and also gradually to increase the permissible contents of sulphur and phosphorus from 0·04 to 0·08 per cent. respectively. The necessities of this type of work impressed on all concerned the great need for care in the making of the steel ingot. As flaws in the ingot gave trouble to the user right down to such material as the finest of wire, it is to be hoped that this lesson will not soon be forgotten.

War-time secret and confidential work is gradually being revealed, and one of the most important papers on special steels recently published is that on nickel-chromium steels by J. H. S. Dickenson. He deals with the highly controversial subject of the tests that may be relied upon to prove brittleness in steel, and strongly favours the notched-bar shock test. He shows how by the heat-treatment of special steels high elastic limit and toughness may be obtained, and discusses in detail temper brittleness, which when developed by cooling in air after tempering can be avoided by quenching after tempering. The real cause of temper brittleness has not yet been made clear.

Dr. W. H. Hatfield, in a paper on the mechanical properties of steel, which evoked a great amount of discussion, considers that there is a tendency to give too much weight to the notched-bar test in judging of the possible brittleness of steel in use.

During the war there has been a curious combination of secrecy and unusual publicity; on the one hand results of work on newly-developed needs were kept from the enemy, but spread abroad among the Allies; and on the other, those firms that had made great successes in their special lines not only pooled their information, but taught their practice to outside firms. Such intercommunication, together with the general difficulties brought about by greatly increased production costs, gave a further impetus to the development of systematic research work in factories. Noteworthy events in this connexion are the recent opening of a research laboratory at Messrs. Bruntons' works and the really good progress achieved by the American Malleable Castings Association.

Alloy steels are being used more and more, and the high chromium type known as "stainless" will undoubtedly be much extended in use now that the embargo on its manufacture has been withdrawn, the whole supplies of chromium no longer being needed for war work. Alterations in the composition of alloy steels are represented by two new patents of Sir Robert Hadfield on his manganese steel. The position with reference to the employment of electric furnaces in steel smelting is being very carefully re-examined. The success in prospecting for Indian iron ores, and the movement to establish two if not three new steel plants in India, besides the gradual expansion of the Tata plant to an output capacity of three-quarters to one million tons of ingots per annum, have all attracted attention. During 1918–19 the difficulties attending the use of Indian refractories were completely overcome, thus marking a very distinct advance. The discoveries of the manganese ores in West Africa seem of great importance. Calcium carbide was evidently tried by the enemy during the war as a partial substitute for manganese, but did not prove satisfactory. The viscosity of blast-furnace slags and the mineral constitution of open-hearth slags have been studied in relation to the general question of the influence of slag on the metal produced. The patent for the Miris Steel process of quenching ingots in a liquid so soon as they can be handled has been published, and extensive experiments are being made with the process. Mr. Humfrey has developed on the lines of Dr. Sorby's "nature" prints a method of showing clearly the structure of an ingot. A number of studies of the metal of electric and oxy-acetylene welds has been made. It is claimed that the existence of two distinct eutectics has been proved, the austenite-graphite at 1153° and the austenite-cementite at 1144° C.

NON-FERROUS METALLURGY.

Although progress reported in non-ferrous metallurgy during the year shows several points of interest, technical matters have been perhaps somewhat overshadowed by economic considerations. The year began with large reserves of metals under the control of the Allied Governments, but later, under the influence of a greatly increased demand, accentuated by labour troubles, lack of fuel and difficulty of transport, an actual scarcity occurred, especially in lead, which was soon reflected in market prices.

While this country is in a more fortunate position than most others, in view of the vast resources of the Empire, it is disappointing that the hope of increasing home production is so far from being realised that in some cases our smelter production is actually considerably less than before the war.

With regard to progress of a general nature, flotation processes of ore concentration continue to show notable advances. Oxidised copper ores are now treated with some success, and it is said that a selective agent has been discovered enabling the flotation process to be applied commercially to tin ores. The Cottrell electrostatic method of fume and dust precipitation, first developed to mitigate objectionable and damaging fumes, continues to find extended applications, not only in the recovery of valuable by-products, but as an essential portion of process plants.

Of the base metals, judging from the amount of space occupied in the technical press, the metallurgy of zinc is receiving most attention at the hands of technical workers, more especially in connexion with the hydro-metallurgical and electrolytic treatment of ores. The fact that success in the electrolytic deposition of zinc depends so largely upon the purity of the electrolyte is reflected in many articles and patents on the subject, and much careful work in regard to detail has been published. Prof. C. H. Fulton has continued his researches relative to thermo-electric methods of distillation and has described a series of experiments in a novel type of resistance furnace wherein briquettes, composed of a mixture of roasted zinc ore and coke, are so arranged as to constitute part of an electric circuit and are heated by an electric current to such a degree as to distil the zinc. The large organisations owning deposits of complex zinc-lead ores (notably the Burma Corporation) are experimenting with a view to obtaining higher recoveries of the metallic values than is possible even with the methods now available. Two processes—the Ganelin-Queneau and the Elmore—have been specially referred to, but no authoritative descriptions have yet been published, and, with the exception of the earlier patent specifications, information is limited to the meagre references in the companies' reports to the shareholders.

In the copper smelting industry, pulverised coal fuel has long been successfully used in reverberatory furnaces, and it is now being tried as a substitute for coke in blast furnace practice. Leaching processes provide a mass of reading matter in the technical press, and keen interest continues to be shown generally in connexion with the treatment of low-grade oxidised copper ores, which exist in enormous quantities in many parts of the world. Nothing very new has been reported, but a continual regard to detail has increased the efficiency of existing plants and methods.

The new hard lead alloy, composed of lead and small amounts of calcium and barium, and known under the name of "Ulco," is receiving considerable attention. Originally designed as a substitute for antimonial lead in the manufacture of shrapnel, it is claimed that the alloy will take its place among the important bearing metals in view of its high melting point, excellent structure, and low coefficient of friction.

The physical properties of the metals and alloys is beyond the scope of the present report, but attention should be drawn to the excellent work of British investigators in the field of original research, most of which appears reported in the pages of the *Journal of the Institute of Metals.* Special mention may be made of the report of G. S. Bengough and O. F. Hudson to the Corrosion Committee giving the results of their investigations into the actions which take place when metals such as zinc, copper, aluminium, and alloys, such as 70:30 brass, corrode in distilled water and sea water.

SUGAR.

Generally speaking, the manufacture of sugar from the cane is now carried on with a high degree of efficiency. In several countries local experiment stations have been established for the investigation of problems concerned with the agriculture of the cane and the process of extraction, and by the staff of these institutions (as well as by others) a considerable amount of useful work is being done.

During the period under review, the operation of expressing the juice from the cane by mills has been further improved, and in Hawaii it has now been found possible by the adoption of certain modifications to realise an extraction of sucrose in the juice of no less than 98 per cent. of that originally present in the raw material. Sources of loss at different stages of manufacture have been investigated by means of a careful system of chemical control, and the result is that in many factories the recovery of commercial sugar from the juice has reached a high figure.

Contributions have been made in regard to the colouring matters present in the cane which pass into the juice, as well as those which form during the operations of clarification and heating, and from the point of view of white sugar manufacture these are naturally of considerable importance.

In the refining of raw sugar animal charcoal has been in general use for the past 100 years. It is of some interest to draw attention to the application of other forms of decolorising carbon as an alternative medium for the adsorption of colouring matters (and other impurities) from solutions of raw sugar. It is possible to record that methods depending upon the use of decolorising carbon are now in routine practice in certain factories for the production of refined sugar. Some work has also been done during the past year in indicating the comparative value of different methods that have been proposed for the preparation of these special carbons.

There can be little doubt that, while some manufacturers of raw sugar produce excellent grades for refining, others appear to operate without sufficient care and without always bearing in mind the requirements of the purchasers of their wares. In the Annual Report attention is drawn to the most desirable qualities that a raw sugar should possess from the point of view of the refiner. A criticism is made of certain practices in manufacture that render the work of the refiner of the raw sugar *unnecessarily* difficult, and suggestions for the avoidance of such irregularities are indicated.

Raw sugar during storage may undergo deterioration as the result of the action of certain micro-organisms, considerable financial loss sometimes being occasioned in this way. Recent investigations have revealed the conditions that should be observed in order to establish the best conditions for the avoidance of such changes in the quality of the product. The nature of the micro-organisms effecting the alteration under consideration has also been the subject of study.

Some progress has been made during 1919 in the direction of founding the beet-sugar industry in this country. The industry on the Continent has greatly suffered as the result of the war, and, in consequence, there is little progress to record in this direction. Nevertheless, a few papers worthy of attention have appeared.

FERMENTATION INDUSTRIES.

Details of fermentation processes which have been used on a manufacturing scale during the war have lately come to light, and interest in the year's work is centred chiefly on these publications. A conference on the recent devolpments in the fermentation industries was held at the annual general meeting of the Society. The manufacture of acetone by Fernbach's process was discussed at length. The process was used successfully during the war, but at the present time acetone can be made more cheaply by the destructive distillation of wood. At the same meeting the establishment of a national institute of industrial micro-biology was recommended. Small quantities of glycerin are found when sugars are fermented by yeast. The yield can be much increased if the fermentation is carried out in slightly alkaline solutions, and during the war the Germans obtained on a manufacturing scale 20—25 per cent. of the sugar as glycerin by fermenting in presence of sodium sulphite, the glycerin being used for making explosives and for other purposes.

Various investigators have described methods of obtaining alcohol from such sources as horse-chestnuts, marine algæ, Iceland moss, vegetable ivory, etc. The report on "Power Alcohol" points out that sun-dried flowers of the mahua tree contain about 60 per cent. by weight of sugar, which can undergo alcoholic fermentation. This report also considers the production of alcohol from ethylene derived from coal or coke-oven gases. Distilleries and the vinegar industry may eventually have to face competition from a synthetic alcohol manufactured in this way.

The food accessory factor known as the antineuritic "vitamine," or "water soluble B," occurs in yeast and in preparations from yeast. Such preparations have been of much use during the war. It is interesting to note that over a gram of yeast is consumed daily per head of population in this country in the form of baker's yeast in bread. This yeast is not likely to have lost its antineuritic properties during baking, and the statement that white bread is deficient in this unknown principle seems to require modification. The whole question of "vitamines" is being vigorously attacked at the present time, as the recent report on the subject shows.

Papers dealing with the saline constituents of brewing waters have appeared. The matter is discussed mainly with reference to the effect these constituents have on the hydrogen ion concentration of worts and beers. American investigators show that the most favourable acidity for diastatic action is $P_H = 4{\cdot}4$—$4{\cdot}5$ for malt amylase and $4{\cdot}8$ for the enzyme in *Aspergillus oryzae*. The figures are of interest, for an aqueous solution of carbon dioxide shows an acidity closely approximating to these figures. The action of diastase on starch is accelerated if yeast is present, and possibly the production of a favourable acidity due to the formation of carbon dioxide is the only cause of this accelerating influence.

Other methods used by the physical chemist can be employed to solve certain fermentation problems. The importance of some velocity constants has been emphasised, and these constants have been used as a basis on which to build up an explanation of yeast growth and fermentation by living yeast. The maladies of low gravity beers have forced their attention on many investigators, especially in Germany. Discoloration, unpleasant flavours, cloudiness, and other undesirable characteristics have been observed.

The idea that acetaldehyde plays a part as an intermediate compound in alcoholic fermentation has received further support, and the use of a sulphite as a "fixing agent" for aldehydes has been further extended. Aldehyde appears to be an intermediate compound in other fermentation reactions.

Some detailed analyses by A. R. Ling of barleys and malts derived from them have been published. The results are of interest, as very few analyses of this kind are on record.

RUBBER.

The literature on rubber has been concerned generally with the examination of more or less fundamental principles rather than with any investigation or discovery of a startling nature. Much of the work, however, is of importance, and is significant of the desire to eliminate empiricism as completely as possible from technical practice. Considering the unsettled condition of the period it is perhaps not unnatural that much of the work is of a distinctly practical type, emanating chiefly from the factory and the plantation.

A remarkable feature of the work is its wide scope and general nature. As an interesting example of plantation work which could not well have been done elsewhere may be quoted that of O. de Vries on the specific gravity of Hevea latex, which S. Whitby's subsequent research on the latex yield and rubber production of individual trees serves to complement. On the manufacturing side papers have dealt with such diverse topics as the methods for introducing mineral and other ingredients into rubber, more modern rubber fillers such as glue and amorphous carbon, the catalytic speeding up of the hot vulcanisation process, the relative efficiency of organic and the commoner mineral catalysts, and S. J. Peachey's new method of cold vulcanisation with sulphur dioxide and hydrogen sulphide. Other investigations worthy of note are those by E. Beckmann and his collaborators, and by A. M. Kellas on the composition of molten sulphur at vulcanising temperatures, and also the interesting physico-chemical investigation of G. Bruni and M. Amadori as to the actual condition of so-called "free" sulphur in sulphur chloride; these are of considerable significance with respect to vulcanisation by the hot and cold methods respectively.

It is somewhat surprising to note what a large proportion of the year's work may be regarded as directly concerned with the molecular condition of rubber, an unsolved problem of which previous partial elucidations, even the investigations of C. D. Harries, serve chiefly to emphasise the magnitude. The information which has become available during the year as to the limited success experienced in Germany with synthetic rubber, clearly indicates the unsatisfactory state of knowledge in this direction, because it is not possible to make any definite decision as to the molecular state of the synthetic product or of the natural rubber which it is intended to reproduce, although the difference in this respect probably accounts largely for the shortcomings of synthetic rubber. The gradual alteration in physical properties, or the "ageing" of vulcanised rubber, involving change in tensile strength, extensibility and solubility, which has received further attention during 1919 from O. de Vries, B. J. Eaton and F. W. F. Day, and H. P. Stevens, is also presumably bound up in some modication of the molecular condition; the importance of the problem is evident. In all likelihood also to be referred to the same prime cause is the difference observable even between different lots of rubber of similar origin, such as Hevea rubber, in the relation exhibited between increasing load and the corresponding increase in elongation; this relation, defined by P. Schidrowitz and H. A. Goldsbrough as the "slope" or "type" of the rubber, calls for particular attention in view of their recently elaborated method for giving mathematical expression to the characteristic latter portion of the stress-strain curve for vulcanised rubber.

Probably mainly as the outcome of war-time experiments various reports have been published as to the rate and measurement of the diffusion of hydrogen through rubbered fabrics; these, together with the recently published experiments of Sir J. Dewar, have necessitated a brief review of the position with respect to the diffusion of gases through rubber films. For this review, and also for others dealing with less extensive investigations in various directions, the reader must be referred to the Annual Report on the subject.

LEATHER.

Scientific work in connexion with the leather industry has been small in quantity during 1919, and no outstanding discoveries have been made. In actual works practice there is a steady and increasing effort to utilise machinery in every possible way. Many tanners are now using mechanical methods of liming for unhairing in place of the slower process that has been used for hundreds of years. In the actual tanning of hides there is the same tendency, as is readily seen from a survey of recent patents.

There is no slackening in the efforts to establish firmly the chrome tanning industry, and it is generally recognised that the chemist must here play a large part if permanent success is to be attained. In the leather industry as a whole the value of technological training is now admitted. The proofs of this are the overflowing state of the two leather industries' schools in this country, and the support given to conferences of tanners and technical chemists.

Artificial tanning materials have not been conspicuous in the patent literature, but are very widely used. It remains to be seen what will be the effect of more normal supplies of vegetable materials which have been so difficult to obtain during the war. Cultivation and systematic investigation of natural supplies are now much in evidence, particularly in the British Empire, and the old wasteful methods of production will not, it is hoped, endure for long.

A very interesting paper on leather manufacture by Cross, Greenwood, and Lamb dealt with a principle which appears to the writer to be of far-reaching practical importance, namely, the principle of restrained tannage. A colloid, such as gum-tragasol, having affinity for tannin, but to a less extent than has hide, is mixed with the tanning liquor before introducing the hide. The effect is to render possible the use of very strong liquors without the usual difficulties of drawn grain and case-hardening. The speed of tannage is very greatly increased. The principle appears to be embodied in the patented process of Turnbull and Carmichael, in which starch is the colloid used.

The most important analytical work has been that carried out by committees, particularly in America, on leather, sulphonated oils, fat extraction, etc. Most of this has been on the testing, comparison and standardisation of methods already in use. Work has been published indicating the desirability of reopening the question of tannin analysis, in the light of advances in colloid chemistry since 1907, when the present official methods were fixed. A most important fact, brought to light by Wilson, is that electrolyte non-tannins (*e.g.* sodium sulphate) are not taken up by hide powder in the proportion in which they are present in solution, and thus invariably give rise to errors.

The synthesis of gallotannic acid (the tannin of oak galls) is now an accomplished fact. When Fischer began his work on this substance some ten years ago its constitution was not known, although chemists had worked on it for over a century. Fischer's demonstration that gallotannic acid was pentadigalloylglucose, and his final achievement of its synthesis will rank amongst his best work. It is good to notice that others are continuing in this field. The puzzling influence of neutral salts of strong acids on basic chrome liquors, chromic chloride solutions, and dilute acids is being worked upon by Baldwin, and is also the subject of a recent paper by McBain. The enhanced acidity produced is of great importance in chrome leather manufacture, and a sound explanation is much to be desired. Loeb's recent work on the behaviour of gelatin at its iso-electric point is of great interest, though carried out from the biochemical standpoint.

NEWS FROM THE SECTIONS.

MANCHESTER.

At the fourth meeting of the session, held on January 9, Mr. John Allan presiding, Mr. Harold Moore read a paper on "A New Instrument for Measuring Vapour Tension." There was a large attendance of members.

The determination of the volatility of motor spirits by the process of fractional distillation does not constitute a direct measurement of volatility, and is therefore only indirectly indicative of the behaviour of the spirit in the engine. In the jet carburetter of the present day the fuel is sprayed into the induction system and drawn into the cylinder partly in the state of gas-air mixture and partly in the form of a fine mist. The portion not in the gaseous state may be gasified by the heat of the cylinder if the engine has been running, and also by the heat of compression. The ratio between the amounts of fuel in the liquid and in the gaseous state determines the ease of starting under standard conditions, and also the "flexibility" of the engine whilst running at various loads and speeds. The proportion volatilised depends upon the vapour tension, a knowledge of which is essential in the evaluation of motor spirits.

The author's instrument for determining the vapour tension of motor spirits and motor spirit mixtures consists of two tubes, of about 5 mm. bore and about 800 mm. long, connected to each other and to a levelling bottle containing mercury, by means of a Y-piece and thick-walled rubber tubing. Both tubes are clamped vertically and possess mercury-sealed cocks at their upper ends, and one is surrounded by a water jacket containing a thermometer, so that its temperature can be regulated. When the levelling bottle is raised and the cocks opened, mercury fills the tubes, and on closing the cocks and lowering the levelling bottle two barometric colums are formed.

To make a determination the cup on the jacketed tube is filled with motor spirit and a small measured amount passed into the tube, sufficient mercury being then placed in the cup to ensure an effective seal. The levelling bottle is lowered, and the difference in height of the mercury in the two limbs observed. This measures the vapour pressure of the spirit. In accurate work it is necessary to make a correction for the density of the mercury.

The laws governing vapour tensions of mixed substances are somewhat complex, and a mixture of two soluble substances may have a vapour tension either lower or greater than that of either constituent, or which may even approach the sum of the individual vapour tensions. Cases in which the latter phenomenon is shown are of extreme importance to the student of motor fuels, as any method of raising vapour tension is of great value. In cases where the vapour tension exceeds the required value there may be found plenty of cheap fuels which can be added to bring about the necessary reduction in volatility. Graphs showing the vapour pressures of mixtures of alcohol-benzene and alcohol-petrol at various temperatures accompanied the paper.

LIVERPOOL.

A paper was read by Major F. E. Everington on "Limes and Some Other West Indian Products," at the meeting held on January 16. After reviewing the importance of the lime as a source of citric acid, and pointing out that by far the greater quantity of the acid used in this country was prepared in Germany, the author emphasised the value of the West Indies for growing limes and the need of manufacturing the acid from the juice in this country. He then described the cultivation of the lime, the preparation of the lime oil, both by milling by hand and by machinery, and the manufacture of the concentrated juice and of calcium citrate. The lecturer then dealt with the cultivation of cassava and the details of the preparation of starch, tapioca, dextrin, and glucose from its roots, as well as the utilisation of the waste products as food for animals. The value of cassava as a source of starch in comparison with the potato was shown by crop statistics and analyses of the starch contents of the two materials, cassava being markedly superior. Brief references were also made to cocoa, vanilla, and some other products.

EDINBURGH.

An informal meeting was held on January 13, with Dr. D. S. Jerdan in the chair.

The meeting opened with a discussion on several points regarding the progress of the Society which had been raised by the President and Dr. Longstaff during a recent visit to Edinburgh, and various means were discussed by which the popularity of the meetings and the membership of the Section might be increased.

Mr. B. D. W. Luff then read a note on "The Solubility of Nitro-cellulose in Methyl Alcohol" which showed that the solubility was not due to the presence of acetone as is commonly supposed, but that nitro-cellulose would dissolve in the pure alcohol.

Mr. B. D. Porritt read a paper on "The Action of Halogens on Rubber," dealing with the matter in the first instance from the historical standpoint. The action of halogens on raw and vulcanised rubber was then considered in detail, and also the possibility of using the formation of the tetrabromide as a means of estimating the amount of rubber in crude samples. The method, however, is rendered inaccurate by the presence of other organic products in the rubber which may take part in the reäction with chlorine. In vulcanised rubber the presence of from 2 to 3·5 per cent. of combined sulphur introduces some uncertainty as to the accurate figure for the bromine content of the fully saturated caoutchouc tetrabromide. Mr. Porritt also gave a description of the attempts which have recently been made to make a lacquer for substances exposed to acids, alkalis and chlorine, and similar corrosive influences, by the action of chlorine on rubber dissolved in some solvent such as carbon tetrachloride.

Dr. A. C. Cumming read a note on "The Manufacture of Potassium Iodide," dealing especially with the reasons for the discoloration of the salt so frequently observed.

Mr. D. B. Dott read a note on "An Acid Sulphate of Strychnine," and showed that the acid salt on re-crystallisation from water loses acid and gradually becomes converted into the normal salt. He drew attention to the danger in the case of such a powerful drug as strychnine of the use of a salt of variable composition, and expressed the opinion that on account of its greater solubility and neutrality the normal salt only should be used in medicine.

There was a good attendance of members, and an interesting discussion followed the reading of the papers.

MEETINGS OF OTHER SOCIETIES.

FARADAY, ROYAL MICROSCOPICAL, OPTICAL AND PHOTOMICROGRAPHIC SOCIETIES.

A joint meeting of the Faraday Society, the Royal Microscopical Society, the Optical Society and the Photomicrographic Society was held on the 14th inst. at the rooms of the Royal Society. The meeting consisted of two parts: an exhibition of microscopes and accessories, and a series of papers on microscopy.

Amongst the exhibits was a new form of illuminator for opaque specimens, consisting of an annular electric lamp which surrounds the objective. It is claimed that many objects, particularly in metallographic work, are shown much more clearly by this type of illumination than by the ordinary vertical or normal illumination. The exhibits also included many forms of microscopes, both for visual and photographic work, and a number of different forms of illumination, including small oil, acetylene, gas and electric lamps. Various filters, lenses, etc., were also shown. Although only indirectly connected with microscopy, mention must be made of the crystal models exhibited by Miss Nina Hoselli. These very beautiful models are arranged to show the various development of crystal forms round the different axes of symmetry, and are made of coloured threads stretched across wire supports and mounted in glass cases, the latter representing one of the possible crystal forms.

Microscopists have been divided into "Brass and Glass Men" and "Bug and Slug Men," and the division was apparent in the papers which were read at the meeting, though in many cases, more particularly perhaps in the papers emanating from the metallurgists, there was a decided tendency to bridge the gap between the two classes, as, for example, in the excellent contributions by Prof. Desch and by Dr. Rosenhain on the metallurgical microscope, and by Dr. Willows on the microscopic outfit of a textile research laboratory.

There appeared to be a substantial unanimity, both among the authors of papers and the members who took part in the discussions, that for photomicrography the best source of illumination either was, or would shortly be, a tungsten arc, or Pointolite lamp. As at present made, the lamp is hardly powerful enough for use with high magnifications, but larger types—up to 4000 candle power—have recently been put on the market. For low powers the half-watt cone filament lamp, as manufactured for motor-car head lights, has proved satisfactory.

A considerable amount of divergence of opinion was expressed as to whether the apochromat lens was necessary for the highest quality work in metallurgical photomicrography. Some workers considered that the flatter field given by a good achromat more than compensated for the less good colour correction of the latter type, the bad effects of which could be eliminated by the use of a suitable light filter. The majority of the speakers, however, appeared to be decidedly of the opinion that better results were obtainable by the use of apochromatic objectives.

The question of magnification was much discussed, many speakers emphasising the fact that resolution was of far greater importance than mere magnification, which indeed would be harmful if carried too far. In this connexion reference may be made to the photographs in the paper by Sir Robert Hadfield and Mr. Elliott, some of which were magnified 5000, and one 8000 diameters. A paper on the work of Sorby, and a general review of the subject, particularly from the metallographic point of view, were contributed by Sir Robert Hadfield, president of the Faraday Society; a general survey of microscopy by Mr. J. E. Barnard, president of the Royal Microscopical Society, and a paper on the history and design of photomicrographic apparatus by Mr. Duncan, president of the Photomicrographic Society, were also read.

THE CERAMIC SOCIETY.

At the monthly meeting on January 12, discussion took place on "Unestimated Losses in Pottery Manufacture." Dr. J. W. Mellor opened with some remarks on what he termed "Works Blindness," which he characterised as a kind of disease attended by the blunting of the observational powers due to constant association with a particular works or process. One instance quoted had reference to the appearance of ferruginous specks in ware produced at a certain factory where the condition of the stores department for raw materials was regarded with special pride. On visiting the store-room, Dr. Mellor promptly perceived the presence of a rusty iron bracket in a prominent position, and also a rusty gas pipe running round the room. No doubt the managers and foremen, if they had visited another works, would have noticed anything of the kind at once.

Mr. A. Fielding stated that many unestimated losses were taking place from want of attention to details, from carelessness, from want of adequate supervision, or in some cases from want of knowledge, the last being almost inevitable because of the large number of subjects which had some bearing on operations carried on in a pottery. Engines and boilers were often sources of loss through being unsuitable or not properly worked. A good stoker can save more money than the engine man, as there is no need to send out clouds of black smoke. Extravagance in the use of steam accounted for some unestimated losses, especially in the absence of records to check the working of the engine. Defective valves, etc., also give rise to losses. Another source of loss was the running off of the condensed water, instead of using it (freed, if necessary, from oily matter) for charging the boiler. The use of a jug instead of a proper oil-can for lubricating purposes wastes much material. Loss is also sustained through letting waste heat escape instead of utilising it. Other losses arise from not showing due regard for cleanliness, as in unloading clay etc. on a dirty floor, so that some of the material cannot be used.

Most (if not all) of the foregoing considerations apply to other factories as well as to potteries.

The Institute of Metals.—The list of forthcoming meetings issued by this Institute bears witness to the progress that is being made, for in addition to the ordinary meetings to be held in London, fixtures have been arranged in connexion with the local sections at Birmingham, Sheffield, and Scotland. The annual general meeting will be held on March 11 and 12, at the Institution of Mechanical Engineers, Storey's Gate, Westminster. The membership of the Institute is now over 1200.

THE ROYAL INSTITUTION.

The first Friday Evening Discourse of the present session was delivered on January 16 last by Sir James Dewar on "Low Temperature Studies." After remarking that the present year marks the coming of age of the Dewar vacuum vessel, the lecturer proceeded to describe an experimental method whereby the relative transparencies or diathermancies of various materials to low temperature radiation may be compared at the temperature of liquid oxygen. Liquid oxygen was shown to be highly transparent to such radiation. A thin membrane of indiarubber is similarly transparent. The physical properties of such thin indiarubber membranes at the temperature of liquid oxygen render such membranes eminently suitable for the construction of a device capable of serving as a low-temperature thermoscope. Essentially, the device consists of a number of carbon particles of linear dimensions of the order of 0·5 mm. resting upon a support of chiffon and contained within a receptacle which is closed above by a thin rubber membrane. The receptacle is connected with a delicate manometer and, when desired, a trap-door device can be lowered above the rubber membrane, effectively shutting off the carbon granules from all outside radiation. In order to secure effective thermal insulation the device is immersed in liquid oxygen contained in a vacuum vessel, the latter being surrounded by a vessel containing liquid air. The liquid oxygen must be free from particles of solid ice or carbon dioxide; if present, they are removed by lowering into it a crystal of uranium nitrate. Owing to the pressure developed in the uranium nitrate crystal, consequent upon its cooling, it becomes electrified and the ice and solid carbon dioxide crystals become attached to it and are easily removed. The inner surface of the vessel containing liquid oxygen is covered with black paper, which serves to absorb any stray radiation. When low-temperature radiation, transmitted through the superincumbent liquid oxygen, is incident upon the carbon granules, an alteration in the volume of gas occluded by the charcoal occurs, and the consequent change of pressure in the enclosure containing the granules is indicated by the manometric device, and serves as an indication of the intensity of radiation incident upon the granules. The device is capable of detecting a change of temperature of the enclosure of the order of 0·0005° C. When applied to the measurement of the relative transparencies of various media to radiation at the temperature of liquid oxygen it is found that quartz is very much less transparent to radiation at such low temperatures than at ordinary atmospheric temperature. The fourth-power law of radiation emission holds equally well for low temperature radiation as for high temperature emission.

Experiments on the transparency of rock salt in the massive, crushed and compressed forms show that when the mass is crushed, moistened with brine, and subsequently compressed, the small crystals are separated by strongly adhesive films of water which no amount of pressure can remove. The relative transparencies of various substances are indicated as follows:—Hydrogen chloride, 10·6%; sulphur dioxide, 20%; ammonia, 4%; carbon tetrachloride, 33%; carbon oxysulphide, 53%; phosphorus, 76%. The following numbers indicate the respective transparencies to low-temperature radiation of some compressed solids:—Iodine, 38%; benzoic acid, 7%; camphor, 9%. The substitution of hydrogen by nitrogen in organic substances results in the transparency of the body to low-temperature radiation being considerably reduced. Isomers can readily be detected by the method of diathermancy measurement, for in general the transparencies of isomers are markedly different.

In conclusion the lecturer deprecated very strongly the present-day demand for utility in all activities, and entered a strong plea for the support of the scientific work of the Institution. Our world position would never be maintained if we were impelled solely by utilitarian motives. Pure science must be fostered. Scientific men must make science attractive to the world, and must themselves attract the world to it.

THE CHEMICAL SOCIETY.

On January 15 Sir J. J. Dobbie presided at an ordinary scientific meeting, when two papers relating to the constitution of coal were read by Dr. R. Lessing, the one on the behaviour of banded bituminous coal on coking, and the second on its mineral constituents. The researches were undertaken at the suggestion of Dr. Marie Stopes and Dr. R. V. Wheeler, whose work on the constitution of coal is well known to chemists (*v.* this J., 1918, 311 R; 1919, 452 A).

The author's experiments were carried out on samples of fusain, durain, clarain, and vitrain, isolated by Dr. Stopes from a block of South Staffordshire bituminous coal. It will be remembered that Tideswell and Wheeler submitted these constituents to slow destructive distillation *in vacuo*, raising the temperature by intervals of about 50° C. (Chem. Soc. Trans., 1919, 619; this J., 1919, 614 A). Dr. Lessing distilled similar samples rapidly in a confined space, *viz.*, in a narrow quartz tube fitted with a movable piston, and found that fusain did not form coke, that durain showed little tendency to form it, and that clarain and vitrain gave a very coherent coke (at 600° C.). Coke from durain was of a dull gray colour; that from clarain was brownish with a bronze lustre, and that from vitrain silver-gray and lustrous, like a high-class metallurgical coke. At 900° C. the differences were much more marked, particularly in regard to the appearance of a crater or mushroom-like formation on the surface of the coke from vitrain. The author expressed the opinion that the differences in coking quality were not due solely to the varying content of organic matter, and he holds that the process of coal formation was probably influenced by the nature and amount of mineral matter present, the latter perhaps acting catalytically.

In the second paper Dr. Lessing described the ash obtained by incinerating the above-mentioned coal constituents. The differences were very marked, not only in colour, but also in regard to quantity and composition. Thus fusain left 4·5—16% of ash, durain 5—7%, clarain and vitrain, 1·1—1·2%. The solubility of the ash in water and in hydrochloric acid was also investigated and found to vary widely with the different constituents. All the ashes were alkaline except that from durain, which was neutral. Quantitative examination disclosed notable differences in composition, from which the author drew some interesting speculative conclusions. Thus the very high alumina content of durain ash (42%) might be explicable on the assumption that this constituent is derived mainly from *lycopodia*, the only known plants which contain a high aluminium content; and this inference is supported by the observation that under the microscope durain is seen to contain a great many spores in the plant matrix. It was found, however, that the ratio Al_2O_3:SiO_2 in durain and fusain tallies with that in clay substance (0·85), rather than with the average ratio in the ash from *lycopodia* (2·92), but the ratios for clarain and vitrain come close to the latter. Similarly, the high magnesium content of clarain may be associated with the (unique) presence of leaf-tissue substance, magnesium being a constituent of chlorophyll.

A good discussion followed, in which Dr. M. Stopes (who exhibited microscopic slides of the coal constituents and also remarked upon the very great differences in their water content), Dr. H. G. Colman, Dr. Alex. Scott, Mr. A. C. Chapman, and Dr. R. H. Pickard took part.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At the January meeting, a paper on "The Spontaneous Ignition Temperatures of Liquid Fuels" was read by Mr. Harold Moore. Sir Frederick Black, president, was in the chair.

A summary of previous investigations on this subject, which is one of the greatest interest to users of internal combustion engines, showed the need for an apparatus and technique capable of simple, rapid and accurate operation. The author had devised such an apparatus in which the fuel was dropped into a cavity in a heated steel block, the temperature of which could be controlled and determined with accuracy, a current of preheated air or oxygen being simultaneously admitted. The preliminary data published in 1917 had been augmented, and a careful study had been made of the influence of variation in the conditions employed in the test, particularly as regards the quantity of fuel and of oxygen used, the effect of dilution with carbon dioxide and the catalytic action of the material of the test cup, all these factors proving of very small moment.

The spontaneous ignition temperatures in air and in oxygen of a large number of fuels, including crude petroleums and various distillates and residuums derived from these, coal tars and distillates, shale oils, alcohol and a selection of pure organic compounds were tabulated, the most noteworthy conclusions being:—

1. Among petroleum distillates the lightest products have the highest ignition temperature.

2. The same rule holds with coal-tar products, but all aromatic compounds have ignition temperatures very considerably higher than petroleum products of corresponding boiling point. Olefinic compounds, such as cracked spirit, ignite at a lower temperature than the corresponding saturated hydrocarbons.

3. The temperature of spontaneous ignition in oxygen is usally from 100° to 170° C. lower than in air.

Some curves of great interest were shown illustrating the variation of spontaneous ignition temperature with composition in the cases of various mixtures of fuels, such as petrol-benzol and cannel oil-creosote, and demonstrating that a small amount of the component of low ignition point has a much more notable effect than a considerable proportion of the component of high ignition point.

The application of the data obtained in this research to the question of the most suitable compression-pressure for a specific fuel used in a Diesel engine and the modifying effect of variations in engine design and other influencing factors, was discussed and illustrated by curves derived from engine tests.

ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

Attendance of Employees at Continuation Schools.

A meeting was held recently at the offices of the Association of British Chemical Manufacturers, with Mr. W. J. U. Woolcock, M.P., in the chair, for the purpose of discussing with Sir Robert Blair, the Chief Education Officer of the London County County, a scheme for Compulsory Day Continuation Schools under the Education Act, 1919.

Sir R. Blair expounded the conditions under which the Education Department of the London County Council deemed it advisable for the contemplated action to be taken. In view of the fact that hitherto only some 20 per cent. of ex-elementary school pupils have attended evening schools, a compulsory further education is now regarded as essential. The Act requires that after a given day (which will probably be July 31 or October 31 next) boys and girls who have attained 14 years of age shall attend compulsory day continuation schools for 8 hours a week for 40 weeks in the year, an obligation which is to apply at first only to boys and girls between 14 and 16, but after seven years from the appointed day also to those between 16 and 18.

Owing to the circumstance that boys and girls may live in one district and work in another, the problem of arranging the hours of attendance at these schools is very difficult, but Sir R. Blair suggested that two days of four hours each—either morning or afternoon—would be the best solution. The opinion of those present was that this method should be adopted. There is also an obligation on the part of the employer to allow sufficient time for the boy and girl to reach the school and to be in a fit physical condition to assimilate the instruction.

In regard to the chemical industry, Sir R. Blair suggested that it might be advisable to establish a chemical school where the pupils could not only take general education, but also receive tuition in chemistry. It is therefore necessary to ascertain the number of boys and girls, within the specified age limits, who are engaged in chemical works in London, and he asked those present to endeavour to supply this information. In answer to a question put by the speaker as to the seasonal nature of different branches of the chemical industry, the meeting gave the following information:—Tar distilling, pharmaceutical and fine chemical branches: no season, busy all the year round. Gas companies: seasonal; winter the heaviest time. Fertiliser industry: seasonal; autumn, winter, spring busy; summer slack.

As there are some 60,000 children leaving the London elementary schools yearly, provision will have to be made in continuation schools for 240,000 pupils when the Act comes into force. The problem of providing accommodation and teachers will therefore give considerable trouble to the local authorities, who are responsible for carrying out the provisions of the Act. Sir R. Blair suggested that if a firm had a sufficient number of boys and girls of the proper age in its employ, the question of providing a school room on the premises should be considered, and if the firm also had on its staff adults capable of giving the requisite teaching, the necessity of boys and girls attending separate compulsory continuation day schools could in this way be obviated. A private works school would be recognised by the authorities, provided the curriculum and the number of pupils were held to be satisfactory by the Local Education Authority.

It was very important to consider whether the boys and girls who will leave the elementary schools at the end of each term—estimated at 15,000—should be exempt from continuation schools by attending full-time schools. In response to various questions, Sir Robert Blair said that secondary and central schools would be most suitable for full-time education.

Employers appear to have the right to refuse to employ children under the age of 16.

The chairman referred to the question of the number of boys and girls employed in chemical factories in the London area, and the opinion of those present was that approximately 15 per cent. of the total number of employees would be boys and girls between 14 and 18 years of age. It was therefore estimated that provision would have to be made for 3,000 pupils engaged in the chemical industry in the London area. In the case of gas companies it was estimated that the percentage was about 10—12.

On the subject of the curriculum, Sir R. Blair said that physical education must be pursued in the first two years. Boys from 14-16 years of age would be instructed in writing, English, some English literature, history and geography; and from 16-18, in mathematics, science and some definite technical subject relating to the trade in which they were engaged.

PERSONALIA.

Prof. W. A. Noyes has been elected president of the American Chemical Society for 1920.

The death is announced of Dr. J. H. Wilson, lecturer in agriculture in the University of St. Andrews.

Dr. Edwin Deller has been elected Assistant Secretary of the Royal Society, in succession to Mr. R. Harrison.

Prof. R. Willstätter, of Munich, has accepted the chair of chemistry in the University of Berlin, vacant by the death of Emil Fischer.

Prof. W. Nernst, director of the Institute of Physical Chemistry in Berlin, has been elected a foreign member of the Swedish Academy of Sciences in Stockholm.

Mr. A. C. J. Charlier, president of the National Association of Industrial Chemists, has been re-elected president of the Federation of Technical and Scientific Associations.

The Perkin Medal awarded annually by the American Section (late New York Section) of the Society of Chemical Industry is being awarded this year to Dr. Charles F. Chandler for his work on the standardisation of kerosene.

The William H. Nichols Medal of the American Chemical Society is to be awarded to Dr. Irving H. Langmuir for his paper on "The Arrangement of Electrons in Atoms and Molecules," which has been adjudged the outstanding feature of the publications of the Society during the past year.

Dr. T. F. Sibly, professor of geology at Armstrong College, Newcastle-on-Tyne, has been appointed principal of the Swansea Technical College. This college, which has recently been affiliated to the University of Wales, has departments of chemistry, metallurgy, mathematics, physics, and engineering.

The following candidates were successful in the examinations held by the Institute of Chemistry in January, 1920:—Fellowship: G. B. Brook (Metallurgical Chemistry); F. F. Beach, M.A., B.Sc. (Food and Drugs, Fertilisers and Feeding Stuffs, Soils and, Water). Associateship: H. H. Barber, B.Sc.; L. P. McHatton, A.R.C.S., and H. C. S. de Whalley (Organic Chemistry); J. Haycock and Miss E. E. Sparling (Food and Drugs, etc.).

Colonel Sir Frederic Nathan, recently officer in control of alcohol under the Ministry of Munitions, has been appointed Power Alcohol Investigation Officer under the Fuel Research Board of the Department of Scientific and Industrial Research. The appointment is a direct consequence of a recommendation made by the Inter-departmental Committee on the Production and Utilisation of Alcohol for Power and Traction Purposes (this J., 1919, 250 R). A similar appointment is that of Prof. Pierce Purcell, formerly secretary to the Irish Peat Inquiry Committee, to act as Peat Investigation Officer under the Fuel Research Board.

NEWS AND NOTES.

CANADA.

A New Mineral Dye Industry in Ontario.—A new company, named the Mineral Dye Products, Ltd., will shortly be producing pigments at Trenton, Ontario, the mineral being derived from a property near the Rideau Canal, 18 miles from Gananoque. It is reported that the company has perfected processes for the manufacture of high-grade mineral dyes for woollens, silks, etc., as well as for the paper industry. It will also probably manufacture paints.

Iron Ore Deposits in British Columbia.—The iron ore deposits on the coast of British Columbia are shortly to be investigated under the auspices of the Provincial and Dominion Governments. Meanwhile representatives of an English steel firm are prospecting privately and have notified the Department of Mines of British Columbia that if the deposits are found to be as stated, the firm will finance the erection of iron and steel works in the vicinity of Vancouver and build the necessary railway.—(*Official.*)

AUSTRALIA.

Reward for Oil Discovery.—Following a recent meeting of the Federal Cabinet the Prime Minister (Mr. W. M. Hughes) made the following announcement:—"The Commonwealth Government has decided to offer a reward of £10,000 for the discovery of oil in commercial quantities in Australia." Presumably this refers to free mineral oil (petroleum), which has long been sought in various parts of Australia without much of a practical nature resulting, although traces of oil have been discovered in several places.

In New South Wales oil-bearing shales have been worked to a limited extent for many years, and similar deposits are known to exist in some other of the States. The Shale Oil Bounty Act of 1917 provides for the payment of bounty on crude shale oil produced in Australia from local shale at rates ranging from 2½d. to 1½d. per gallon according to the quantity produced, the amount to be so expended by August, 1921, being limited to £67,500.

In Papua the Commonwealth Government has spent much money in putting down bores and testing likely fields. Oil is undoubtedly present, but whether in commercial quantities has yet to be proved. Arrangements have lately been made to spend a further £100,000 in boring operations, the Imperial Government finding half the money.—(*Hardware & Machinery, Nov.,* 1919.)

BRITISH INDIA.

Indigo Crop Statistics.—The area under indigo cultivation is officially estimated at 233,800 acres, the total yield at 37,100 cwts., and the average yield at 18 lb. per acre. The corresponding estimates for the previous year, 1918–19, were 296,200 acres, 43,800 cwts., and 17 lb. respectively.

Forest Research Institute.—We have pleasure in inserting the following communication received from the President of the Forest Research Institute, Dehra Dun:—There are now special opportunities of developing the forest resources of India. Both the Government of India and Provincial Governments have already taken measures to inaugurate new industries, and a special staff is being organised to deal with the commercial undertakings that have already been or are rapidly being established. Delays are inevitable in communicating with manufacturers of plant and equipment, and it is therefore proposed to open a library of catalogues and price lists in the Economic Branch of the Forest Research Institute. The Forest Economist will be pleased to receive and circulate among inquirers catalogues, etc., dealing with every branch of equipment used in forest industries. It is hoped that firms will help in establishing and maintaining this library by contributions *in duplicate* of catalogues, pamphlets, etc., as they are issued.

UNITED STATES.

Wool as Filtering Material.—Experience gained during the war in industries using magnesium chloride, tungstic acid, aluminium sulphate, Epsom and Glauber's salts, etc., shows that such materials can be filtered through woollen filter pads. These have the advantage over cotton in that they can be washed repeatedly and re-used; but, of course, they cannot be used for alkaline substances.

Horse Flesh in Human Dietary.—In his presidential address to the Association of Official Agricultural Chemists, Dr. P. F. Trowbridge discussed the economic gain which would result from the use of some two million undersized horses in the United States for food purposes, and produced a sample of dried horse flesh prepared in his laboratory which compared very favourably with the best grades of dried beef. It was the opinion of many of those who sampled both materials that the dried horse flesh prepared from an animal twelve years of age was not only more tender, but of better flavour than the best grades of dried beef. Notwithstanding such successful demonstrations, it will doubtless take many years to overcome existing prejudice against unusual foods.

Potash from Searles Lake.—Owing to the high borax content of the potash produced at Searles Lake, the Department of Agriculture has found it necessary to place restrictions on the use of potash salts containing borax, so that not more than two pounds of anhydrous borax may be applied per acre. Instructions have been issued to fertiliser manufacturers and mixers not to sell potash salts direct to farmers when they contain more than five-tenths of one per cent. of borax, nor to sell mixed fertilisers containing more than two pounds of borax per ton. If these restrictions are complied with it is thought that no danger whatever will attend the use of Searles Lake potash salts. In view of the possibilities of Searles Lake it is unfortunate that any material should have been used carrying damaging amounts of borax, as it is feared that it will be some time before the prejudice created can be overcome.

The Dangers of Wood Alcohol Consumption.—At the invitation of the American Chemical Society, Dr. Reid Hunt, head of the department of pharmacology in the Medical School of Harvard University, has written a bulletin with the object of exposing the dangers attending the consumption of wood alcohol in beverages sold to the public. After emphasising the difficulty of distinguishing wood spirit from ethyl alcohol outside of the laboratory, Dr. Hunt adduces pharmacological evidence in support of the contention that the action of the former on the animal organism is fundamentally different from that of the latter. Whereas ethyl alcohol is oxidised rapidly to water and carbon dioxide, and any excess of it is eliminated by the kidneys and lungs, wood alcohol remains in the organism as such for a considerable time and is then slowly converted into formic acid, and possibly also formaldehyde. The alcohol and its conversion products attack the brain and other organs, causing death or blindness. Toxicity is a specific property of the alcohol, and although the fatal dose varies with individuals, its deadly nature is evident from the fact that of a group of 130 men who drank a mixture of wood and grain alcohol all but 32 died or became blind. (*Cf.* this J., 1916, 795 *et seq.*, 1918, 26 T.)

Metallurgical Notes.—A new refractory brick has made its appearance. It is a metal-encased magnesia brick which can be used in place of magnesia or silica brick in parts of furnaces. Rectangular or circular soft steel casings, open at both ends, are rammed full of high grade, dead-burned magnesite, and when properly dried the bricks are ready for use without having been burned. The bricks are laid as headers with either open end next the heat. No cement is used in laying the rectangular bricks, but magnesite is used in the case of the circular ones. In use the steel container melts back from the surface for a short distance and impregnates the dead-burned magnesite which it encloses. The surface becomes practically monolithic, and the tendency to spall is thereby greatly lessened.

A satisfactory substitute for the bath of melted cyanide ordinarily employed for case hardening has been invented by P. W. Shimer. The bath consists of a fusion of such materials as sodium chloride, calcium chloride, and barium chloride, into which selected lumps of fresh calcium cyanamide, composing 5 per cent. by weight of the bath, are introduced, preferably in a basket. As soon as the cyanamide is introduced there is an active evolution of gas, and so long as this continues to escape the bath is in proper condition for use. The hardening obtained is perfectly satisfactory, the expense of operating the bath is less than with cyanide, and obviously the danger is removed.

FRANCE.

A French "Chemistry House."—Arrangements are now in hand for the founding of a central institution, to be called "La Maison de la Chimie," which will house all the important chemical societies and at the same time form a *rendez-vous* for the carrying out of business transactions. The "Maison" will be located in the heart of Paris and will extend hospitality to all members of the chemical profession resident in foreign parts. It is further suggested that the premises will afford the most suitable meeting-place of the International Union for Pure and Applied Chemistry.

The Coke Problem in the Metallurgical Industry.—Official statistics show the production of pig iron during the first half of 1919 to have been 1,000,428 tons, including 450,697 tons from Alsace-Lorraine; this represents about 22 per cent. of the production in 1913. Some of the blast furnaces started up in July last had to be slowed down owing to the acute shortage of coke. In November last the Lorraine works were supplied with this material at the rate of 6000 tons a day, and the works elsewhere at the rate of 1140 tons a day. As one means of remedying the shortage, the big iron masters are working to secure the abolition of the syndicates of coal merchants which have hitherto practically monopolised the supply of fuel to the metallurgical industry. "La Société des Acièries de Longwy" set a notable example in this direction by taking a leading part in the formation of a company—"La Société Lorraine de Carbonisation"—with the object of erecting a coking plant at d'Auby, near Douai. The Longwy company has a 58 per cent. interest in the new undertaking, and expects to obtain from it a yearly supply of 145,000 tons of coke. The Longwy company, in conjunction with four other metallurgical firms, has erected another coke installation at Sluiskill, on the Scheldt, in Holland. These works, which are supplied with British coal, have an output capacity of 300,000 tons of coke per annum, which may eventually be increased to 500,000 tons. The Longwy company has, further, acquired a large interest in the Gewerkschaft Carl Alexander, near Aachen, where a rich deposit of coal covering some 3,650 hectares exists. In this way French metallurgical firms are extending their interests both at home and abroad in order to safeguard their fuel supplies.

Fuel Economy.—Another step towards economy in fuel consumption is the foundation of *L'Office de Chauffe Rationelle*, an organisation with Government support, which, amongst other things, has established a school of instruction for stokers and firemen, and which also acts in a consultative capacity to engineers. Attached to it is a research laboratory in which much useful work has already been accomplished.

SWEDEN.

War-time Chemical Industries and their Prospects.—In an informative paper read before the Sixth General Swedish Chemical Congress, Alf. Larsson referred to the difficult problem of fuel supplies for the Swedish industry. The output of the Swedish coal mines is equal to about 300,000 tons of English coal, and that of the peat industry to about 280,000 tons. The consumption in 1914 was 5,076,000 tons of coal. Wood is abundant, but it is considered uneconomical to burn it, as it should be converted into wood pulp. The recently opened mine of bituminous mineral at Billingen should be useful, and the Strehlenerts process of manufacturing a powdered fuel from the spent liquors of the sulphite wood-pulp mills is considered to be promising. The increase in wages and the shortening of the working day from 9—10 to 8 hours are estimated to increase average production costs by 11 per cent.

The wood tar industry has been of great importance during the war, as it has supplied the country with substitutes for lubricating oil and grease, motor oil, linseed oil for painting, fat for soap making, oil for electric transformers, printing oil, and paraffin for matches. These war-time industries have, however, now ceased, and manufacturers are asking for protective duties, especially against imports. From the spent liquor of the sulphite pulp mills there have been produced glue, lime, and tannin. Twenty plants for making spirit from these sulphite lyes have been erected, and these are producing about 20,000,000 litres yearly of 100 per cent. alcohol. Great difficulties have been placed in the way of the utilisation of this spirit for industrial purposes by official restrictions and temperance legislation.

Lack of fat was one of the greatest difficulties of the war period both for the people and industry. Rape, mustard, and flax have been cultivated, but insufficiently. The straw of rape has been treated with good results to make pulp. Two modern oil factories—in Karlshamn and Kalmar—were erected during the war, and table oil from native seed is now produced in Sweden. A new plant for utilising the fat from carcases, fish residues, etc., to produce industrial fat and feeding meal for cattle, was built in Malmoe, and works satisfactorily even now. A fat-hardening works was erected in Sundsvall, where electrolytic hydrogen from alkali manufacture was available. A plant for making trichlorethylene was also erected and is still running at Hudiksvall. Carbon bisulphide is produced at a new electrical plant in Trollhättan.

During the most severe period of the war wood pulp was used advantageously for feeding cattle; if suitably prepared it is a good substitute for oats and hay.

Saccharin and crystalose have been made by A/B Svensk Färgämnesindustri, Södertelge, which also manufactures drugs and organic dyestuffs.

The manufacture of Swedish matches was nearly stopped owing to lack of phosphorus and paraffin. A/B för Kemisk and Elektrokemiskproduktion, at Trollhättan, however, started to make phosphorus in electrical furnaces from apatite, and produced 100 tons in 1917. Another factory, A/B Reduktor, at Gullspäng, was started later. These two firms have been bought out by the Swedish Match Trust (Svenska Tändsticks A/B), and the Swedish match industry is now assured of a sufficient home supply of phosphorus.

The production of chromium salts has been started in two plants, and it is believed that these will produce sufficient for the Swedish market.

Höganäs-Billesholms A/B has an experimental plant running for producing oxide of aluminium from fire-clay and, eventually, metallic aluminium. Another method (electrolytic) for making alumina from clay is under investigation.

Tannin extracts are produced at two factories—one started before the war in Västervik, and a new one in Landskrona—and both utilise Swedish and imported raw materials.

Distillation of oil from shale has been started on large scale at Kinnekulle, but an import duty is required to ensure its continuance.

The production of calcium carbide has been increased enormously during the war, owing to the great scarcity of paraffin oil and stearin for candle manufacture. Part of it has been used for making calcium nitrate, the fertiliser. A plant for producing sulphate of ammonia from nitrate of lime as raw material has been started at Ljungaverken.

Bleaching powder was imported before 1914; now three factories are running, and three others are producing sodium hypochlorite for bleaching wood pulp. At Trollhättan a cyanide works (2000 kw.) has been started satisfactorily. The method is supposed to consist of heating in an electrical furnace a mixture of potash felspar and coal in a current of nitrogen.

Only one small plant for the fixation of atmospheric nitrogen by the Birkeland-Eyde process is in operation, but a new process of the A/B Kväveindustri is undergoing a large-scale test at Gothenburg. The results are being kept secret.

Chlorates of potassium and sodium are made in Trollhättan by Hamilton and Hansell (1000 kw.). Another plant is running at Alby. Perchlorates are made at a factory at Trollhättan (Stockholms Superfosfat A/B, 2000 kw.), part of the output being used for producing the new high explosive "Carlsonite," which consists of ammonium perchlorate with TNT and dinitronaphthalene. The production of "nitrolite," a war-time explosive with a low content of nitroglycerin, will probably soon be abandoned.

Electrolytic refining of copper from scrap and brass, as well as from copper ore, is now carried on at three new works.

During the war plants for the electrical smelting of zinc and lead, started several years ago, proved of great value for furnishing the Scandinavian industry with these metals. A new plant for producing magnesium and another for making sodium metal have been started. Graphite for lubrication and electrode manufacture is made at a new plant in Trollhättan. At this place, which possesses a hydro-electric station near the excellent harbour of Gothenburg, a new company, A/B Alkaliverken, was formed to make sulphuric acid and alkali from sodium bisulphate or sulphate.

An experimental plant for the electrolytic precipitation of iron in basic solution by the Estelles system is running. The result, however, is not known.

Elmoverkens A/B, at Almhut, started in 1917 with a paid-up capital of 3,000,000 kronor (about £170,000), makes high quality glass, especially lenses, and will probably render Sweden independent of foreign supplies.

The above shows that the Swedish chemical industry has developed on many new lines during the recent past, and that the country will be economically more independent than formerly. (See also this J., 1919, 9 R, 28 R, 88 R, 145 R, 210 R, 352 R, 445 R, 457 R.)

GENERAL.

British Dye Purchases in Germany.—A mission, consisting of representatives of the most important dye-users' organisations, has proceeded to Germany in order to purchase large supplies of fine dyes needed by British colour users. The mission has been sent with the full knowledge and approval of the Board of Trade, but the Government is not in any way responsible for the financing of the purchases. The Board of Trade has intimated that the quantity of dyes to which British users are entitled under the reparation clauses of the Peace Treaty will probably be substantially in excess of the 1500 tons stated, and that the purchases now being made will be in addition to whatever amount may be received under that treaty.

Proposed Synthetic Ammonia Plant.—*The Times* of January 17 announced that the rights of the new French Claude process for synthesising ammonia (see this J., 1920, 61 A) have been secured for the United Kingdom, South Africa, India, Australia, and New Zealand by the Cumberland Coal, Power, and Chemicals, Ltd., with which is associated an influential British financial group; and that it is intended to proceed as soon as possible with the erection of synthetic ammonia works on a large scale in West Cumberland. The process devised by M. Georges Claude is claimed to be an improvement on that termed the Haber process, inasmuch as by using pressures up to 1000 atmospheres and not increasing the temperature, the yield of ammonia is increased about fourfold, *i.e.*, up to 50 per cent. of the theoretical, the velocity of the reaction being increased proportionately. It is also claimed that the total power expenditure per ton of product is no greater than is required with 200 atmospheres. The company mentioned has acquired 25,000 acres of coal land near the proposed site of the new works, and will, in the first place, erect a plant with an annual output capacity of 50,000 tons of ammonium sulphate.

The Patents and Designs Act, 1919.—The Council of the Chartered Institute of Patent Agents has issued the following summary of the most important alterations introduced into British patent law by the passing of the new Act. Items numbered (6) and (7) are not yet in force:—

(1) The period of provisional protection is increased to nine months. Any application, therefore, accompanied by a provisional specification and lodged subsequent to March, 1919, may be completed within nine months of the date of application or by the payment of a fine, within ten months.

(2) The term of a patent is increased to sixteen years. This applies to all patents on applications dated December 23, 1905, or later. The fees, if any, to be paid for the fifteenth and sixteenth years are not yet fixed.

(3) A patentee, other than a late enemy, who by reason of the war has suffered loss or damage (including loss of opportunity of dealing with or developing his invention owing to his having been engaged in work of national importance connected with the war) may apply in a simpler and cheaper manner than was before possible for a prolongation of the term of his patent, and the Court in considering the application, may have regard solely to such loss or damage.

(4) Any person who has acquired or may acquire by assignment, licence, or the like, any interest in a patent or design, *must* register his interest at the Patent Office.

(5) The grounds on which the grant of a patent may be opposed are enlarged. Such grant may now be opposed on the ground that the invention has been published in any document published in the United Kingdom prior to the application.

(6) At any time after the sealing of a patent the patentee may request the Comptroller to endorse the patent with the words "Licences of right." The Comptroller, on being satisfied that the patentee is not precluded from making such request, will so endorse the patent, and thereafter the patentee will only have to pay half the normal renewal fees, but any person who wishes to use the invention will have the right to a licence on terms to be settled by the Comptroller in default of agreement between such persons and the patentee, and the Comptroller may, in order to secure equality of advantage among several licensees, reduce the royalties payable under any licence previously granted.

(7) Somewhat drastic provisions as regards the grant of compulsory licences and revocation have been substituted for Section 27 of the old Act, the so-called "working" section.

(8) Under certain conditions publication of an invention in a paper read before a learned society does not invalidate a patent subsequently applied for. This provision, however, is fraught with the greatest danger and should not be taken advantage of without professional advice.

(9) No person other than a registered patent agent may now practise, describe or hold himself out as a patent agent.

British Launderers' Research Association. — The Secretary of the Department of Scientific and Industrial Research announces that the Research Association of the British Launderers' Industry has been approved by the Department. The Association is to be registered as a non-profit-sharing company.

Emil Fischer's Associations with Applied Chemistry. —At a special meeting of the German Chemical Society held on October 24, 1919, in memory of the late Prof. Emil Fischer, Prof. C. Duisberg passed under review his associations with applied chemistry.

Unlike Adolf v. Baeyer, Fischer had a keen appreciation of chemical technology, and while it is true that his researches were not undertaken with any utilitarian motive he realised the necessity of a *liaison* between pure and applied science. His fidelity to pure science was shown in 1883, when he refused the offer of the Badische Anilin- und Sodafabrik to succeed Caro as director of the scientific laboratories with a salary of 100,000 marks. Fischer was pre-eminent in matters of organisation. It was due to his initiative that during the war the manufacture of nitric acid from ammonia derived from atmospheric nitrogen was developed; likewise the production of sulphuric acid from gypsum, of glycerin by fermentation, and of synthetic rubber. As chairman of the Foodstuffs Committee he directed attention to the utilisation of straw, and among other things he established the important fact that stearic acid is digestible by man when dissolved in oils and fats.

Fischer's first investigations were concerned with the coal tar dyes, more particularly with fluorescein and eosin. His discovery of phenylhydrazine led Knorr to the discovery of antipyrine, and later to that of pyramidon; the importance of the hydrazines to the dye industry was instanced later by the discovery of the tartrazins. The constitutions of rosaniline and fuchsine were cleared up by his work on hydrazine compounds, thus leading to industrial progress in the triphenylmethane series of dyes. Fischer first established direct contact with industry in connexion with his well-known work on the sugars, for he required so much acrolein for the synthesis of the acroses that he was forced to use a large-scale plant placed at his disposal by the Höchst dyeworks. His work on the purine group led to the cheap production of theobromine and theophylline. In conjunction with Mering, he prepared veronal, the manufacture of which was taken up by the Elberfeld and Höchst works, then diphenylbarbituric acid, and subsequently adalin. Fischer showed how bromine, iodine and arsenic could be incorporated with compounds of a non-toxic character, and, together with Mering, he discovered "Sajodine," the calcium salt of di-iodobehenic acid. His "Elarson" acquired great importance in arseno-therapy during the war. Immediately prior to the war Fischer was co-operating with Carel in work connected with the treatment of cancer, to which affliction he, by a tragic fate, succumbed.

The "Interessengemeinschaft" of the dye industry has decided to erect statues to the memory of Baeyer and Fischer in Münich and Berlin.

Phosphate in the Pacific Islands.—A Memorandum presented to the New Zealand House of Representatives states that on Nauru Island there are reserves of phosphate amounting to about 100,000,000 tons, sufficient to meet the world demands for 200 years. The deposits on Makatea Island are estimated at 30,000,000 tons, and, together with those on Ocean Island and Christmas Island, will probably be worked out within the present generation. The phosphate on Nauru Island is of the highest grade (85—86%), contains little rock, and is easily mined. The average yearly production is 150,000 tons, which could be increased to 200,000 tons with present appliances. The New Zealand Board of Agriculture considers that it would be to the advantage of New Zealand if the proposed agreement between the British Government and the Governments of Australia and New Zealand, for the administration of Nauru Island and for the distribution of the phosphate, be ratified.

Other Pacific Islands containing deposits of phosphate of a varying degree of purity are Angaur Island, Surprise Island, Clipperton Island, Walpole Island, and Malden Island.—(*Bd. of Trade J., Dec.* 18, 1919.)

GOVERNMENT ORDERS AND NOTICES.

EXPORT PROHIBITIONS.

The Board of Trade (Licensing Section) has notified the removal of the following articles from Lists A or B of Prohibited Exports:—Palm kernels, copra, groundnuts, palm-kernel oil, coconut oil, groundnut oil, cottonseed cake, and cottonseed meal.

The Board of Trade has issued instructions (Cmd. 512, price 1*d.*) regarding the conditions under which trade may be carried on with Germany, Turkey, Bulgaria, countries formerly included in the Austro-Hungarian Empire, Norway, Sweden, Denmark, Holland, Switzerland, Poland, Finland, Esthonia, Lettland, and Lithuania.

Export Credits Scheme.—Rumania has been added to the list of countries to which this scheme applies (this J., 1919, 339 R, 381 R).

Industrial Explosives.—The Open General Licence for the export of industrial explosives and munitions for smooth-bore guns (this J., 1919, 481 R) has been withdrawn, and another substituted authorising exportation to:—British and French Possessions and Protectorates, the United States, South America, Japan and Korea, Asiatic Russia, France, Belgium, Spain, Portugal, Greece, Italy, Serbia, Rumania, Norway, Sweden, Denmark, Holland, and Switzerland. All destinations in the Prohibited Areas are excepted, and for these an export licence is required for all arms, ammunitions and industrial explosives.

LEGAL INTELLIGENCE.

Caustic Soda Contract. *The Produce Brokers Co., Ltd., v. Widenmann, Broicher and Co., Ltd., and Others.*

In the King's Bench Division, on November 27, before Mr. Justice Roche, the Produce Brokers Co., Ltd., sought to recover damages against Widenmann, Broicher and Co., Ltd., Mr. P. D. Leake, accountant, and Cowan Bros., Ltd. (all of London), for alleged breach of a contract by which the plaintiffs sold to Widenmann, Broicher and Co. 300 tons of American caustic soda (76—78%) at £45 per ton, for delivery in New York.

It was stated on behalf of the plaintiffs that the original contract was with Widenmann, Broicher and Co., Ltd., and delivery was to be by September 30, 1918. In August, 1918, it was ordered that the business of Widenmann, Broicher and Co. in the United Kingdom should be wound up, and the second defendant, Mr. Leake, was appointed to supervise the winding up. Mr. Leake sold the business to Cowan Bros., and it was provided that the buyers should take over the liabilities of Widenmann, Broicher and Co. After these events the plaintiffs asked each of the defendants to take delivery of the soda which was ready in warehouse in New York, but they did not do so, and the plaintiffs had to sell against them, and in respect of the loss they claimed £8647 damages.

Mr. Justice Roche entered judgment in favour of the plaintiffs against Widenmann, Broicher and Co. for £8504 7s. 7d., as claim and counterclaim with costs. He entered judgment in favour of Mr. Leake with costs and in favour of Cowan Bros., but without costs. The undertaking was given on behalf of Cowan Bros. that they would not take any steps to prevent the plaintiffs' claim being satisfied out of the funds in the hands of the controller. Liberty was given to apply to the judge in regard to any future third-party proceedings.

On January 12, 1920, third-party proceedings were brought by Messrs. Widenmann, Broicher and Co. against Messrs. Cowan Bros. to recover an indemnity in respect of the sum awarded to them and costs. Messrs. Cowan Bros. counter-claimed damages for breach of warranty in consideration of the sale by Leake on behalf of Widenmann of the latter's business. When the purchase was negotiated there was a visible profit for the year of £6,768, but subsequently it was found that there had been no profit at all, but a loss.

In the course of the proceedings it transpired that there had been a big error in the balance-sheet, whereupon it was agreed between the parties that there should be judgment for the defendant, with costs, the amount payable to be decided by the judge. It was also agreed that Mr. Leake had given no warranty when he negotiated the sale of the business.

His lordship sanctioned the agreement arrived at.

Alleged Damage due to Picric Acid. *Crow Nest Estate v. Brookes' Chemicals, Ltd.*

The hearing of this action was concluded in the High Court on December 11, before Mr. Pollock, Official Referee. The plaintiffs claimed damages in respect of injury to the estate by noxious fumes and pollution of a stream alleged to be caused by the manufacture of picric acid at the defendants' works at Lightcliffe, near Halifax. Defendants admitted that there was substantial pollution of the stream at the date of the armistice, but contended that there was no permanent damage, as claimed by the plaintiffs. Mr. Pollock held that the claim failed on the ground of permanent injury, and he gave judgment for the defendants, with costs.

REPORT.

VITAMINES.

Report on the Present State of Knowledge concerning Accessory Food Factors (Vitamines). *Medical Research Committee, Special Report Series No.* 38. (*London: H.M. Stationery Office*, 1919.) *Price* 4s. 6d.

The report of the Joint Committee on Accessory Food Factors (Vitamines), appointed by the Medical Research Committee and the Lister Institute, collects and brings up to date the existing knowledge on the subject. The introductory chapter tells of the importance of these substances as food constituents, an importance out of all relation with the amounts in which they are normally consumed, suggesting that they function rather as catalysts than as sources of energy. Three of them are clearly recognised, each having its own special function and distribution among foodstuffs. It is believed that they are formed only in the living tissues of plants, whence they pass to those of herbivora, and thence to those of carnivora. Succeeding chapters deal with the two main experimental lines of attack that have been made on the subject, the one line discovering the accessory food factors as substances essential to the growth of young rats, and the other revealing them as substances, in the absence of which certain well defined diseases (" deficiency diseases ") develop in human beings or in animals. These two lines of research are more and more converging and on many points they have now met.

Dealing with the accessory food factors as substances necessary to growth, the first to formulate any such concept was Lunin in 1881; later Hopkins in 1906 made the same point, but it remained for American workers to carry out the bulk of the work from this aspect. As a result of their activities, two accessory growth factors were clearly defined, in the absence of either of which rats cease to grow, decline and die. The one, designated Fat Soluble A by McCollum, is associated with animal fats, particularly butter and codliver oil, but not with lard or vegetable fats; it is also present in green leaves and the embryos of seeds. The second, Water Soluble B, is associated with the embryo and bran of cereals, the seeds of pulses, eggs, yeast, meat and vegetables; it does not accompany the butter fraction of milk, but remains behind when the cream is removed. The Water Soluble B is resistant to heat, only being destroyed slowly even when heated under pressure at 122° C. for 2 hours; the Fat Soluble A also appears to be resistant to heat in some conditions, but evidence on this point seems scanty and conflicting.

In addition to these two, a third factor, the antiscorbutic factor, is also now recognised as necessary for the optimum growth of rats. Its existence was originally overlooked by the workers on growth factors because it does not seem to be essential to growth in rats. Careful experiment, however, shows that it is necessary for optimum growth.

The second great line of work, dealing with the accessory food factors as substances in whose absence the deficiency diseases develop, has elucidated the etiology of scurvy and beriberi and put them on a perfectly clear footing. Further, very recent work which is recorded in a much later section of the report, makes it clear that rickets is also a deficiency disease, due to the lack of a specific accessory factor.

The distribution of the anti-beriberi and antiscurvy accessory food factors (vitamines) and their behaviour towards heat and certain reagents is fully set out and discussed. When these data are carefully examined and compared with similar data for the Fat Soluble A and the Water Soluble B factors, it becomes apparent that the two lines of research have met and that the Water Soluble B factor and the anti-beriberi vitamine are identical. The anti-scorbutic factor and the Fat Soluble A factor, however, retain a perfectly clear and separate individuality.

Very detailed experiments by Delf are given dealing with the resistance to heat of the anti-scorbutic vitamine, which have practical importance in connexion with the cooking of foods. The behaviour of the anti-scorbutic vitamine to heat has led Delf to make a very interesting tentative suggestion with regard to its composition; the coefficient shown for its rate of destruction on heating cabbage at various temperatures, is so low as to suggest that it is not an enzyme-like or protein body, but some much simpler substance.

Two large sections of the report are devoted to the application of the experimental work to the practical problems of human diets, one section dealing solely with the nutrition of children. These chapters are perhaps the most interesting in the report, but they do not lend themselves to condensation in a short abstract. Numerous quotations from human experience show how old dietary puzzles resolve themselves in the light of the new knowledge; how completely experiment and experience fit in and confirm one another; and how, as the fruit of experiment, the right remedy is discovered. The history of lime juice is a case in point (see this J., 1919, 351 R).

The section dealing with the nutrition of infants has much in it of prime importance. Breast feeding is strongly urged, but it is pointed out that only if the mother herself is receiving a diet sufficient in vitamines, is she able to hand them on in sufficient quantity to her child, so that the diet of nursing and pregnant mothers should be rich in vitamines. The risks likely to be incurred from the vitamine standpoint in bottle feeding a child, either with raw cow's milk, or with heated or otherwise treated milk, or with proprietary foods is fully gone into, and important recommendations for obviating these very real dangers are set out.

From the medical and national standpoint the chapter which deals with rickets as a deficiency disease is probably the most important in the whole report. Experiments are detailed, the work of E. Mellanby, in which typical rickets was produced in puppies by feeding on a diet of separated milk, white bread, linseed oil, yeast, orange juice and salt. On this diet puppies, taken from their mother at 6 weeks old and kept under laboratory conditions, could be relied upon to develop rickets within 6 weeks. Animal fats, some vegetable fats and extractives, *e.g.*, meat and malt extracts, were found to have a protective value, but no value was found to attach to fat simply as fat.

The distribution of the substance preventing rickets corresponds very closely with that of the Fat Soluble A accessory factor, and here again it seems possible that the two great lines of research may meet and the identity of two more separately discovered dietary essentials be established. Confirmatory is the experience of Hess and Unger, who distributed codliver oil among negro families in New York, where 90 per cent. of the children, even when breast-fed, is said to have rickets. After 4 to 6 months, the percentage of non-rachitic children was found to vary directly with the amount of codliver oil distributed.

The relation between defective teeth and rickets is shown to have been placed on an experimental basis by May Mellanby, and that between rickets and lowered resistance against infection has also been observed.

Finally the claim of pellagra to be considered as a deficiency disease is discussed, and the very interesting investigation of outbreaks of pellagra in Egypt, by W. H. Wilson, of Cairo, are summarised. These results seem to correlate the disease with a low intake of protein of good biological value; that is to say, pellagra seems to develop when the intake of protein containing certain essential amino acids falls below a certain minimum.

The report closes with a short appendix, originally published separately, in which are incorporated the committee's recommendations for the application of the knowledge to food relief in famine-stricken countries. This appendix includes a very valuable table of the distribution of the accessory food factors among the common foodstuffs.

TRADE NOTES.

BRITISH.

Ceylon in 1918.—The trade of Ceylon during 1918 was fairly satisfactory, though the volume was considerably less than in 1917, financial stringency, shortage of freight, and difficulties of exchange continuing, though in a less acute form. The total value of trade, exclusive of specie, in 1918, was 4,065¼ lakhs of rupees, as compared with 4,983½ lakhs in 1917. The exports and imports for the year included the following (cwts.):—

Exports.—Rubber, 413,303; coconut oil, 527,481; copra, 1,272,321; plumbago, 304,340; cacao, 79,025; citronella oil, 9,359; cardamoms, 3420.

Imports.—Cement, 89,299; manure, 1,307,680; sugar, 414,989.

The direction and source of the exports and imports, with their relative values, were as follows:—

	Exports to.	Imports from.
British India	10	38·08
Burma	0·02	19·51
United Kingdom ..	44·72	16·11
Japan	·61	5·14
United States	17·78	3·17

Freightage difficulties and the control of imports into the United States brought about an accumulation of stocks of rubber, the exports showing a decrease of 232,494 cwts. on those of the previous year. The area under rubber continues to expand, and approximately 255,000 acres is now under cultivation.

The trade in coconuts and coconut products commenced unfavourably, but a demand for copra in India, and extensive purchases of coconut oil by the Imperial Government effected an improvement, prices ruling very high towards the end of the year. Crops were satisfactory on the whole.

The possibilities of vanilla cultivation on a small scale are being investigated, and attention is being given to the prospect of the successful cultivation of sisal and other fibres.

The manufacture and collection of salt is a Government monopoly. A record yield was obtained during the year, amounting to 1,186,524 cwts. Owing to shortage of stocks it was found necessary to continue the importation of this commodity. The total stocks at the end of the year amounted to 1,426,244 cwts.

Some beds of monazite sand have been discovered in Ceylon, and a special plant for the treatment of this sand was erected during 1918 at Bentota. The plant has worked successfully, and 20 tons of refined sand was awaiting shipment to England. (For plumbago production, see below.) —(*Col. Rep.—Annual, No.* 1007, *Nov.* 1919.)

Ceylon Plumbago Situation.—At present there is no market for Ceylon plumbago, and the shipments have been falling off for some time, thus:—1916, 33,000 tons; 1917, 27,000 tons; 1918, 15,400 tons; first half of 1919, 4000 tons. The bulk of these quantities was taken by Great Britain and the United States, as the following figures show:—

	United States.	Great Britain.
1917	77% ...	15%
1918	55% ...	41%
1919 (half) ...	62% ...	32%

The price, which rose in 1916 as high as $500 per ton, now stands at $85 to $175, according to grade. As most of the mines are in the hands of natives of small means, the market conditions are quickly reflected by the mining returns; at the beginning of 1919 there were only 263 mines, with 6433 men at work, while in 1917 there were 1288 mines, with 19,912 men. The normal capacity of the Ceylon mines is about 30,000 tons.—(*U.S. Com. Rep., Nov.* 6, 1919.)

Trade of East Africa (formerly German) in 1918—1919.—The Acting Administrator reports that owing to absence of ocean tonnage the import trade into East Africa has been restricted to purchases in Zanzibar and British East Africa. Export trade was confined mainly to sisal, hides and cotton. Exclusive of military supplies the imports were valued at Rs.15,116,097 (rupee=1s. 4d.), including kerosene, soap, and matches to the value of Rs.729,224. The exports were valued at Rs.10,507,627. The trade in dyed cottons is of some importance, and at present supplies are derived from the United Kingdom. Formerly the market was controlled by Holland. Soap was imported, principally from Zanzibar. Some progress has been made in the local manufacture of soap, but the quality does not compare with that imported from Zanzibar. The main items of export were as follows:—Sisal, 7954 tons; cotton 1,654,881 lb.; hides, 30,636 cwts.; copra, 48,790 cwts.; wax, 5375 cwts.; ghee, 5328 cwts.; groundnuts, 17,598 cwts.; rubber, 3447 cwts.; and skins, 1120. The exports of sisal were seriously affected by lack of ocean tonnage. Under normal conditions it is anticipated that the 1913 production of 20,834 tons will be exceeded. The exports of copra declined owing to local military demands for oil, and to the establishment of a few small soap factories. The territory abounds in oleaginous products awaiting exploitation. There are vast areas suitable for the cultivation of sisal, cotton, and rubber. The future trade of the region depends on its exports, facilities for transport between the various trade centres, and direct transport communication with the European markets.—(*Bd. of Trade J., Nov.* 27, 1919.)

FOREIGN.

Hongkong Peanut Oil Trade.—A big boom in the export of this oil to the United States occurred during August and September, 1919. The value of exports in August alone amounted to $805,000, or more than three times that of the whole of 1918. Large quantities are available in the Hongkong market, as it not only draws its supplies locally, but imports large quantities of nuts from China, India, and also oil from North China. The oil from whatever source is usually refined in Hongkong, the free fatty acids being reduced to not more than 2 per cent. The price at the height of the boom rose to about $26 per cwt.; previously, in April, it was only $13½. Both price and exports have begun to decline—chiefly owing to the rise in the silver exchange—and at the middle of September $20 per cwt. was quoted.—(*U.S. Com. Rep., Nov.* 4, 1919.)

Manufacture of Chemical Fertilisers in Sicily.—Avv. Filippo Lavelia, organiser of co-operative associations in Sicily, has formed a company for scientific development of farm lands and the manufacture of chemical fertilisers on a large scale. The Banca Italiana di Sconto gives financial support.—(*U.S. Com. Rep., Nov.* 15, 1919.)

COMPANY NEWS.

BRITISH CYANIDES CO., LTD.

An extraordinary meeting was held in London on January 21 to pass a resolution to increase the capital of the company to £450,000 by the creation of 100,000 new shares of £1 each.

In moving the resolution the chairman, Mr. C. F. Rowsell, said that the additional capital was required to finance the rapid increase in the company's business; the factory at Popes-lane was to be greatly extended and alterations effected at the Tat Bank works (near Birmingham). Mr. Kenneth M. Chance, managing director, referred to the remarkable revival in the chemical trade which occurred last autumn. The company was unprepared for the flood of orders which then poured in. The pace at which the company is developing is rather too rapid, as it throws a heavy strain on the staff, already strained during the war. When the projected extensions have been completed the output of many of the company's products should be doubled or trebled; meanwhile the full demands of customers cannot be met. The policy of the board is to provide for all time ample and cheap supplies of the two raw materials which are the mainstay of the business—cyanogen and potash—the outlook for both of which is extremely promising. The resolution to increase the capital was carried unanimously.

SULPHATE OF AMMONIA ASSOCIATION.

The fifth annual report of the Sulphate of Ammonia Association for the year ended June 30, 1919, was presented at a meeting of subscribers held on December 18 last. It was anticipated by the chairman, in his address, that the Association will be transformed into the British Sulphate of Ammonia Federation, Ltd., by the end of February, the transformation being accompanied by an extension of operations. During the year, 36,870 tons of sulphate of ammonia was sold for export, the total sum realised being £1,050,700. For agricultural purposes, 269,000 tons was supplied for use in the United Kingdom. This represents an increase in home consumption of nearly 700 per cent. compared with pre-war deliveries. Orders for 200,000 tons are in hand for the present season. Propaganda work has been reorganised with the object of getting into direct touch with as many farmers as possible. A number of experimental plots has been laid out on a 20-acre demonstration centre near Ormskirk. The question of autumn *v.* spring manuring is being investigated by arrangement with a number of agricultural colleges. Cereal and root crop competitions are to be organised in a number of different areas. More rapid progress in the production of neutral sulphate of ammonia is desirable. The German claim to have produced synthetic urea is recognised as one which may have a far-reaching effect on the nitrogen problem. The following table affords a comparison of the extent to which sulphate of ammonia and nitrate of soda, respectively, are used for agricultural purposes in Great Britain:—

Year.	Production sulphate of ammonia as such. tons.	Exported tons.	Used for home agricultural purposes. tons.	Nitrate of soda used for home agricultural purposes. tons.
1913	*372,000	324,700	*40,000	*80,000
1914	*363,000	313,900	*50,000	*80,000
1915	*350,000	294,300	*64,000	*40,000
1916†	315,500	160,300	144,600	* 5,000
1917†	283,500	28,500	234,000	* 5,000
1918†	331,500	38,400	269,000	*10,000

*Estimated. The nitrate of soda figures are only rough estimates.
† The figures relate to the "fertiliser year," commencing June 1 in each year.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for January 8 and 15.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the department mentioned and quoting the specific reference number:—

Locality of firm or agent.	MATERIALS.	Reference number.
Italy	Leather, imitation leather, fine varnishes	83
Spain	Chemical fertilisers	49
Switzerland	Chemicals, dyes	51
Algeria	Alcohol, chemical manures	86
Morocco	Sugar, pottery, tinplate	87
"	Clear window glass	88
Mexico	Heavy chemicals, dyes	54
Ecuador	Drugs, paper	92
British India	Galvanised barbed wire, annealed wire	24
"	Chemicals	58
British West Indies	Dyes, soap	31
Canada	Steel, borax glass, litharge, lead acetate, soda ash, cyanide, zinc dust, bone ash, leather, chemical glassware and porcelain	60
"	Chemicals, minerals	62
"	Oils, confectionery, druggists' sundries	65
"	Tinplate, sheet metals	67
"	Paper	*68
"	Glass bottles	*
"	Phosphates	†
Egypt	Paper, glass, soap	34
South Africa	Iron, steel, tinplate, galvanised iron, paints, varnishes	72
Belgium	Leather of all kinds	37
"	High speed and tool steels, industrial oils, potash	38
"	Tinplate, tin solder, zinc sheets, galvanised iron	75
France	Iron and steel bars, sheets and plates	41
"	Chemicals, tanning products	42
" (Nantes)	Cement, cocoa, copra, fats, oils, etc., for soap making, skins, paper (goods in demand)	79

* The High Commissioner for Canada, 19, Victoria Street S.W. 1.
† The Canadian Government Trade Commissioner, 73, Basinghall treet, E.C. 2.

MARKETS SOUGHT.—A Canadian company desires to get into touch with U.K. importers of asbestos cement products. Inquiries to the Canadian Government Trade Commissioner.

A firm in the British West Indies able to export cocoa, coconut oil, copaiba oil, vanilla, etc., wishes to get into touch with importers in the U.K. [31.]

A firm in Belgium desires to get into touch with U.K. importers of old metal. [75.]

TARIFF. CUSTOMS. EXCISE.

Australia.—The import of stranded copper cable is prohibited except under licence as from December 20, 1919.

The date of operation of the conditions prescribed for the importation of rubber-covered wire has been further postponed until April 1, 1920.

Baltic Provinces.—Licences to export goods from Latvia will only be granted to firms who import and sell to the Government or municipal authorities, or to co-operative societies, in return for payment in Latvian money, an equivalent quantity of the most indispensable goods; all applications for export licences must be accompanied by certificates to this effect.

Belgium.—A circular relating to the position with regard to Customs restrictions and the issue of licences has been received, and the clauses so far as they affect British trade are set out in the issue for January 8.

Brazil.—The proposed tariff changes affecting iron and steel manufactures, metalloids, miscellaneous metals, and scientific instruments, may be seen at the Department of Overseas Trade, 73, Basingball Street, E.C. 2.

British India.—The Collector of Customs is empowered to take and pay for samples of drugs or articles of food for the purpose of examination.

Czecho-Slovakia.—Among the articles the import of which is entirely prohibited are cocoa powder, chocolate, tinned and smoked fish, certain edible nuts, and spices.

Among the articles that may be imported under certain conditions are olive oil, Dutch margarine, cocoa beans, and cocoa butter.

Egypt.—The issue for January 8 gives the import tariff valuations of various metals with effect from Dec. 1, 1919, to Jan. 31, 1920.

France.—Among the articles the export and re-export of which are prohibited are animal fats other than fish oils, margarine, organic and chemical manures, raw bones, oleaginous seeds and nuts, sugar, molasses, glucose, fixed vegetable oils, edible vegetable fats, natural phosphates of lime, bauxite, sulphate of ammonia, dephosphorisation slag, nitrates of soda and lime, soap (other than perfumery soap), certain metals, and iron ore. These goods, however, may be sent in transit through France to Switzerland, Italy, or Spain from the U.K. under the pink certificate "S. 45B."

France (Algeria).—A consumption tax of 320 francs per kilo. has been levied, as from December 29 last, upon saccharin and other artificial sweetening substances.

Germany.—Among the goods the export of which is forbidden without permission are food, fodder, seeds, animal and vegetable fats and oils, artificial manures, skins, hides, leather, bones, glue, gelatin, iron, iron ore, iron alloys, manganese ore, paper, timber, lime, plaster, cement, soda, potash, caustic potash, sulphate of soda, and certain pharmaceutical products.

The law relating to the payment of customs duties in gold came into force on January 1.

Grenada.—The export duties on cocoa, cotton seed, nutmegs, and mace have been increased as from November 25, 1919.

Italy.—Among the articles the export of which is subject to a certificate of cession of exchange are citric acid, tannic acid, copper sulphate, soap, candles, white paper, cement, earthenware, and certain kinds of glass.

Nigeria.—Among the articles upon which the import duties have recently been changed are alcoholic beverages, gunpowder, lead, matches, petrol, and soap. The import duty on kerosene and all other lamp oils is fixed at 3d. per imperial gallon.

The export duties on palm kernels, palm oil, and groundnuts have been raised.

Rumania.—The pre-war tariff is, with some exceptions, still in force.

St. Vincent.—The export duties on cotton, cotton seed, arrowroot, starch (other than arrowroot), cocoa, sugar, syrup, and rum have been amended as from November 2, 1919.

Switzerland.—The export of, *inter alia*, beer, wines, alcohol, and animal waste, extract and tablets of rennet is now covered by general export licence.

Uruguay.—A copy of the law whereby certain building materials are permitted to be imported duty free may be seen at the Department of Overseas Trade, 35, Old Queen Street, S.W. 1.

REVIEW.

Alcohol: Its Production, Properties, Chemistry, and Industrial Applications. *By C. Simmonds. Pp. xx.+574. (London: Macmillan and Co., Ltd.,* 1919.) *Price* 21*s. net.*

The appearance of a comprehensive work on alcohol by a British author supplies a long-felt want. The brewing industry is well served with text-books, but reliable information on the distillation and technology of alcohol in this country and on the evolution of the present system of Excise Regulations and procedure has hitherto been somewhat scattered and inaccessible.

In this country the technology of alcohol stands on a somewhat different footing from that obtaining on the Continent and in America, both as regards the raw materials used and also, to some extent, the character and uses of the finished products. On the Continent the distilling industry has been fostered and subsidised for many years, and the consequent increase in the cultivation of potatoes has been attended with marked benefits to agriculture in general. In Great Britain petrol and benzol, as sources of motive power, have hitherto held the field on account of their relative cheapness, although the production of synthetic alcohol from calcium carbide and from coke oven gas bids fair to assume noteworthy proportions in the not far distant future, and we are evidently approaching a period of keen competition between the existing available sources of energy, in which alcohol will play an increasingly important part. The eventual exhaustion of the world's supplies of coal and mineral oil may well have the effect of stimulating the development of the agricultural resources of tropical countries, which should be capable of furnishing an almost inexhaustible supply of fermentation alcohol. The author is fully alive to the possibilities of the future, and the chapter on alcohol as a source of light, heat and motive power is an interesting feature of the book.

After a short historical account of alcohol and the development of modern views on fermentation, a chapter is devoted to an outline of the technical production of ethyl alcohol. The chief raw materials, the enzymes of malt and yeast, the different types of yeast and their relative importance in brewery and distillery practice, and the chief amylase-producing moulds are fully treated.

The section on mashing and fermentation contains a *résumé* of the work of Harden and Fernbach on the mechanism of alcoholic fermentation and a useful account of the "amylo" process. A curious anomaly still exists in connexion with the introduction of this process into Great Britain. It is a statutory requirement that the gravity of distillers' wort before distillation shall be ascertained by means of the saccharometer, a procedure which is impracticable in the "amylo" process. It is to be hoped that some means will be found of removing an obstacle which in the author's words "impedes progress," and which discourages research in a most promising field.

A short but concise account of the distillation and rectification of alcohol is followed by sections on the production of alcohol from wood and other cellulosic materials, including sulphite waste liquor, on synthetic alcohol from acetylene and on statistics as to the production of alcohol in different countries

In chapters IV. to VI. the chemistry and physics of methyl and ethyl alcohols are dealt with in considerable detail. The separation of these alcohols from one another and from other organic liquids and their estimation under varying conditions present analytical problems often of considerable difficulty, and a selection of methods is given which should be of great value to the analyst.

A separate chapter is devoted to alcoholometry in which, as might be expected in a work emanating from the Government Laboratory, a great deal of valuable information is to be found regarding proof spirit and the use of Sikes' hydrometer. The alcohol tables on pp. 237—257 are considerably more extensive than those usually met with in reference books on this subject.

Industrial alcohol and its technical applications are dealt with in chapters VIII. and IX. The field of industrial alcohol is a large one, and it is obviously difficult in the compass of a single volume to give more than a general outline of the various processes and manufactures in which alcohol plays an important part. During the war the demand for alcohol in the manufacture of explosives increased to an enormous extent, to say nothing of the immense scale upon which, towards the close of hostilities, "mustard gas" was being prepared from alcohol-derived ethylene. The author has however, perhaps wisely, omitted any detailed accounts of exceptional developments created solely by war conditions and has confined himself to a discussion of the more pacific uses of industrial alcohol.

In the chapter on spirituous beverages, the relative advantages and defects of the Allen-Marquardt, Beckmann, Government Laboratory and other methods of estimating higher alcohols are fully discussed. This chapter contains a useful section on the composition and analysis of wines, a branch of analysis which, although highly developed in France, has perhaps naturally attracted but little attention in this country. The outline given of the main principles and methods used by French chemists will be welcomed by those who may be called upon to undertake detailed examinations of foreign wines.

The book concludes with a chapter on the physiological effects of alcohol, in which the author acknowledges his indebtedness to the recent admirable report of the Advisory Committee appointed by the Central Control Board (Liquor Traffic).

A useful bibliography and indexes of names and subjects are appended.

The author has arranged, in concise and readable form, a large amount of useful information bearing upon every aspect of the alcohol industry. The book cannot fail to commend itself to a large circle of readers, and may very well rank as a standard work on the subject.

G. W. Monier-Williams.

PUBLICATIONS RECEIVED.

Final Report of the Nitrogen Products Committee, Munitions Inventions Department, Ministry of Munitions of War. *Cmd.* 482. *Pp. vi.+357. (London: H.M. Stationery Office,* 1919.) *Price* 4*s.*

The Dyeing Industry. *By* S. H. Higgins. *Being a third edition of "Dyeing in Germany and America." Pp.* 189. *(Manchester: The University Press; London: Messrs. Longmans, Green and Co.* 1919.) *Price* 8*s.* 6*d.*

Chlorination of Water. *By* Joseph Race. *First edition. Pp.* 158. *(New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1918.) *Price* 7*s.*

Annuaire Sucrier, 1919-1920. *Pp.* 696. *Liste des Fabriques de Sucre et Raffineries du Monde Entier. (Paris: Bureaux du Journal des Fabricants de Sucre.* 1919.)

THE ROLE OF FATTY ACIDS IN LUBRICATION

Hitherto, free fatty acids in lubricants have been judged mainly by the injurious effects which they are capable of causing, and their presence has come to be regarded as wholly objectionable; but Messrs. Wells and Southcombe, in their interesting communication to the London Section on February 2, now show that, in strictly limited amount, free fatty acids are capable of greatly improving the friction-reducing values of mineral oils, and that the improvement in "oiliness" or lubricating power of a mineral oil, caused by mixing with it a fixed oil, is due far more to the small quantity of free fatty acid contained in the fixed oil than to the neutral glyceride.

Some figures quoted by Mr. Archbutt in the discussion illustrate this point very forcibly. In some experiments made with a Thurston machine under conditions of very low speed and high pressure, so as to ensure a certain amount of solid friction between the bearing and the journal, it was found that 0·5 per cent. of rape oil fatty acids added to a mineral oil reduced the friction coefficient from 0·0066 to 0·0049, whilst nearly 60 per cent. of neutral glyceride of the same rape oil was required to produce the same effect. It appears, therefore, that this discovery affords the means of diverting to other more useful purposes the greater part of the saponifiable oils and fats which are to-day used for blending with mineral oils, and of employing in their stead a very much smaller proportion of free fatty acid.

The authors' theory that the action of the fatty acid is due to the fact that the interfacial tension between oil and water and between oil and mercury is greatly lowered by the addition of fatty acid to a mineral oil met with a good deal of criticism, and it was pointed out that, although neutral rape oil added to mineral oil greatly reduced the friction coefficient, the inter-facial tension between neutral rape oil and water was nearly as high as that between mineral oil and water. In the lubrication of a shaft or journal running at a fairly high speed and under moderate pressure, the bearing is separated from the journal by a film of oil, and the friction is solely due to the viscosity of the lubricant. That property of a lubricant which is not viscosity and is termed "oiliness" only becomes important when the conditions are such that solid or "contact" friction occurs, and all recent work points to the fact that it is the chemically reactive and unsaturated constituents of lubricants which promote "oiliness," and that they do so by entering into physico-chemical union with the solid faces lubricated, forming new composite surfaces with lower surface energy and opposing less resistance to shear than the unlubricated surfaces. The great activity of free fatty acids is quite in accordance with this theory.

Messrs. Wells, Southcombe and Archbutt are to be congratulated on having made an important addition to our knowledge of lubrication.

THE CHEMICAL INDUSTRY OF GERMANY.*

IMPRESSIONS AND REFLECTIONS ARISING FROM A RECENT VISIT OF INSPECTION OF CHEMICAL WORKS IN THE RHINE AREA.

E. V. EVANS.

Many of us have had the opportunity as chemists of visiting German chemical works from time to time, but in the majority of cases we have gone as experts upon a particular matter, and throughout have dealt only with the subject under investigation. Few chemists, however, have had the opportunity of inspecting at their own choice any of the chemical works to be found on the Rhine, or have been enabled to take part in a visit of inspection which included the works of Bayer & Co. at Leverkusen, Meister, Lucius & Brüning at Höchst, the "Badische" at Ludwigshafen and Oppau, Griesheim Elektron, and some smaller works such as those of Raschig at Ludwigshafen.

A fairly complete inspection of these works would have taken months if not years, but it was only possible to devote two or three weeks to this task. Under such circumstances only a comprehensive bird's-eye view of the Rhineland industries *en masse* could be obtained, but the experience thus gained was in its way unique, for the specialist referred to above was able only occasionally to see just one corner of the industry. Not only were these impressions obtained through visits to works, but they were also supplemented by frequent conversation with directors of the German undertakings and with members of the economic sections representing British and French authorities.

The outstanding impression gained during the visit was that of a huge and highly efficient organisation temporarily paralysed. The works were seen lying practically stagnant but in an exceedingly good state of repair, everything ready except the raw material and available men to do a reasonable day's work, directors with time hanging on their hands, research and control laboratories half empty, the chemists having returned temporarily to their professors to continue some form of research work. The latent potentialities of such an organisation can only be fully appreciated by an actual inspection of these idle plants, and when consideration is given to the special facilities afforded to the industry owing to its situation on the banks of the Rhine, it is realised that the presence of such an immense potentiality in the world cannot be ignored. I do not want to be pessimistic or in the least to decry the effort that has been made in Britain for the resuscitation of the organic chemical industry; neither have I been made so dizzy by a rapid flight through the German Rhineland that it has been impossible to find sanity again. I wish to place facts before you which must be taken into account. Once British chemists decide definitely to face these facts, then I know perfectly well that we have nothing to fear.

The industry in Germany is an immense and exceedingly efficient machine; it has had national support behind it, from the Government and the banks; it has been fostered as a new-born babe of royal blood. The Universities and technological schools have given a sound training to the young men, the chemical industry has kept in the closest touch with the Universities, chemists have been created in such number that the process of expand-

* Papers read before the London Section on January 5, 1920.

ing the industry has been greatly facilitated. It may be said that the chemical industry in Germany has been fostered with a pride equal to that of our own shipbuilding industry. It is not surprising therefore that the German has chosen such a unique spot as the Rhine, which, apart from the facilities which have been given to it by man, seems to be particularly suited for the development of a chemical industry. The river itself, in addition to being a source of water supply, provides the direct means of transit both for the raw materials imported and the finished products despatched for export, while the tributaries bring from the valleys many of the raw materials so essential to the industry. Further the region is provided with an excellent railway service, unhampered by unnecessary restrictions, which connects up by means of its branches the manufacturing centres with the river, and in fact with the whole of Germany. The industry is, moreover, supplied efficiently and economically with power, as the presence of brown coal in the adjacent regions has led to the establishment of large electric power installations which deliver power to the neighbouring works at a remarkably low figure. Finally the works situated near the foot-hills possess the additional advantage of being able to draw upon an inexhaustible supply of soft water from the underground streams. It is all these regional facilities which initially place the chemical industry in a distinctly advantageous position.

I feel that this is but a very cursory treatment of so important a matter as the natural and acquired facilities of the Rhineland industry. I should like to take the opportunity of urging you to read with care the Report of the Chemical Mission to Germany prepared by the Association of British Chemical Manufacturers. I have been placed in a very favourable position to know how assiduously the members of that mission worked to convey their impressions to the British chemist.

One of the members, Mr. J. Allan, the chairman of the Liverpool Section of this Society, has stated that in his opinion the strength of the German industry may be attributed to the scientific control of every department of business activity, and to the courage and breadth of outlook displayed by those in command. He considers that Germany possesses no secrets in the manufacture of inorganic products except in a few instances (and here I think he refers particularly to the manufacture of synthetic ammonia by the Haber process) which would entitle her to world supremacy, whilst he states that some of the processes inspected compare unfavourably with those operated in Great Britain. The latter statement, however, cannot be applied to the British organic chemical industry, but I too agree that even in this branch of manufacture the processes used do not appear to be based on unique reactions. I have visited process after process for the manufacture of organic products, but have not seen one based on a chemical reaction unknown to me. I want here to emphasise the point that the German chemical industry does not appear to utilise unique chemical reactions, but only those which have resulted from a careful selection of a number of possible reactions well known to the academic chemist.

The outstanding feature in process design is the immaculate care given to the selection of a process which entails a minimum number of operations, whilst such factors as the conservation of high yield and the highest possible degree of purity of the product together with the ultimate cost of manufacture are studied exhaustively. I know these are the underlying principles studied throughout the world, but it appears to me that they play a more important part in the establishment of the industry in Germany than elsewhere. Its strong position is not accounted for by witchcraft, but results from the complete collaboration of chemist, physicist, engineer, and commercial director. In many of the more efficient British works all these points are brought similarly into evidence, especially in those cases where efficient chemists and engineers have devoted much time and energy to a particular process.

I should like to suggest that there is something about the German temperament which allows it to be specially adaptable to spade work. In this country the field of specialisation of the chemist appears to cover a much wider range than is the case with the German chemist. The wealth of detail that is worked out for each process in German factories, whether it be the fractionation of naphtha or the manufacture of synthetic indigo, requires the drudgery that appears to be so ably supplied by the German. One *Oberchemiker* had manufactured benzyl alcohol, benzaldehyde and benzoic acid ever since leaving the university, and in company with benzaldehyde and its derivatives his hair and beard had become quite white with age. In his spare time this man, having been thoroughly trained, kept in touch with the general advances in chemistry. He possessed a control and research laboratory, and when questioned as to the nature of the research conducted, his reply was "benzyl alcohol, benzaldehyde, and benzoic acid, their manufacture and application." Here is the whole tale of the German spirit, and although it is not to be admired, yet it is a quality we are up against.

This "Oberchemiker's" kingdom was in this sphere of chemistry, and it was the general practice for the directorate to decide according to his recommendation.

Such work, as you know, in this country is often relegated to a foreman, and it would be one of the duties of an over-worked director or chief chemist to maintain a guiding eye on the benzaldehyde plant. It was surprising to learn how little is known by the chemist engaged on any one particular process of what is going on in other parts of the works, whilst it was just as surprising to realise the degree of expertness possessed by each Oberchemiker. One of the directors stated that he had spent many months on a certain process which had given the *Oberchemiker* of the process too difficult a problem. This director being responsible to the board for a series of similar processes had relegated a portion of his duties to another in order to work out the problem.

Another director had personally dealt with the manufacture of sulphuric acid from gypsum, and he had apparently done nothing else for years. When it was suggested that this process had been evolved only for the purpose of relieving Germany from the temporary difficulty of obtaining pyrites or other source of sulphur, he emphatically stated that there should be a much larger future for this process than the present cost-sheets showed owing to the fact that the reduction mass resulting from roasting gypsum with low quality fuel was most eagerly sought for by cement manufacturers. It was this which in his opinion determined the future of the process.

Great care has been taken to maintain a high standard of *morale* among all workers.

Another point of the utmost importance which affects the prosperity of the German industry is doubtless the fact that engineers have found it worth their while to cater for the chemical industry. This in my opinion is one of the most important assets possessed by Germany at the present moment. Enamels, acid-resisting cements, filtration materials and alloys, have been studied very carefully by the engineer and chemist in collaboration. The problem before this country at the moment is not only the capture of the organic chemical industry, but the adaptation of engineering to the requirements of the industry. This is no small question and will require a considerable amount of effort. In most of the second-rate chemical works which I have seen in this country, the state of affairs as regards the engineering side is too disgraceful to warrant detailed description. The difficulty arises largely from the fact that the engineering aspect of the question is frequently left to a foreman fitter, and he is only able to supply what the engineering firms in this country have specialised in.

There are, however many indications of the existence of the will to improve matters in this respect, and the creation of the Chemical Engineering Group of this Society is a healthy sign. The reading of papers, though of extreme value, is, however, only work of propaganda, and no time should be lost in setting our house in order, for the progress of chemical industry at the present moment is sadly hampered by the difficulties of obtaining plant and apparatus. This is due to a complication of circumstances in which labour plays no small part, but it must always be remembered that in pre-war days we often obtained apparatus from Germany. I must confess that although orders for plant were placed in this kingdom, my reference books for the design of plant were largely the catalogues of the chemical engineering firms of Germany.

The large output that has been attained by many of the German installations is another factor which must be taken into account, as the effect of mass production on the reduction of working costs is a very material one. The ammonia oxidation plant at Höchst is capable of manufacturing the nitric acid equivalent of 10,000 tons of sodium nitrate monthly, and is so wonderfully designed that the whole plant is operated by one man. The output of oleum at the Dormagen plant is 100 tons daily, of caustic soda at the Höchst plant 70 tons daily, whilst at Knapsack 300 tons of calcium carbide may be produced per day.

In all these matters it is farthest from my wish to present to you the German bogey which, in the chemical industry at least, is almost done to death. The British organic industry is sometimes considered to have had five years start, but you know perfectly well that nothing of the sort has happened. We have been busy at war, and there has been a shortage not only of material for construction, and labour to carry on work, but the chemicals required for the manufacture of dyes have themselves had to be diverted to the more urgent preparation of explosives. It is probable that we are doing very well under the circumstances, but we should not delude ourselves into the belief that there is a smooth journey in the future. I have seen in Germany the value of the organised effort of a great body of men possessing sound scientific training. It has taken Germany 40 to 50 years to create this body of scientific workers and to build their industry. The position to-day is that although plant has been kept in a state of good repair, the shortage of raw materials, the want of men and many other causes due to the war account for the fact that little progress is being made.

An aspect of the dye question which appears to present difficulty lies in the fact that although there exists in Germany an organisation capable of producing 80 per cent. of the world's pre-war requirements of dyestuffs, yet Britain, America, Switzerland, and even France have made and are making elaborate extensions in order not only to become self-supporting, but to create if possible a large export business. Manufacturers agree that in the case of a great number of products the question of mass production is an all important one, and if for no other reason than this, an export business frequently becomes necessary to countries possessing small home consumption. Even should the efforts of all these countries be successful it is quite a question whether the world's requirements will not be largely over-supplied, and there will then result that inevitable attainment of equilibrium which has such drastic effects upon the less fortunate members of the industry. Moreover, it is not to be expected that Germany will lie quietly aside whilst this equilibrium is being attained.

Further it must be borne in mind that the erection of plant in these times requires capital expenditure three or four times as large as that in the years when such an institution as Bayer of Leverkusen was developed. It must also be remembered that the capital of Bayer and of most large German undertakings is largely written down. Again, the importation of German products is greatly favoured by the present low value of the mark in this and other countries.

It would appear to stand to reason therefore that even assuming it is in the interest of world progress that in the countries mentioned above great extensions of plant should be effected, it is certain that some form of protection must be given to manufacturers in this country to prevent ruthless importation. In Great Britain the prosperity of the large textile industry is materially dependent upon an adequate supply of colouring matters, and it is only natural that the dye-users should have been given facilities to import the dyestuffs so urgently required for the maintenance of their business. In this connexion it is well known that Switzerland has rendered most valuable service.

It is regrettable that the public appears to connect with the protection of a key industry those vexatious questions of tariff reform and free trade. The temporary fostering of an industry falls under an entirely different category. In 1918 the Board of Trade created the Trade and Licensing Committee for the purpose of preventing the importation of dyestuffs, if such could be made in this country in the quantity and of a quality that would satisfy the dye-user. This Committee consisted of a few experts who gave a considerable amount of their valuable time, and worked most assiduously—for the Committee met about once weekly in Manchester. It is no simple matter to differentiate between the multitudinous names under which dyestuffs appear. Not only is the nomenclature exceedingly complicated, but the question of quality is of immense importance, and it would appear that the names given to modern products do not always convey to the dye-users what those names may have meant in 1913. In my opinion, a licensing system is the very way to protect the infant dye industry, and at the same time to satisfy the dye-user—a most important man in this country—but it must be realised by the Government that to do this effectively requires a well-organised and comprehensive department manned not only by adequate administrative staff but also by chemists and analysts capable of computing the constitution of dyestuffs, of adjudging their relative values, and of comparing the home-produced colours with those imported. Such a scheme may seem to be elaborate, but past experience has shown that a large machine will be necessary to deal with this question. The members of the Trade and Licensing Committee have done their utmost and are worthy of considerable praise, but the present system has broken down hopelessly owing to the inordinate amount of work required to carry out the task adequately.

I would urge every member of the Society to use such influence in his power to help the Government to formulate some means of fostering the organic chemical industry of this country. The task before the chemist here is great enough, but the present international position renders his future success uncertain. The projected Imports and Exports Regulation Bill was a complete failure. It is believed that this Government intends to legislate for the benefit of the so-called key industries, but this should be done expeditiously, for the risk of placing capital into the chemical industry at the present moment is so high that definite progress cannot be expected in the near future.

There is one final suggestion that I should like the opportunity of presenting to you, and that relates to the fact that although it is of importance to be able to manufacture in this country colours already produced in Germany, the real supremacy of British individuality will best be realised by the creation of specialities. For this the chemical industry depends very largely upon the resources of the universities and technical schools which are capable of undertaking the highest form of research. If applied chemistry is to progress in the next 20 years proportionately to the achievements of the last 20 years in Germany and elsewhere, the whole face of the subject will be altered, and it is the nation which plays the most important *rôle* in new achievements that will ultimately triumph. The chemical industry is already manned with staff able to reproduce processes in this country which are not new to the world, but that industry looks to the leaders of pure science to mark out the path of the future.

I am afraid that notwithstanding the efforts that I have made to depict an optimistic story, the fact remains that it has not been possible to do this, but in conclusion I should like to remind you of Dr. Alfred Rée's opinion of British characteristics which are considered by him to be "independence of thought and action, great originality, pluck and perseverance, and that saving grace of common sense and level-headedness."

THE COLLECTIVE EFFORT OF GERMAN CHEMICAL INDUSTRY.

G. S. WALPOLE.

The policy of combined effort, which forms such an outstanding feature of German chemical industry, is but part and parcel of the policy of German industry as a whole. The nation exists essentially as a manufacturing nation, and is organised to that end. The land on which a works is built, and the railway running into it, are obtained directly from the Government, and the Government expects good use to be made of both. The raw materials of manufacture are conveyed by rail straight into the works, and when the processes on them are finished they go out again by rail either to another works to be further treated, or direct to the consumer. The great advantages of such a system, working as it does smoothly and efficiently day in and day out, are obvious, but its full significance can scarcely be realised without actual observation of the manner in which chemical plant is handled.

Our methods are different. The land on which a works is built is not invariably freehold; the question of the entry of a railway into the works is not to be taken for granted; it is a matter which has to be settled between the works' management and the railway company. The latter demands terms that ensure profit to itself in any event, and is not concerned with any other aspect of the case. The Railway Sidings Act, 1906, is never invoked. Moreover, the railway company demands that the works' management shall satisfy all local authorities. Possibly most of us have discovered that in dealing with local authorities the requirements of chemical industry do not outweigh all other considerations.

All this means that if the chemical manufacturer wishes to extend his plant, modernise his processes, cheapen his cost of output, and improve his transport he has to face the leaseholder and his solicitors, the landlord and his solicitors, the surveyors for the solicitors of both, the borough surveyor, and the insurance guarantee of the shareholders; also, in many cases, the representatives of a river conservancy or harbour trust; then, again, the local surveyor demands the employment of an architect, and so on, so that it very often happens in small works, at any rate, that developments are not made simply because of the delays and difficulties that these prolonged negotiations involve. I have every reason to believe that these processes are very much simplified for the German industrialist, and that the simplification is the outcome of excellent staff work by somebody, somewhere.

Meeting the directors and staffs of these factories from day to day, one could not but be impressed by the breadth of their scientific knowledge and the minuteness of their acquaintance with the details of their own industry. Their facilities for work were excellent—large, airy offices and laboratories, good libraries, etc., and, in fact, all the equipment that makes life worth living to an educated man. But, over and above all this, one was particularly struck by the wide knowledge of chemical plant possessed by the younger men. Speaking very generally, a works chemist of thirty in England who has earned his own living since he took his degree has not held responsible positions in many works, and his knowledge of plant is limited. This would not be so under a system whereby technical men could proceed from one works to another to gain a varied experience.

In the smaller German chemical works there is also evidence that the chemist is well served by the engineer. In this country a small works appears to start in a very small way indeed by purchasing odd pieces of plant here and there, then gradually extending its buildings and "feeling its way." One year it buys a lorry, and the next year a second boiler, and so on. The process adopted is usually one that is known to be worked already with profit elsewhere, and is run in competition. There are, of course, many small factories of this type in Germany, but in most cases they are laid out in detail on paper in the first instance, the business policy of the company is arranged, sites are laid down, and transport conditions arranged at the very outset. Then money is put up, a large share being generally held by some bank, and the work goes forward on definite lines—*not to enable the undertaking to make a start*, but *to enable it to deliver certain quantities of goods on certain dates to certain specified customers.*

Success on these lines depends largely upon the service of good chemical engineers. We have too few chemical engineers in this country, and we lack even an adequate supply of draughtsmen. Most plant is of iron or steel, and so can be obtained in Germany cheaply and promptly. German chemical industry need fear no shortage of plant as soon as it can pay for it. English chemical industry can pay for it but cannot get it.

The picture conjured up by German chemical industry to-day is team work in its highest development. Partly as a consequence of this, one notices everywhere the most stringent economy of materials and men but the most lavish expenditure of capital on plant designed to work with a minimum of attendance. It is as rare to see a man shovelling anything as to see a waste product; even calcium sulphate, the tangential blind alley, as it were, to so many cycles of chemical operations, is either washed, dehydrated, and sold as gypsum, or, as at Leverkusen, it is mixed with sand and clay and converted to sulphuric acid and cement. This may all be traced to the thoroughness with which the whole cycle of operations is studied by the chemist in the first instance, the sureness with which the chemical engineer lays out every detail of the plant, and the experienced confidence of the banks. Plants are not put down piecemeal, haphazard, with a view to catch some temporary gain, but as the essential part of a far-seeing policy which takes the world market as its main consideration.

With regard to the chemists themselves, the situation is somewhat unique. There is a great over-production of aspirants to the profession both in this country and in Germany. In England it is said that, owing to the Government grant system, there will be double the normal output for at least three years, whereas the demand will probably not increase. These chemists are, of course, needed, but they will not be wanted. In Germany the over-production will be greater, so much so that the *Bund angestellter Chemiker und Ingenieure* has circularised the students, urging them to choose some other profession. At the present time there are three big organisations whose main object is to further the interests of technology and industry:—

(1) The *Reichsverband der deutschen Industrie*, a kind of federation of German industries whose main interest is the development of export trade. The federation of German chemical industries will naturally form part of this.

(2) The *Deutscher Verband Technisch-Wissenschaftliche Vereine* is a federation of societies, associations, and unions of technical men, which issues lists of the names of its members, publishes an excellent handbok, but takes no direct part in organising industry.

(3) The *Reichsbund Deutscher Technische Berufstände* is a league of technical professional men, to which all kinds of technical and professional associations subscribe, including the two main bodies, to which are affiliated the very numerous special chemical societies. These two bodies are the *Verein deutscher Chemiker*, which is the professional organisation for chemists, and the *Bund angestellter Chemiker und Ingenieure*, which includes among its members the majority of the academically trained works chemists and engineers. As an example of the activities of the latter association, it may be mentioned that in September last it secured for all its members in the Berlin area a minimum wage of 500 marks per month, with certain stipulated increases; and it also arranged terms of agreement between certain firms which were offering prizes for the best descriptions of processes and the competitors. It will be easy to understand that a *rapprochement* between the *Verein* and the *Bund* was not easy to arrive at, but nevertheless an agreement was concluded between them in November last.

It has always appeared strange that the Englishman, who in sport always plays for his side, should in business prefer to play a lone hand, whereas the German, having no sport other than his business, always plays on a highly developed system of combination of interests.

The power of German chemical industry lies in its policy of united effort with control extending to every detail. The organisation of an industry as one big, self-contained industrial body involves the abolition among its parts of useless competition under which one product may be made on a small scale in a number of little works, and some badly needed intermediate may not be made at all, but must be imported. Municipal bodies, railways, inland revenue authorities, harbour trusts, and so on are pressed to frame their regulations in sympathy with the needs of chemical industry, and not blindly to adhere to edicts laid down when the value and technical qualities of chemical products were less well understood than they are now. Under such organisation the post-graduate training of chemists and engineers is not left to the initiative and energy of the individual—his combativeness is rather reserved for the technical difficulties of his profession—but is arranged for him by the industry which will eventually reap the reward of his expert services. And this mode of organisation carries with it the provision of chemical plant, not made in odd corners of engineers' and boiler-makers' shops, but in factories specialising on definite lines to produce plant of the necessary design and quality.

It must also be remembered that the interchange between firms of members of their technical staffs is necessarily accompanied by the pooling of information, and that this is supplemented by co-operation between the buying and selling organisations.

In this country the Army and the Aliens Act, together with certain protectionist legislation, alone stand to-day between us and the extinction of synthetic chemical industry. During the last five years our industry has enjoyed the most wonderful protection of Providence. Chemists were withdrawn in large numbers from positions of risk and danger in the field; many of those who had never seen the inside of a factory learned to handle plant and workmen; and men from University staffs got into close touch with the proprietors and managers of chemical works. All this was done under a system of restricted or prohibited imports. Now that the shielding influences are being one by one withdrawn, trench warfare behind barbed wire will develop into battles in the open. Man for man we shall have to hold our own; our plant and our training will be put to a severe test; but the whole issue will depend upon the collective action of the big chemical industries in this country and upon the efficiency of their "staff work."

NEWS FROM THE SECTIONS.

AMERICA

At a meeting of this Section on January 16, at the Chemists' Club, New York, Dr. Charles F. Chandler was presented with the Perkin Gold Medal for his distinguished scientific achievements.

After some introductory remarks by Mr. C. E. Sholes, chairman of the Section, and some reminiscences by Dr. M. C. Whitaker, who was associated with Dr. Chandler at Colombia University, the presentation was made by Prof. Marston T. Bogert, president of the Society of Chemical Industry in 1912—13. The medal, he explained, is awarded annually to the American chemist, who, in the opinion of a jury of his profession, has done most to advance the progress of chemistry. The original medal was conferred upon Sir William Perkin by the parent Society in recognition of his discoveries which lead to the foundation of the coal-tar dye industry.

In reviewing the life of the recipient, Prof. Bogert stated that he studied at the Lawrence Scientific School of Harvard University, and at the University of Göttingen, where he graduated. On returning to the United States he became assistant instructor in chemistry at Union College, Schenectady. As this post did not carry any emolument, he was forced to serve simultaneously in the same institute as a janitor at a salary of $400 per annum. In 1864 he was called to Columbia College, and became one of the founders of its well-known School of Mines; and he served as the Mitchill professor of chemistry in Colombia University until his retirement in 1911. He is also regarded as the founder of the American Chemical Society, which he twice served as president.

In addition to his educational work, Dr. Chandler acted as a consultant to the sugar, petroleum, coal-gas and photographic industries; he conducted important researches which led to an increased production of caustic soda, and he originated many important manufacturing processes. As a petroleum expert he introduced standards and tests for kerosene which practically eliminated accidents from its use. He also enforced standards for the purity of milk and initiated a campaign against adulterated liquors and spoiled food. Although 84 years of age, Dr. Chandler is still practising his profession as advisor to chemical manufacturers on the best means of utilising the 4,000 foreign chemical patents taken over by the Alien Property Custodian.

MANCHESTER.

The annual dinner was held at the Grand Hotel on January 22. Mr. J. Allan, chairman of the section, presided, and announced with regret that Mr. John Gray was unavoidably prevented from attending. He also paid a tribute to the excellent work which Mr. Gray was doing as president of the Society.

Mr. W. Thomson, vice-chairman of the Section, presented to Mr. L. E. Vlies an illuminated album as a mark of esteem from the members on his retirement from the office of honorary secretary, which he had filled so successfully from 1913 to 1919. Mr. Vlies, in his reply, remarked on the very small number of hon. secretaries which had served the Section, and conveyed his sincere thanks to the members and to the late chairmen, who had guided and stimulated him during his tenure of office.

Prof. F. L. Pyman, in proposing the toast of "The Chemical Industries of the District," laid stress on the enormous number of students now studying chemistry and of the need for *liaison* between the industry and the chemical schools. Dr. Herbert Levinstein responded. The acquaintance with chemical factories which many professors had acquired during the war would be of great service to them in training young students, and it was worthy of note that it was not until academic leaders had distinguished themselves in industry that the rush to the chemical schools had occurred. The war had undoubtedly awakened the people to a knowledge of the national value of the organic chemical industries; had the revelation come earlier the war would have been of much shorter duration; and the present and prospective development of these industries were the best guarantee of future peace. Dr. E. F. Armstrong, who also responded to the toast, recalled the pioneer work of the late Ivan Levinstein in founding the British dye industry, in protecting it against the encroachments of the foreigner, and in building up the nucleus around which the present industry had developed. He also emphasised the need, particularly in the organic branch, for research work and for trained workers, who must be offered adequate financial inducement. The British were pre-eminent in the possession of financial intelligence, but this had too often been applied on the "get-rich-quick" principle; healthy development would only ensue on the basis of large organisations, co-operative action, ample financial resources, preparedness to risk large sums of money, and patience to await results.

NEWCASTLE.

The meeing held on January 26 was devoted to the reading of two papers on tungsten. Prof. P. P. Bedson presided.

Mr. J. Coggin Brown, in his "Notes on the Distribution and Mining of Tungsten Ores in Burma," dealt in the first place with the early research work on tungsten, and stated that the commercial life of this metal dates from 1847, when Oxland patented a method for the preparation of sodium tungstate and metallic tungsten. In 1857 he patented a preparation of alloys of tungsten with iron, steel, and nickel.

In 1910 the world's production of tungsten was about 6,000 tons of 60 per cent. WO_3 concentrates, the chief producing countries being the United States, Portugal, Queensland, the Argentine and Bolivia. In 1911 Burma, with an output of 1300 tons, became the leading producing country, and kept the lead until 1916. Although Germany had no domestic or colonial supplies of importance, she was said to control two-thirds of the world's production in 1913, and British steelmakers usually obtained their supplies of finished tungsten products from the German manufacturers.

The most important metallogenic province is the Sino-Malayan one, which includes Burma, the Shan States, the Malay States, the Dutch East Indies, Siam, Tonkin and South China. In Burma, wolfram and cassiterite always occur in direct association with the granite ranges which stretch from the Shan States to the extreme south of the province.

The early methods of mining were very primitive, and the industry still suffers because they are not entirely eradicated. Of late years, however, improved methods have been used. Tributing, though still largely practised, is controlled; deep level work is carried on by compressed air-driven drills; concentrating mills have been erected, and large-scale mine plans and sections are required by law; hydraulic machinery is being installed. Wolfram is a difficult mineral to recover even by the most modern devices, as it breaks into thin mica-like plates when powdered. The best method, in the opinion of the author, is to sort the ores by means of coarse crushing in rolls, sizing and jigging.

Before 1916 the mixed concentrates were wholly shipped as they came from the mines. Then a magnetic separating plant was installed by the High-Speed Alloys Mining Co., Ltd., so that some part of the output is now separated before export. The machines used are of the Ulrich type.

In "A Few Notes on Tungsten," Mr. T. W. Moore outlined the history of the manufacture of tungsten and tungsten steels, and gave typical anlayses of its ores as prepared for the smelter, and of ferro-tungsten. He also outlined some of the methods for extracting tungsten, dwelling more especially on the production of ferro-tungsten in the electric furnace, and concluded by describing in detail the quantitative determination by fusion with alkali and subsequent precipitation with mercurous nitrate.

GLASGOW.

A meeting was held at the Royal Technical College on January 27, with Mr. Q. Moore in the chair.

Mr. W. H. Nuttall read a paper on "Wetting Power and its Relation to Industry." The factors influencing the power of a liquid to wet a solid surface were described, emphasis being laid on the fact that it is the interfacial tension between a liquid and a solid, rather than surface tension, which determines the wetting power. Since most solids requiring to be wetted in industrial operations are usually already coated with a greasy or waxy layer, the wetting liquid must also possess some slight solvent action on such substances. The part played by surface concentration (adsorption) in the wetting power of certain liquids, *e.g.*, saponin solution, was also considered.

In describing various methods for comparing the wetting powers of liquids, the author gave details of a method he had employed for some time which was based on the use of Donnan's "drop pipette." In this method a standard oil is made to represent the surface to be wetted; the lower the interfacial tension of the wetting liquid towards the oil, the higher is its wetting power.

The factors conducive to the formation of good emulsions of oil in aqueous liquids were next described, as well as those necessary to give a permanent foam. Since the chief requisite for a good oil emulsion is a low interfacial tension of the oil to the aqueous liquid, a good emulsion has always a high wetting power. Donnan's "drop pipette" can also be used for measuring emulsifying power. The important part played by wetting in various industrial operations was illustrated by reference to the minerals separation flotation method, to disinfectants, cattle dips, tree sprays, and to the use of soap, Twitchell's reagent, etc.

LONDON.

At the meeting held at Burlington House on February 2, Mr. Julian L. Baker presiding, Mr. H. M. Wells and Mr. J. E. Southcombe contributed a paper entitled "The Theory and Practice of Lubrication: The Germ Process."

The primary object of the authors was to elucidate the reason for the superior lubricating efficiency of fatty glycerides over "straight" mineral oils. The distinction was emphasised between the lubrication of fast-running shafts with a large excess of oil, where the frictional values are a function primarily of the oil viscosity, and the slow-speed, high-bearing pressures where viscosity measurements no longer assist in the choice of the lubricant. In view of the fact that only those liquids which "wet" a solid surface possess lubricating powers in the generally accepted sense, experimental work in the direction of capillary relationships seemed to be indicated, and this, on being undertaken, at once yielded results of great value and interest. It was found that the interfacial tension against water of vegetable and animal oils was very much lower than in the case of a mineral oil, and that this lowering was due to the slight content of free fatty acid in the fatty oils; by removing the free fatty acids from the saponifiable oils the tension rises, and by adding free fatty acids to the mineral oil the tension can be lowered. It follows that if a substance be added to an oil which brings about a lowering of interfacial tension, such addition will act favourably as far as lubrication is concerned by preventing a rupture of the liquid film and consequent direct contact between the metals. Mr. L. Archbutt concludes from experiments which he has recently communicated to the Physical Society that the addition of 1 per cent. of free fatty acids to a mineral oil lowers the frictional co-efficient to the same extent as does 60 per cent. of pure rape oil, and thus lends support to the authors' contention that it is not the glyceride, but the free fatty acids in a compounded oil which improves its lubricating value. This principle of making lubricating oils by adding to mineral oils small quantities of fatty acids or substances which lower the interfacial tension has been accepted by the Patent Offices in all civilised countries.

In the second part of the paper the application of the relevant physico-chemical principles was further elaborated, and the reasons which influenced the authors in the adoption of the term "germ process" were explained. Various specifications of oils suitable for different types of lubrication were discussed and criticised, and a warning given against the idea that the haphazard addition to mineral oils of fatty acids of unknown origin and composition would in all cases prove satisfactory. In the ensuing discussion Messrs. Archbutt, Arnold Philip, Southwell, Ormandy, Drummond, and Prof. Brame took part, and a letter was read from Prof. Donnan. Some of the speakers thought that the adoption of the term "germ process" was somewhat unfortunate, as being likely to lead to misunderstanding owing to its ambiguity.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

The January meeting was held at Stourbridge on the 21st, the president, Mr. S. N. Jenkinson, occupying the chair. Dr. W. E. S. Turner, in an address on "The Factory Inspection of Glassware," said that except in the cases of table ware and optical glass there had never been any real attempt at systematic inspection. Every article should be carefully examined in the blank state before it was passed on to be decorated; a sound glass industry could only be built up on quality. Dr. Travers emphasised the need of selecting competent glass experts as inspectors, and Mr. J. Northwood said that in pre-war days much material was rejected in order to keep Stourbridge ware up to the highest standard of excellence on account of competition from abroad; it was possible that the standard had declined during the war period.

Lieut.-Col. Thomas read a paper on "A Glass-house Pot of Special Construction," and exhibited an experimental pot of Stourbridge clay and a separate crown showing a groove in which was an asbestos rope. The object of making the pot in two parts was to get a denser body and quicker drying, as it was known that the life of a pot was improved if the interior surface could be worked upon when in a hard and toughened condition. On the Continent it was the ordinary practice, with pots which were made in moulds, to heat the inside surface after it had become hard, but this was impossible in the case of covered pots because the required condition of hardness and toughness was not reached until after the crown had been put on. The object of the asbestos rope was to form a jointing cushion between the pot and crown, thereby preventing the entrance of dust or furnace gases; in practice it was found that the asbestos cushion makes a thoroughly effective gas-tight and dust-tight joint, and it could either be applied loose or cemented into the joint with a fixative. The pot exhibited had been made in a solid mould with a core, the clay being brought into a suitable condition and rammed into a dense body with a wooden rammer during the process of manufacture. The result was a much stronger and denser body than the ordinary hand-built pot. In the discussion some doubt was expressed as to whether the asbestos rope would withstand for long the high temperature of the furnace.

Dr. Turner also read a paper on "The Relative Durabilities of Potash and Soda Glass for Artistic and Table Ware."

SOCIETY OF PUBLIC ANALYSTS.

Dr. S. Rideal presided at the annual meeting, held at Burlington House, W., on February 4, and delivered an address. Officers and council for 1920 were then elected, Mr. Alfred Smetham becoming president.

An ordinary meeting followed, at which Messrs. F. S. Sinnatt and L. Slater read a paper on "An Investigation into the Composition of the Unsaturated Hydrocarbons present in Coal Gas." The authors have separated the bromine addition products of the unsaturated hydrocarbons present in coal gas in quantities sufficient to allow of a separation of the more volatile compounds. Their experiments show the percentage composition of the unsaturated hydrocarbons to be:—Ethylene, 84 and 84·3; propylene, 13·4 and 11·8; butylene, 1·75 and 2·35; amylene, 0·97 and 1·54.

In a contribution on "The Estimation of the Available Oxygen in Sodium Perborate and in Perborate Soap Solutions," Mr. H. Trickett defined the optimum conditions for carrying out the volumetric methods based on the use of permanganate and potassium iodide. He also described a gas volumetric method based on the reaction:—

$$NaBO_3+CaOCl_2+H_2O=NaH_2BO_3+CaCl_2+O_2,$$

which is stated to be as reliable as, and more rapid than, the iodometric method, and which can be directly applied to soap powder mixtures.

CORRESPONDENCE.

THE BRITISH OXYGEN INDUSTRY.

Sir,—In the recently-issued Report of the Nitrogen Products Committee certain statements are made on pages 57 and 58, obviously intended to reflect on this company. As these statements are entirely inaccurate and calculated to mislead many people, I shall esteem it a favour if you will afford me space to make the necessary corrections. I will deal with the points seriatim:—

1. The Report says that "it appears from information at the disposal of the Committee that the recovery and utilisation of by-product oxygen from nitrogen plants has been checked by restrictive clauses in trade agreements."

There are not, as yet, any nitrogen plants installed in this country, and the only order for such a plant was entrusted to us. It consisted of three large units of the liquid-air type, destined for the Committee's belated and unfortunate adventure at Billingham. In the contract there is no mention of any restriction on the use of the oxygen residual. None was ever suggested or contemplated by us. Even a royalty, to which we might have been legally entitled, was not asked for, and the contract for the plant was accepted on a basis of 10 per cent. profit on cost, a profit which we need hardly say is never likely to be realised.

2. The Report states that "the oxygen and liquid-air industries in this country cannot be said to have enjoyed a free and unrestricted development on a competitive basis, and the prices hitherto prevailing for the compressed and liquid products have not been conducive to their employment to the fullest extent."

This company, established 34 years ago, was the first successful commercial enterprise in oxygen, and may justly claim to have founded the world's present industry in that gas. Competition has frequently been experienced by the company in the course of its development, and will, no doubt, be experienced again. Whether that will lead to a freer and less restricted development than hitherto is a matter for competent consideration in the light of the following facts:—

Oxygen is a supply business analogous to electricity and coal gas. For cheap distribution it has to be produced locally whenever the demand is sufficient to yield an adequate return on the capital involved. This company has steadily pursued that policy. We have to-day oxygen factories in all important industrial centres throughout the country—11 in operation, and others in hand. I believe that no country is better supplied with oxygen factories than England. I know, at any rate, that in France and the United States of America, where competition prevails to a marked degree, the selling price of oxygen is higher than it is here.

3. The Report states that "prior to the war the selling price of oxygen to fairly large users inclusive of the cost of compression into cylinders, of hire of the latter, and of freight was of the order of 1d. per cubic foot, or, say, £4 per 1,000 cubic feet."

It is to be hoped that this statement is not a fair specimen of the general degree of accuracy throughout the Report. Prior to the war the average selling price of oxygen in this country was considerably less than half the figure quoted above. This average includes not only industrial supplies in large quantities, but also the gas supplied in small cylinders for medical and entertainment purposes. No charge is made for the hire of cylinders for periods varying from a fortnight to a month, but afterwards a small rent charge is made in order to prevent their unreasonable detention. The average cost of transport is only a few shillings per 1,000 cubic feet.

For the year ended March 31, 1919 (the last audited record), the average increase on pre-war figures in the cost of producing, compressing and handling 1,000 cubic feet of oxygen was 8s. 6d., whilst the average increase in the selling price was less than half that amount. I think even Government officials must admit that there is not much evidence of profiteering in these facts.

4. The Report states that "attempts have been made in this country by lampmakers (electric) to induce the liquid-air industry to take up the commercial manufacture of argon, but so far without success."

There is not a vestige of truth in this statement. This company has expended many thousands of pounds in connexion with the production of argon. Prior to the war we had conducted considerable experimental work, and an argon producing plant was in hand when war broke out. Owing partly to war pressure and the paramount necessity for giving precedence to oxygen supplies, but owing even more to the absence of reasonable assistance from the Government in the matter of labour and material, our first plant was only started shortly after the armistice. It has been in operation, as required, ever since, and a second plant is now being erected in another works. Our difficulty, however, is to find a market for the gas.

I may add that, in addition to the above extracts, there are further statements in this Report relating to oxygen and other gases with which we entirely disagree, but, as these are put forward as expressions of opinion rather than fact, I will not trespass on your space with further criticism.

I desire, however, to add in conclusion that there is no shortage of oxygen production in this country. The trouble lies in the distribution of the gas, and this is due entirely to the fact that the production of oxygen cylinders was virtually stopped by the Government during the war. This official action was adopted to enable vast quantities of hydrogen cylinders to be manufactured for air-ship developments which never materialised. Thousands of these cylinders are now lying unused and deteriorating in air dumps throughout the country, whilst oxygen supplies are being starved and work of national importance retarded for lack of cylinders. This matter might well be investigated by some competent and independent engineer of recognised authority on behalf of the Government. It would afford this company gratification to have a similar investigation made regarding the oxygen position before, during, and since the war. I venture to predict that it would bring to light a striking example of the harm which can be effected by ignorant and prejudiced official interference with a well-conducted, highly technical and responsible industry. It would, I think, also disclose the true source of misleading statements such as those referred to in this letter.—I am, Sir, etc.,

THE BRITISH OXYGEN COMPANY, LIMITED.
K. S. MURRAY,
Managing Director.

January 27, 1920.

THE POINTOLITE LAMP.

Sir,—In the current number of the Review (Vol. 39, page 34 R), in your account of the joint meeting of the Faraday, Royal Microscopic, Optical and Photomicrographical Societies, I notice a statement that the Pointolite lamp " is at present . . . . hardly powerful enough for use with high magnifications, but larger types up to 4,000 c.p. have been recently put on the market." Lest this discourage or mislead anyone who is thinking of adopting what is, in my opinion, the most perfect form of illumination for photomicrography at present obtainable, may I draw your attention to a paper communicated to this meeting by Dr. R. E. Slade and myself? In this we describe the form of apparatus used by us for the rapid production of photographs at 2,000 magnification and employing a Pointolite lamp *of only* 100 *c.p.* For all ordinary high-power photomicrography this is quite sufficiently intense—it is a matter of common consent that a magnification of 2,000 is in most cases high enough—and using practically monochromatic green light our exposures are only from 2 to 10 seconds, quite short enough for convenience.

It should, moreover, be noted that the mere substitution of a higher candle-power Pointolite lamp for a lower one does not, *caeteris paribus*, shorten the exposure, as the extra power of the lamp is due to an increase of size of the light source, the intensity per unit area remaining the same. The intensity of the projected image can be increased only by the introduction into the condensing system of a suitable lens, which, while reducing the size of the image of the light source thrown on to the object (this is permissible on account of the increased size of the source), increases its intensity and consequently that of the projected image.—I am, Sir, etc.,

British Photographic Research Association. G. I. Higson.

Feb. 5, 1920.

PERSONALIA.

We record with deep regret the death, on February 1, in his seventy-ninth year, of Mr. C. E. Groves, F.R.S., an original member of this Society.

Dr. Samuel Smiles, professor of organic chemistry at Armstrong College, Newcastle-on-Tyne, has been appointed to succeed Prof. A. W. Crossley as Daniell professor of chemistry at King's College, London.

Mr. F. H. Carr has been elected to a seat on the board of directors of The British Drug Houses, Ltd.

Mr. R. L. Frink, of Lancaster, Ohio, U.S.A., has been appointed director of research by the council of the British Glass Research Association.

Mr. A. V. Hill, F.R.S., lecturer in physiology in the University of Cambridge, has been appointed to the chair of physiology in the University of Manchester.

Dr. Harold Hibbert, formerly a consulting chemist in Toronto, has been appointed assistant professor of organic chemistry in the University of Yale.

A gift of £20,000 has been made by Mr. S. B. Joel and Mr. J. B. Joel to the Senate of London University for the endowment of a chair of physics, tenable at the Middlesex Hospital Medical School.

Dr. Charles Crowther, lately professor of agricultural chemistry in the University of Leeds, has been appointed director of the research department recently established by the Olympia Agricultural Co., Ltd.

The post of chief librarian at the Patent Office has been filled by the appointment of Mr. Allan Gomme, formerly an assistant examiner of patents.

M. Metzner, lecturer in chemistry in the University of Dijon, has been appointed professor of applied chemistry in the same University.

Prof. T. S. Vincent, professor of physiology and bio-chemistry in the University of Manitoba since 1904, has been appointed to the University chair of physiology in the Middlesex Hospital Medical School. Dr. H. E. Roaf, lecturer at St. Mary's Hospital Medical School, has received a similar appointment at the London Hospital Medical College.

The Council of the Institution of Mining and Metallurgy has awarded its gold medal to Mr. H. L. Sulman for his work on the separation of minerals by floatation, the gold medal of the Consolidated Goldfields of South Africa, Ltd., to Mr. W. H. Goodchild, and the premium of forty guineas of the same company to Dr. E. T. Mellor.

Dr. E. W. Smith, chief chemist to the City of Birmingham Gas Department, has resigned his position to become managing director of a new private company that is to be formed to deal chiefly with problems relating to fuel conservation. In this work he will be associated with Sir Arthur Duckham (chairman), Sir William Jones, and Mr. W. H. Woodall. Dr. Smith will take over his new duties on June 1, and Mr. T. F. E. Rhead, hitherto senior chemist, will succeed him as chief chemist to the Department.

NEWS AND NOTES.

FRANCE.

Trading with Germany.—The attempt on the part of France to re-establish trade relations with Germany has suffered a great set-back owing to the measures adopted by the latter to counteract the depreciation in the value of the mark. These measures take the form of very strict orders to customs officials not to allow any machinery or chemical products to pass the frontier without levying an imposition equal to the difference between the selling price of the material in Germany and the price at which it is quoted in France. A small allowance is, however, made to French buyers with a view to securing their orders, which otherwise would most probably go to England or the United States. It is obvious that such measures are not conducive to a resumption of normal trade relations. Moreover, attention has been called to the poor quality of the imported German articles, which compare very unfavourably with those obtained before the war. Unless such *impedimenta* as the above are removed, it is anticipated that the interchange of commodities between the two nations will soon dwindle into insignificance.

Coal Production in 1919.—The publication of the statistics of coal production for 1919 has caused bitter disappointment in industrial circles. The production is given at 19,537,843 metric tons (Lorraine excluded), against 26,322,000 tons in 1918. Including Lorraine, the figure for 1919 is 21,863,453 tons. Although the disappointment is not shared to the same extent by those who have followed the industry from within, it is generally agreed that the position would have been better if certain measures had been taken. For example, the miners working in the south and centre of France might have been retained there instead of being returned to their homes in the devastated districts of northern France, where production must be very restricted for some time to come. Further, it is held that the prisoners of war were released too soon, and that the new law curtailing the hours of work was prematurely applied. The criticism advanced in many quarters that more use should be made of coal-cutting machinery is negatived by the fact that the nature of the French coal deposits, the thinness and irregularity of the seams, does not admit of the application of such machinery.

CANADA.

Industrial Water Power Development.—The census of electric stations taken by the Dominion Government shows that over 1,700,000 h.-p. is derived in Canada from water power at central stations, whilst steam provides barely 180,000 h.-p. The average development throughout the country amounts to 276 h.-p. per 1000 of population, which involves a saving of from 12 to 50 million tons of coal, according to the efficiency allowed for in making the comparison. Omitting water-power resources at present remote from civilisation, the grand total of the water-power supply of Canada is estimated, conservatively, at 18 to 20 million h.-p. The developed water power is over 2,300,000 h.-p., nearly 500,000 of which is consumed in the paper and pulp industries, while nearly 250,000 is developed exclusively for the electro-chemical, mining and milling industries. These industries are now drawing attention to the need of instituting some large and comprehensive scheme for developing the St. Lawrence River for water-power purposes.

BRITISH INDIA.

The Indian Chemical Service Committee.—In the issue of this Journal for January 15 (p. 12 R), it was stated that the Government of India was about to constitute a committee to consider the creation of a Chemical Service. Prof. J. F. Thorpe has recently arrived in India to preside over the committee, and is now engaged in collecting the necessary information and discussing the objects of the proposal with the heads of local governments and others. After spending some time in Delhi in consultation with the Central Government, he is making an extensive tour through India and Burma, accompanied by Dr. J. L. Simonsen and Mr. R. W. Davies. Dr. Simonsen was formerly professor of chemistry at Madras University, and later, chemical adviser to the Indian Munitions Board; he is now chemist to the Indian Forest Department. Mr. Davies is a member of the Indian Civil Service and is Director of Industries in Madras. When the tour is completed early in February they will proceed to Simla, to meet the other members of the committee and draw up their report. The other members will probably be Sir P. C. Ray, to represent Indian chemists, Dr. J. J. Sudborough, of the Indian Institute of Science at Bangalore, Dr. Harrison, of the Agricultural Research Institution at Pusa, to represent the agricultural chemists, and Dr. Caldwell, professor of chemistry at Patna, to represent the educational chemists.

In a resolution, dated November 26, 1919, dealing with this matter, the Government of India draws attention to the unsatisfactory system, or want of it, at present existing so far as scientific officers are concerned. It is stated that the present condition of affairs is even less satisfactory to the Governments than to the officers. The terms of reference of the Committee are:—

(1) To consider whether an All-India Chemical Service is the best and most suitable method of overcoming the difficulties and deficiencies.

(2) In the event of the Committee approving the principle of an All-India Service, to devise terms of recruitment, employment, and organisation; to indicate the extent to which chemists already in Government employ should be included in that service; and to suggest what should be the relations of the proposed organisation with the public and with the departments of the Government of India and of local governments.

(3) In particular to frame proposals for the location, scope, and organisation of institutions for chemical research.

The Industrial Commission suggested that the Imperial research laboratories should be placed at Dehra Dun, where the Forest Research Institution is already situated, as well as the headquarters of the Survey of India, and the choice will probably lie between this station and Bangalore, where the existing Indian Institute of Science could be taken over, provided that the consent were obtained of the trustees and of the Mysore Durbar. Neither of these places is very central, but they possess the advantage of fairly good climates.

Trade and Industry.—Two recent publications of the Indian Government* give a considerable amount of interesting information concerning recent developments in Indian trade and industry, and as they are well written and got up in a convenient octavo form they should be procured by all interested in these subjects. The Industrial Handbook is an enlarged and revised version of a booklet that was issued in connexion with exhibitions that were held in 1917–18, and consists of some 38 articles written by those who have been engaged during the last few years in organising trade and industry for the supply of military requirements. Most of them deal each with a separate industry and discuss not only the present position, but also the prospects of future development. Some of the industries discussed have not yet been established in India or are in very early state of development. The manufacture of calcium carbide, for example, which is dealt with by Dr. L. L. Fermor, has not been started, and glue and gelatin manufacture, discussed by Dr. G. J. Fowler, practically does not exist, as it is impeded by the absence of cheap supplies of acid and of a demand for bone meal and other phosphatic manures in the country. The production and manufacture of lac, on the other hand, are practically a monopoly of India, and three articles are devoted to it. W. A. Fraymouth advocates the more general use of seed lac instead of shellac, because it is not only cheaper, but is not so liable to be adulterated. On the other hand, E. C. Ansorge, who apparently reflects the opinion of the Calcutta market, opposes this change, and contends that the users in Europe and America will not find seed lac so satisfactory as the shellac and button lac usually exported from India in the past. The most important industrial development in India during the war was probably that of the tanning industry, and there are three articles dealing with the subject:—Hides, Tanning and Leather, by A. C. McWatters; Researches on Tanning Materials, by W. A. Fraymouth; and the Future of Tannin Extract, by J. A. Pilgrim. Before the war the great bulk of Indian hides and skins was exported in the raw state to Austria and Germany. Now they are mostly sent in the partly-tanned condition to England, and the Indian hides have formed the principal source of supply of leather for the uppers of boots for the whole of the Allied armies. Formerly a large proportion of the hides was injured by faulty flaying; but of late Government pressure has effected a considerable improvement in this respect. Another peculiarly Indian supply is jute, and the jute mills on the Hooghly above and below Calcutta form the most highly-developed industry in the whole country.

* Industrial Handbook, Indian Munitions Board, 1919, price Rs. 1-8 or 2s. 3d.
Handbook of Commercial Information for India, by C. W. E. Cotton, C.S., Collector of Customs, Calcutta, price, R. 1 or 2s.

During the war these have made very good profits. The principal development has been the production of a larger proportion of fabrics and a diminution in the amount of fibre exported.

In the Handbook of Commercial Information the same subjects are treated of amongst others, but principally from the point of view of the export trade. All the principal articles of Indian export are briefly but clearly reviewed, and much useful information is given about Indian ports and trade centres and the general organisation of trade. The statistical and other information contained in both books is fully up-to-date.

UNITED STATES.

Synthesis of Maleic, Tartaric, Citric, Lactic, and Succinic Acids.—At the meeting of the New York Section of the American Chemical Society, on January 9, Messrs. J. M. Weiss and C. R. Downs described their new method of preparing maleic acid by oxidising benzene vapour with air in presence of a catalyst. The authors believe that this method will open up a new field for the use of maleic acid in the preparation of dyes, medicinals, and perfumes, and state that arrangements are being made to manufacture such products on a large scale. Starting from this acid, it is possible to prepare tartaric acid (which, owing to the Prohibition *régime*, can no longer be made from cream of tartar), citric acid, lactic acid (which has lately been used successfully as a feed for pigs), and succinic acid, which can be manufactured cheaply by the new process.

New Method of Manufacturing Phthalic Anhydride.—In the November issue of the *Journal of Industrial and Engineering Chemistry*, Mr. H. D. Gibbs describes experiments on the oxidation of the methyl group of toluene by subjecting mixtures of oxygen and toluene and of atmospheric air and toluene to contact with various catalysts at temperatures ranging from the boiling-point of toluene to about 550° C. The oxides of the metals of the fifth and sixth groups of the periodic system were found to be the most effective catalysts, vanadium being the best and molybdenum the next best. Similar reactions were applied to the manufacture of phthalic anhydride from naphthalene (Gibbs and Conover, Eng. Pats. 119,517 and 119,518; this J., 1918, 684 A), and the conditions to obtain the optimum yield were determined. The best laboratory results showed 82 per cent. of the theoretical conversion. The phthalic anhydride produced is remarkably pure, and is quite free from chlorine or sulphur compounds which were common impurities in the phthalic anhydride formerly on the market. The U.S. Department of Agriculture, in whose laboratories the process was devised, has renewed its offer to co-operate with chemical manufacturers for the purpose of introducing the process on a commercial scale.

Tentative Regulations for the Storage and Use of Fuel Oils.—The Committee on Inflammable Liquids of the National Fire Protection Association, meeting at New York, has drafted a series of regulations for the equipment, tankage, piping, heating, combustion and feeding of oil fuel.

The flash point is to be not less than 150° F. (close test). Tanks should be underground and constructed of galvanised steel or wrought iron, but concrete may be permitted for heavy oils of 20° Baumé and below. Details relative to venting, provision of the usual fittings, and setting are given. For indoor storage the requirements are more stringent and the capacity should be limited, *e.g.*, for ordinary buildings to 5000 galls. Piping, valves, heaters and pumps are similarly treated, and suggested specifications are evolved.

The American Petroleum Institute has tabled a number of objections to the draft regulations; amongst others the flash point of 150° F. is considered too high so long as good venting is provided for; 135° F. has been suggested as a reasonable minimum. Further, it is put forward that so long as the established factor of safety is observed there should be no limit to the dimensions of a tank. The Institute objects to the provision of embankments round a tank which contains fuel oil, although for crude oil they are advisable; and it considers that oil of lighter gravity than 20° B. may be stored in concrete.—(*Chem. and Met. Eng.*, Dec. 24—31, 1919.)

American Oil Shales.—Motor transport in the United States requires an ever-increasing amount of fuel, and it is estimated that there would be 7,602,000 motor vehicles on the road at the end of 1919, with a renewal demand of 1,000,000 cars per annum.

Similarly, the conversion of shipping to oil-firing both in the United States and in Great Britain will necessitate vast amounts of liquid fuel. The reserves of oil in the States, according to the Bureau of Mines, constitute 60 per cent. of the total underground supply, whilst production has reached a maximum, and with a predicted demand of 800,000,000 barrels in 1927 the whole known underground resources will be exhausted in 1928.

The importance, therefore, of exploiting the immense shale deposits is self-evident. In 1918 and in 1919 the Bureau of Mines reported on the shale deposits of North-West Colorado. These deposits are richer than those of Scotland, and it is estimated that at least one barrel of oil will be recovered per ton of shale, together with about 10 lb. of ammonium sulphate. The Colorado shales are apparently several hundred feet in thickness, and on a conservative basis it is reckoned that 110,000 barrels of oil would be produced per acre. At the present time, however, the deposits are inaccessible, and transport facilities would need to be provided. Utah, Nevada and Wyoming all possess valuable deposits.—(*Bd. of Trade J.*, *Jan.* 29, 1920.)

Antimony in the U.S.A. in 1918.—The United States imports antimony ore from China, Bolivia and Mexico, and obtains also a small amount of liquated antimony sulphide from China. During the early part of the war the high price stimulated home production, ore carrying 2100 short tons of metal being mined in 1915. The imports, however, greatly increased, and consequently the price fell. By the end of 1916 many of the American mines were almost non-productive, but the entry of the United States into the war gave them a temporary stimulus. At the close of 1917 nearly all domestic mines had ceased operations. In 1918 the price varied from 14 cents a pound in January to 7 cents in December, and the quantity in bonded warehouses dropped from ten million pounds to five million pounds. Domestic producers could not make a profit at the prevailing prices, and the quantity of ore mined was only about 190 tons, carrying about 50 tons of metal. There is reason to believe that in October, 1919, there was about a year's supply of antimony in stock for the world, together with large supplies of antimonial lead and other alloys. For this reason it is likely that antimony mining will for the present be of little importance. Prior to the war the American market was largely controlled from London, but now that Chinese and Japanese brands have become so firmly established the American market is hardly likely to return to the dominance of British firms.

During the war antimonial lead carrying 12—13 per cent. of antimony was employed in the manufacture of bullets. Antimony sulphide is almost universally used as a constituent of primers in shells and cartridges; and in powder it is used in the charges of some shells to produce a dense white smoke on explosion for range-finding purposes.—(*U.S. Geol. Surv., Oct.* 18, 1919.)

War Gas Investigations.—Bulletin 178 A, an advance chapter from Bulletin 178, War Work of the Bureau of Mines, Washington, is concerned mainly with a statement of the organisation and personnel of the various bodies concerned with the investigation of war gas problems. The work was undertaken initially by the Bureau of Mines in February, 1917, and was transferred to the Chemical Service of the Army in June, 1918. The total sum allotted by the Army for war gas investigations during the year ended June 30, 1918, was $2,212,000, and by the Navy $250,000.

The American gas mask is claimed to be the best in existence, but the first masks shipped overseas did not afford protection against chloropicrin. The soda lime manufactured in America is claimed to be much superior to the English product. An absorbent mixture for carbon monoxide, operative largely through catalytic action, was introduced, twenty grams of the absorbent affording efficient protection for one hour in an atmosphere containing 1 per cent. of the gas. Of all the substances tested for producing smoke clouds (including titanium tetrachloride, zinc dust and carbon tetrachloride, silicon tetrachloride), phosphorus appears to be the best, as, weight for weight, it possesses 40 per cent. more screening power than any other material tried. At the signing of the armistice, the United States was in a position to manufacture poisonous gases in quantity equal to the combined output of France and England, and a plant with an output of 200 tons of mustard gas per day was in course of erection at that date. A satisfactory mustard-gas detector was evolved, and also an impregnating medium for protective clothing. Therapeutic research showed that chlorine, phosgene, and chloropicrin are fundamentally alike in their toxic action. Burns due to mustard gas can be prevented by washing and scrubbing the skin with kerosene a few minutes after exposure. Mustard gas is effective as a toxic agent in the dilution represented by 1 part in 12,500,000 parts of air. A new gas even more effective has been developed.

The production of arsine, calcium and magnesium arsenides, hydrofluoric acid and fluorides, and nitrogen tetroxide for use in the new explosive "anilite" was investigated. A novel method for the removal of iron oxide from glass sand by the use of phosgene has been introduced, and the reaction has other possible applications. The work of the Bureau also included mechanical, physiological, therapeutic, pathological, pharmacological and toxicological research.

GENERAL.

Report on the Benzol Road Test.—The Automobile Association in its endeavour to promote the manufacture, distribution and use of indigenous motor fuel carried out two important tests between August and November, 1919. A 16 h.-p. Sunbeam car and a 4 h.-p. Triumph side-car combination were run 10,000 and 5,000 miles, respectively, under engineering and chemical supervision, benzol being the only fuel used. The standard benzol fulfilled the following specification:—Sp. gr., 0·870—0·880; distillation test, not less than 75% at 100° C., not less than 90% at 120° C., and 100% at 125° C.; total sulphur, less than 0·40%; water white in colour and on being agitated with 90% sulphuric acid during 5 minutes, the acid to show not more than a light brown colour; free from acid, alkali, sulphuretted hydrogen and water; freezing point lower than 7° F. The test was carried out under ordinary touring conditions, and all precautions were taken to ensure a properly observed trial. After the run the engines were dismantled, and the bearing surfaces were found to be in good condition. In the case of the air-cooled Triumph engine, the total carbon deposit on cylinder, piston, valves, etc., was negligible. No physical effects were observable on the lubricating properties of the oil throughout the motor, and no benzol was detected in the crank case. The analysis of the carbon deposit is of interest:—Loss at 100° C., 2·0%; volatile matter, 39·7%; fixed carbon, 34·1%; mineral matter, 24·2%; oil extracted by solvent, 18·3%. Mineral matter:—SiO_2, 18·6%; Fe_2O_3, 52·1%; CuO, 0·1%; S, 0·6%; Al_2O_3, CaO, MgO and undetermined, 28·6%.

"Giornale di Chimica Industriale."—We have received Nos. 3 and 4 of this new monthly journal, which is published by the *Società di Chimica Industriale*, of Milan (Via S. Paulo N. 10). Each number contains original articles, critical reviews, abstracts from foreign journals of recent work, more particularly on physical chemistry, notes of commercial and technical interest, and lists of Italian chemical patents. Among the original articles is one on the nitrogen problem as it affects the world in general and Italy in particular, with statistics of production; another on continuous filtration *in vacuo;* also a detailed account of new machinery used in industrial processes, and a valuable review of work published on essential oils during the period 1914—1918, together with full details of new methods of analysis and the physical and chemical characteristics of various new oils. The price of the new journal is 4.50 lire (3s. 7d.) for a single number, or 40 lire per annum to foreign subscribers.

Supply of Rock Phosphates.—The output of the North African mines is divided by the French Government between the different importing nations. Thanks to the representations of the Ministry of Agriculture the quantity originally apportioned to this country for 1919 was increased last spring to 247,600 tons. In September last further negotiations with the French Government resulted in increasing that quantity by another 30,000 tons. It seems probable that the supply for 1920 will at least be equal to that for 1919. If labour should permit the United States to send us the amount of rock expected, British agriculture should be able to count on sufficient supplies to satisfy the bulk of its requirements during the present and coming seasons.—(*Official.*)

Fate of the Iron Foundries of Lorraine.—The compulsory liquidation of all foundries formerly in German possession has now been effected. Thyssen's works at Hagendingen, for example, among many others, has been sold for 150,000,000 francs (about £6,000,000) to the "Groupement de Consommateurs de Produits Métallurgiques," formed by the union of 32 French industrial firms. The sum of £4,500,000 was given by the "Participations Miniers et Métallurgiques d'Alsace-Lorraine" for the Lothringer Hüttenwerke at Kneutingen.—(*Z. angew. Chem., Dec.* 12, 1919.)

Proposed Extension of the Life of German Patents.—Germany has not yet introduced a law for prolonging the period of patents. In the National Assembly on November 25 last, a motion for extending the periods of patents and designs was introduced by one of the deputies, and was referred by the Government to a special committee. The plan suggested is to disregard altogether the period between August 1, 1914, and July 31, 1919, for patents which had not expired by July 31, 1914, so that the period of a patent would be continued directly from August 1, 1914, to August 1, 1919.—(*Z. angew. Chem., Dec.* 16, 1919.)

Sulphuric Acid and Alkali in Germany.—Users of sulphuric acid complain that they are receiving barely one-half of their necessary requirements. The shortage is mainly due to the fact that the sulphuric acid works in central Germany are mostly lying idle owing to lack of coal; and the production of sulphate of ammonia and of superphosphate is accordingly very restricted. As the home supply of pyrites is inadequate recourse is being taken to importations from abroad.

New maximum prices of sulphuric acid are as follows:—Acid up to 80 per cent. monohydrate, 1482 marks per metric ton sulphur content (formerly 816 mk.); over 80 per cent. up to 90 per cent. (inclusive), 2820 mk. (1408 mk.); highly-concentrated acid over 92 per cent. monhydrate and up to 40 per cent. anhydride, 1740 mk.

The position in the alkali industry has become worse. Several of the biggest producers of caustic soda, *e.g.*, Fabrik Würselen in Rhineland (a branch of the German Solvay-Werke A.-G., Bernburg), have had to close down owing to lack of coal. Very little hope is entertained of a speedy resumption. —(*Z. angew. Chem., Dec.*, 12, 16, 1919.)

Nitrogenous Fertilisers in Germany.—The total possible output from existing plants is estimated at 500,000 tons of nitrogen, 60 per cent. of which could be produced by the Haber-Bosch process, and 20 per cent. each by the cyanamide works and the gas and coke industries. In October, 1918, the industry had so far recovered that 25,000 tons of nitrogen was being delivered per month, when further progress was interrupted by the revolution. The demand for artificial nitrogenous fertilisers is very great, since all farmers are now convinced of their importance and value. With the co-operation of the Government, the five leading producers of nitrogenous fertilisers have formed a syndicate, the object of which is not to make large profits, but to increase output, to exercise control over prices, and to secure fair distribution. Attached to this syndicate is a committee on which both producers and consumers are represented; by mutual concessions and adjustments between these it is hoped that the German farmer will be able to obtain his nitrogenous fertilisers three times cheaper than if he imported them from abroad.

The 18 per cent. of the total nitrogen supplies contributed by gas works before the war has now sunk to 5 per cent.; but these will continue to manufacture sulphate of ammonia in order to make full use of their plant. The shortage of sulphuric acid is being relieved to some extent by the production at gas works of a spent mass containing up to 50 per cent. of sulphur, which modern combustion furnaces are capable of burning direct to sulphuric acid. Should the supply of sulphuric acid fail absolutely, gas works can fall back on the process introduced by the Badische Anilin- und Sodafabrik by which ammonia is converted into ammonium sulphate *via* gypsum.—(*Z. angew.* Chem. Dec., 19, 1919.)

Competition for the Swedish Saltpetre Market.—The *Svensk Handelstidning* for November 5, 1919, remarks that the fact that the German process of atmospheric nitrogen fixation is economically cheaper than that carried out by the Norsk Hydro Company of Norway renders the nitrate question of especial importance to Norway.

Immediately before the war Sweden imported annually about 35,000 metric tons of nitrate, chiefly from Chile. Norwegian saltpetre being subject to an import duty of 15 per cent. was seldom seen on the Swedish market, but this import duty has now been removed, and it is anticipated that more Norwegian material will be imported. The cyanamide process of fixing atmospheric nitrogen, which was amongst those experimented with in Sweden during the war, appears to be capable of commercial exploitation in the country. The keenest competition is anticipated between the Norwegian and Chilean products. At present the Norwegian product costs 46 kronor per 100 kilo., free of import duty, the Chilean 55 kr. per 100 kilo. (krona=1s. 1½d.). As the former contains 13 per cent., and the latter 15 per cent. of nitrogen, the respective prices are 3·54 and 3·67 kronor per kilo. of nitrogen. Extensive experiments in Germany, Denmark and Sweden have shown that the Norwegian product is fully up to expectations.—(*Z. angew. Chem., Nov.* 28, 1919.)

The Flax Fibre Industry in St. Helena.—The year 1918 proved a very successful one for the flax fibre industry in St. Helena, 516 tons of fibre and 222 tons of tow, with a total value of £61,136, being shipped during the year. Good profits were obtained partly because of the low wage standard, and partly because the colony was fortunate enough to get its produce shipped while the high war prices still prevailed. The average price paid for leaves was 88s. per ton, as against 32s. 6d. per ton in 1915.

During the early part of the year an attempt was made to obtain fibre from the stalks of wild ginger, but the small yield—about 2 per cent. of fibre and 3 per cent. of tow—would not pay for milling in normal times.—(*Bd. of Trade J., Dec.* 25, 1919.)

Commercial Value of Palmetto Leaves. — The palmetto tree, found extensively in Morocco, is of considerable commercial value, as it yields fibre, paper pulp, tannin, gallic acid, alcohol, fecula, fuel, and cattle fodder. The fibre, under the name of "vegetable hair," is used to replace esparto in basket-making, etc., and the more costly American sisal in ropes and sacking. Palmetto leaves can be used for the manufacture of a paper pulp, which is more easily produced than esparto, and which requires only half the quantity of soda; the low yield —28 per cent., against 40 for esparto—is compensated for by the low cost of palmetto and economy in production. The pulp is easily bleached, supple, and fibrous; it also felts well and can be made into very thin sheets, giving a good quality paper equal, if not superior, to esparto paper. Before the war 50,000 to 60,000 tons of this pulp was exported from Algeria.—(*Bd. of Trade J., Jan.* 1, 1920.).

The Anhinga Fibre Industry.—The Anhinga plant is a native of the State of Para, Brazil, which is said to be capable of producing 100,000 tons annually. Anhinga is the raw material from which linen paper is made, and by a chemical process it is convertible into very fine white fibres which compare with first-quality cotton. The fibre is permanent. The industry has to compete with that of rubber, but abandoned sugar mills are being utilised for the treatment of the fibre. One mill already produces 600 kilo. daily. The price at Para is 300 to 350 reis per kilo. (4½d.—5d. per lb.). —(*U.S. Com. Rep., Nov.* 15, 1919.)

Sugar Cultivation in Siberia.—To meet the Siberian demand for sugar ten large factories producing annually 72,220 short tons would be needed. This demand cannot at present be met, and importation is undesirable because it would lead to a further depreciation in the value of the rouble. The organisation of the beet sugar industry has been considered by the Association of Siberian Engineers, and three years' experiments have shown that the sugar beet will grow in many places in Siberia with high sugar content and of extremely good quality. Near the village of Pavlovsk, in the Barnaul district, 11,286 acres has been leased from the Government for beet cultivation and sugar extraction. State funds have been appropriated to encourage the industry, and premiums on production will be paid for several years. To the factory in Pavlovsk the annual premium will amount to over a million roubles. In consequence of this encouragement a joint-stock company, with a capital of 10 million roubles, has been formed. (See also this J., 1919, 378 R).—(*U.S. Com. Rep., Nov.* 19, 1919.)

Glauber's Salt in Siberian Lakes.—The supplies of precipitated Glauber's salt in some of the Siberian lakes are estimated to be: (1) The Great Marmyshansk Lake, 2,600,000 short tons of crystalline salt, $Na_2SO_4.10H_2O$, and 397,210 short tons of evaporated Glauber's salt; (2) Little Marymyshansk Lake, 451,400 short tons of crystalline salt; (3) Lake Tuskal (Minusinsk district), up to 1,805,500 tons of crystalline salt; (4) Lake Varche (Minusinsk district), up to 1,805,500 tons of precipitated crystalline salt, and an enormous quantity of Glauber's salt in solution.—(*U.S. Com. Rep., Nov.* 17, 1919.)

The Iron Ore Deposits in South Russia.—The British Economic Mission in South Russia reports that the normal production of iron ore at the Krivoy Rog Mines is about 400,000,000 pouds yearly (62 pouds = 1 ton). In 1913 the output of this region accounted for 69 per cent. of the total Russian production. At present all mines are at a standstill. Allowing for a reserve stock of 30,000,000 pouds, the stocks of iron ore in mines and factories leave 100,000,000 pouds at the disposal of South Russian factories, equivalent to four months' full supply. Reckoning half-finished material in hand, the factories are safeguarded for full-speed work for eight months. It is estimated that with the gradual reopening of factories existing stocks will suffice for 1½ to 2 years. Iron ore can at present be exported from Dolinskaia to Nikolaeff, and thence by sea.—(*Bd. of Trade J., Nov.* 27, 1919.)

The Chemical and Allied Industries of Turkey.—In normal times Turkey imports annually more than £800,000 worth of chemicals, drugs, dyes, medicines and tanning materials, over 40 per cent. of which was derived from France and Germany. The only large chemical works in Turkey is the Government factory at Makrikoi, near Constantinople, producing such products as sulphuric acid, nitric acid, alcohol and ether, in addition to munitions of war. In Turkey, the manufacture of sulphuric acid, even as a by-product, does not pay. The largest and only modern lead smelter in the country is situated at Balia-Karaidin, and has a normal annual output of about 14,000 tons of metal. With this exception, Turkey possesses no metallurgical establishments worthy of mention. Sulphur is mined at Sparta, and raw saltpetre is recovered from the soil at Konia and Caesarea. There are two modern cement factories, at Daridya and Eski-Hissar, producing annually 80,000 tons of cement, equal to about two-thirds of the annual domestic consumption, and 35,000 tons of hydraulic lime. It is anticipated that Turkey will soon be able to produce sufficient cement to meet home demands.

The ceramic industry of Turkey, which formerly enjoyed considerable fame, is now in a state of decay. Feeble attempts to revive the ancient art of faience manufacture have not met with much success. A number of glass factories has been dismantled, and the manufacture of glass in the country is being generally abandoned for economic reasons.

Constantinople possesses three and Beirut one modern gasworks. Two of the former are now idle. The gasworks at Beirut also manufactures ice. Raw phenol, tar and coke briquettes are recovered or prepared in a very primitive manner at Dolma-Baghtche. Carbon dioxide and oxygen are manufactured at Balat, the works being under German management.

The oil industries are the most important economically. Olive oil is produced on the south coast of the Sea of Marmora, on the west coast of Asia Minor, and in the district of Beirut in Syria. The annual production of this oil is between 70,000 and 80,000 tons, and the exports are about 7000 tons per annum. At Constantinople, sesamum and linseed oil are pressed for soap making. The annual production of sesame amounts to 45,000 tons and that of sesamum oil 800 tons. In 1914, Turkey imported 8000 tons of cottonseed oil. There are two modern oil mills in the cotton growing district of Adan Mersina and two others in Smyrna. One of the latter has a productive capacity of 2800 tons of oil, and has been purchased by a Hungarian company. Hungarians are largely interested in Turkish industrial ventures, and are given preference over others. Linseed oil is imported to the amount of 900 tons annually. Attar of roses is the only essential oil prepared in large quantities. The industry flourishes in the regions of Sparta and Buldur and the vilayet of Brusa. The annual production of rose oil is about 100,000 miskal (=1023 lb.). Amongst the oils distilled are those of thyme, geranium, laurel, anise and orange blossom.

While some soap is exported, chiefly to Egypt, large quantities of cheap toilet soaps are imported from Europe. The industry is carried on in numerous establishments, generally very small, with olive oil as the raw material. Syria produces about 20,000 tons of soap annually.

Valonia extract is manufactured in Smyrna, the production of two very modern factories amounting, in peace time, to about 3000 tons of crystallised, ground and liquid extract. Extract of liquorice is manufactured at an English factory in Soke.

There is a modern tannery at Beikoz on the Bosporus, employing more power than all the others together. Smaller tanneries are located at Constantinople, in Smyrna, Aleppo, Adar Basar, Diarbekir, Safranboli, and other places. In 1913 Turkey exported between 6000 and 7000 tons of goatskins. The thirteen large tanneries of the country produced about 1600 tons of sole leather and vachettes and prepared between 700,000 and 800,000 sheep and goat skins. The imports of leather and leather goods comprised 4000 tons of sole and saddle leather and more than 2000 tons of cattle hides, calf skins, etc. Glue and bone meal are manufactured in a German-owned factory at Jedicule.

Turkey possesses only one modern dyeing establishment, that of the Oriental Carpet Manufacturing Co. (a British company) in Smyrna. Small dyeing establishments occur throughout Asia Minor. Synthetic dyes of German manufacture are generally employed, but natural indigo still predominates in use over the artificial product.

Abortive attempts to establish glass, paper, match and candle factories in the country are testimony that the prospects for chemical industry in the country are not encouraging. There are, however, good opportunities for such industries as will utilise domestic materials. Among such may be mentioned the manufacture of oil, drying of fruits, canning of food, manufacture of alcohol, simple textiles and building materials. Tanning and soap making have an old tradition and should be prosperous.

The importations of chemical and allied produce for 1911—1912—the last year for which official statistics are available—were as follows:—*Chemicals, colours, dyes, varnishes and tanning materials.* Total value £641,628. Derived mainly from: Germany 20·7%, United Kingdom 16·8%, Austria-Hungary 15·6%, France 13·6% Belgium 6·4%, Netherlands 5·6%, Italy 3·5%, U.S.A. 0·3%. *Drugs, medicines and perfumery.* Total value £273,383. France 36·9%, Germany 20·2%, Austria-Hungary 13·1%, U.K. 12·0%, Italy 3·2%, United States 0·8%. *Oils and fats.* Value £1,857,300. From Russia 33·1%, U.S.A. 24·2%, United Kingdom 6·5%, France 6·5%, Austria-Hungary 3·5%, Netherlands 2·1%, Germany 1·8%, Belgium 1·3%, Italy 1·1%.—(*Chem.-Z., through U.S. Com. Rep., Oct.* 28, 1919.)

GOVERNMENT ORDERS AND NOTICES.

Export Prohibitions.—The Board of Trade (Licensing Section) announces that creosote oil and anthracene oil (green oil) containing *no* substance suitable for making dyes and explosives, are not included under the coal-tar, etc., heading in the prohibited list.

Orders Cancelled.—The following orders have been revoked by the Food Controller as from February 1:—Oils, Oilcakes and Meals (Requisition) Order, 1917; Refined Vegetable Oils (Requisition) Order, 1917; Oils and Fats (Restriction) Order, 1918; Margarine (Requisition) Order, 1918; Margarine (Registration of Dealers) Order, 1918; and Margarine (Cheese Returns) Order, 1918.

Census of Production in 1921.—The Board of Trade has issued an order directing that a census of production be taken in the year 1921. Among the trades and industries scheduled are:—Coal and ironstone mines under the Coal Mines Regulations Act; coke works at collieries; oil shale mines and shale oil works; iron mines under the Metalliferous Mines Regulations Act and iron quarries; salt mines; brine pits and salt works; iron and steel trades (smelting, rolling and founding); tinplate; galvanised sheets; engineering trades (including electrical engineering); copper, brass, lead, tin, zinc, and other metals (except gold and silver refining); cotton; woollen and worsted; jute, hemp and linen; bleaching, dyeing, printing and finishing; grain milling; sugar and glucose; brewing and malting; spirit distilling; chemicals, coal tar products and drugs; seed-crushing; fertilisers; soap and candle trades; paper; leather; brick and fire-clay trades; china and earthenware; cement; gas and electricity undertakings. Returns will not be required from persons, companies or firms who do not employ on the average more than five persons, exclusive of officers of the company or members of the firm, during the present year, provided that signed declarations are made of the average number employed.

Re-organisation of the Board of Trade.—A detailed announcement has been circulated by the Board of Trade concerning its re-organisation, which has been proceeding since June last. The duties of the Department are organised under two joint permanent secretaries, Sir Sydney Chapman, who deals with all questions affecting general policy, and Mr. H. A. Payne (Controller), who deals with administration and finance. Some of the principal permanent departments are: Industries and Manufactures: Mr. P. W. L. Ashley (assistant secretary); Industrial Property (including patent office): Mr. W. Temple Franks (comptroller-general); and Power, Transport and Economics: Mr. H. F. Carlill (assistant secretary). Among the temporary departments are the Profiteering Act Department (controller—Capt. H. Hincks), the Export Credits Department (manager—Mr. L. A. Davis), and the Clearing Office for Enemy Debts (controller—Mr. E. Spencer Grey). There are two large departments which hold somewhat special relationship to the Board of Trade, *viz.*, the Department of Overseas Trade (Development and Intelligence) under the joint control of the Foreign Office and the Board of Trade, and the Coal Mines Department, which is attached to, but does not form part of, the Board of Trade. An internal administrative council has also been established, but this is quite distinct from and in no way supersedes the Board of Trade Advisory council, on which manufacturers, traders, and labour are represented.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for January 22 and 29 and February 5.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number:—

Locality of firm or agent.	MATERIALS.	Reference number.
British India ..	Corrugated iron	156
,, ..	Alcoholic beverages	157
British West Indies	Earthenware	93
Canada	Chinaware	121
,, ...	Bristol board, tinfoil, celluloid ..	*
Egypt	Round and flat bars, mild steel sheets, galvanised flat and corrugated sheets	129
,, ...	Lubricating oils	166
,, ...	Paper, ink, stationery (tender for)	†
South Africa ..	Pottery, glass	126, 127
,, ..	Machinery and supplies for gold mining, sugar and oil refining..	165
Belgium	Steel	100
,, ...	Chemicals, drugs, oils, resins, gums, white spirit	99
,, ...	Rubber	101
,, ...	Iron, steel, tinplate, copper, brass, tin	103
,, ...	Tinplate, tin solder	104
, ...	Coarse sea salt	131
,, ...	Chemicals, ores, pharmaceutical products	133
,, ...	Lubricants, metal cleaners ..	167
,, ...	Leather	168
France	Cement	134
,, ...	Motor petrol	172
,, ...	Chemicals	173
Germany	Tanning extracts	135
Greece	Iron sheets and bars, galvanised iron, tin, paint	106
Italy	Soda caustic soda, potassium dichromate	108
,, ...	Metals, tinfoil, wire	109
,, ...	Nickel, white metal, brass, copper, aluminium	110
,, ...	Porcelain, earthenware	111
,, ...	Asbestos	112
Netherlands ..	Leather	140
,, and Colonies	Paper	144
Norway	Pulp, paint, oil, engine oil, grease, red lead, lead, tin and zinc plates, sugar (goods in demand)	—
Switzerland ..	Tool steel	175
Morocco	Glass	179
Asia Minor (Smyrna)	Copper sulphate, iron sulphate, chemicals, naphthalene ..	148
Syria	Leather	149
Dominican Republic	Chemicals, perfumery, alcoholic beverages	118
Mexico	Chemicals for industrial purposes and for making dyes	119
Argentina ..	Plant for distilling petroleum ..	—
,, ..	Wire, cement	117
Chile	Chemicals, drugs, disinfectants, tanning materials, perfumery raw materials	153

* The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

† The Department of Overseas Trade, 73, Basinghall Street, London, E.C. 2.

Markets Sought.

A Canadian company desires to get into touch with U.K. importers of sugar and syrup.

A Canadian firm manufacturing sulphur dioxide (gas and liquid) desires to know the nature of the British market.

A Canadian firm owning mica mines wishes to get into touch with importers in the U.K. Inquiries to the Canadian Government Trade Commissioner.

TARIFF, CUSTOMS, EXCISE.

Australia.—The import of goods from Germany, Austria-Hungary, Turkey, and Bulgaria is prohibited save with the consent of the Minister for Trade and Customs as from January 14. On this date a proclamation was also issued prohibiting the exportation of goods from the Commonwealth to former enemy countries.

Brazil.—The new Consular Invoice Regulations are given in the issue for January 29.

British Honduras.—The export duty on intoxicating liquors has been amended as from November 1, 1919.

British India.—The import duty on opium imported into the Punjab and the North West Frontier Provinces is fixed, as from April 1, at Rs.27.8.0. per seer.

The import and manufacture of such acetylene as is declared to be "an explosive" is absolutely prohibited as from December 6, 1919. The notification defines the term "an explosive," and prescribes the conditions to be fulfilled when acetylene is stored in cylinders. The Notification may be seen at the Department of Overseas Trade.

The complete Schedule of Valuations for import duties with effect from January 1 is set out in the issue for February 5.

Costa Rica.—Silver and silver coin may be imported free of duty.

Denmark.—Among the articles the export of which is still prohibited, except under licence, are ammonia salts, benzine, cement, coal tar and pitch, cocoa butter, colours (with some exceptions), explosives and gunpowder and raw materials for their manufacture (except glycerin), oil-cake, wood pitch, glass vessels, calcined gypsum, hides, skins, leather, lard, linseed oil, manures (natural and artificial), margarine, vegtable oils, oil-seeds, oleo stock, petroleum, potash salts, shellac, starch, sugar (including glucose), turpentine, vinegar, vitriol (copper and iron), and yeast.

Ecuador.—A surtax has been levied on most imports varying from one-half to ten centavos per wilo., or 1 per cent. *ad valorem,* according to the classification. Common soap, candles, petroleum, and leather for boots are, *inter alia,* specially exempted.

Finland.—The Currency Board decides all questions relating to import licences and importers must satisfy the Board that they will not make payment in Finnish marks.

Among the "articles of luxury" the import of which is forbidden are arrowroot, tapioca, cocoa, chocolate, glucose, starch syrup, paper manufactures, certain kinds of manufactures of glass and porcelain, perfumery, and calcium carbide.

French Indo-China.—The rates of duty leviable on imports are subject to the same "coefficients of increase" as those levied on the same class of goods in France.

Germany.—Among the articles that may be imported without licence are certain dyeing plants, opium, certain vegetable fibres, Peruvian bark, wood for pulp manufacture, charcoal, cork, quebracho wood, sumac, cutch, galls, valonia, camphor, hides, skins, china clay, calcined magnesite, mica, fluorspar, alabaster, marble, fuller's earth, lead, iron, manganese, nickel and tin ores, solid asphalt, simple chemicals, mercury and amalgams, alkali metals, arsenic, uranium, iodine, phosphorus, ammonia, tartar, calcium citrate, waste paper and cardboard, certain glass wares, certain kinds of iron and iron alloys.

The export of certain kinds of stones, mineral substances, glass, glassware, and wares of iron and iron alloys is permitted. The full text of this proclamation is given in the issue for January 22.

Greece.—The import of calcium carbide, caustic soda and soda ash is prohibited as from December 25, 1919.

Japan (Corea).—The permission of the Governor-General is required for the export of pulp, printing paper, phosphate of lime, compound fertilisers, nitrate of soda, and sulphate of ammonia.

Latvia.—The import of, *inter alia,* alcoholic beverages, porcelain, polished glass, perfumery, and toilet soap is prohibited.

Madagascar.—The import duty on certain kinds of paper has been modified.

Mexico.—The export duty on henequen has been increased to 8 per cent. *ad valorem* on the price f.o.b. at Progreso, Yucatan, as from November 28.

Morocco.—The text of the Tariff Valuations may be seen at the Department of Overseas Trade.

Poland.—Particulars of the new Customs Tariff are given in the issue for January 29. Among the articles exempted from customs duty are sugar, condensed and dried milk, artificial fertilisers, animal fats, certain kinds of glass, ammonium nitrate and sulphate, common soap, and certain kinds of paper. Borax and sulphuric acid may also be exempted for one year by the Ministry of Finance.

Portugal.—A translation of the Decree concerning the control of imports and exports and exchange operations is given in the issue for January 22.

Rumania.—An additional tax of 2 per cent. *ad valorem* has been levied and is still in force on all imports.

Sierra Leone.—An export duty of 3d. per lb. has been levied on gum copal, and the import duty on spirit has been increased.

Spain.—Among the articles the export of which is prohibited are mineral fertilisers, alloys of aluminium, tin or nickel, aluminium, sugar, sulphur, cardboard, raw hides and skins, iron and steel waste, tin, cereals, metal waste, nickel, nitrate of soda, paper (with some exceptions), petroleum, solid paraffin, potash and its salts (with some exceptions), superphosphate, and sulphate of ammonia. Special export permits are required for earth nuts, alum, malt, oils, tallow, grease, lubricants (except oleine), tar and its derivatives.

The prohibition of the export of esparto has been suspended.

Sweden.—The suspension of the customs duties on lard, oleo-margarine, dripping, and condensed milk has been prolonged until May 31.

Export prohibitions have been removed from graphite, carbon electrodes, salicylic acid, vegetable tanning materials, chrome alum, chromic acid, sodium and potassium chromates and dichromates.

Switzerland.—Among the articles the export of which is now allowed under general export licence are white arsenic, arsenic sulphide, chlorides of barium, calcium and manganese, magnesium carbonate, sulphate and chloride, certain compounds of antimony, sulphur chloride, bisulphite of lime, liquefied gas, acetates of alumina and lime, phenate of lime, nitrate of baryta, sulphate of lead, sulphide of iron, zinc powder, citric and tartaric acids. Certain other chemicals may be exported under general licence revocable at any time.

Tunis.—Export duties have been levied on esparto and diss, and those on olive oil and hides and skins have been increased.

Uruguay.—Imported fuel oil is subject to the same special duties as coal, but in this case the duty is to be increased by 40 per cent.

REPORT.

MINES AND QUARRIES. GENERAL REPORT WITH STATISTICS, 1918. *By the* CHIEF INSPECTOR OF MINES. PART II.—LABOUR. [*Cmd.* 490—6d.] PART III.—OUTPUT. [*Cmd.* 531—3d.] [*H.M. Stationery Office.*]

LABOUR.—Of the total of 1,072,903 persons employed at mines and quarries in 1918, 807,086 worked underground, and 222,602 (including 11,761 females) above ground. Compared with the previous year there was a net decrease of 12,568 workers. The following figures show the numbers of workers, under and above ground, in some of the chief mining industries:—Coal, 994,317; iron ore, 20,507; lead and zinc ores, 3,058; limestone, 12,972; oil shale, 4,946; tin ore, 5,524. There were 83 explosions due to firedamp or coal dust, resulting in 160 deaths, and 64 of these were caused by naked lights. The death-rate per 1,000 persons employed underground was 1·60 in 1918, and the average for the past ten years 1·51.

The following suggestions are made for mitigating the loss of output in coal mines due to the shorter hours of working:—(1) Increasing the effective working time of the hewer at the face by conveying him to and from work by mechanical haulage; (2) increased utilisation of the second, usually the upcast, shaft for the purpose of winding coal or for lowering and raising workers; (3) simultaneous decking of cages where cages with more than one deck are installed; (4) extension of the multiple shift system; and (5) extension of the use of mechanical coal-cutters, other labour-saving devices, and conveyors.

To increase output, more machinery of the latest type, especially in connexion with mechanical auxiliary haulage, should be introduced, coal used on the collieries should be economised, and electrical machinery should replace the heavy coal-consuming steam engines. The number of mechanical coal-cutters in use in 1918 was 4,041, and the quantity of mineral so cut 27,873,646 tons, as against 3,799 machines and 28,196,486 tons in the previous year. The consumption of electricity by electric motors was 965,367 h.-p., an increase of 5·66 per cent. over 1917, and the number of electrically driven coal-cutting machines in use at the end of 1918 was 1,797, or 58 more than twelve months before.

OUTPUT.—*Coal and Coke.*—The most noteworthy feature of the minerol output in the British Isles in 118 (see this J., 1919, 420 R) was the large decrease in coal production, which fell nearly 21 million tons, equal to about 9 per cent. of the 1917 output. The total production of 227,748,654 tons was distributed as follows: England, 159,419,825 tons; Wales, 36,346,610; Scotland, 31,890,218; and Ireland, 92,001 tons. Of this total the following quantities were exported:—

	Tons..
As coal	31,752,904
915,921 tons coke, equal to	1,526,535
1,505,090 ,, manuf. fuel, equal to ...	1,354,581
Bunkers for ships, foreign trade ...	8,756,476
Total ...	43,390,496

thus leaving 184,358,158 tons for home consumption, or 4·385 tons per head of the civil population. The percentage of output shipped abroad shows a slight decrease over 1917, viz., 19·1, against 19·6. For the decade prior to the war exports averaged over 30 per cent. of the output.

The average price of coal during the year was 20s. 11·1d., as compared with 16s. 8·7d. for 1917, so that notwithstanding the fall in quantity, the value of the output increased by £30,000,000. The total coal carbonised was 38,219,479 tons, yielding 7,945,055 tons of gas works coke, and 13,121,311 tons of oven coke (in 1917 39,300,504 tons of coal were carbonised). The total number of coke-ovens in operation was 16,292, of which 40·6 per cent. was of the beehive type. The output of the briquetting industry, which is practically confined to South Wales, was greater both in quantity and value, 1,855,689 tons of coal being used and £2,990,552 worth of products obtained.

Copper.—The 1213 tons of ore raised yielded only 179 tons of metal, showing a still further decline in the quality of ore mined. During the year the imports were 15,319 tons ore, 21,013 tons regulus, and 205,651 tons metal, while over 7000 tons of metal was exported. The average price of "Best Selected" was £126 5s. 1d. per ton.

Iron.—The statistics for the chief centres of production are:—

County.	Quantity.	Price per ton
Under the Coal Mines Act (average 30% of iron)—	Tons.	s. d.
Northampton	145,589	3 10
Stafford (North)	689,856	17 7
Yorks (N. Riding)	4,544,135	9 7
Ayr	103,948	22 8
Lanark	72,916	24 3
Renfrew	125,674	13 4
Under the Metalliferous Mines Regulation Act—		Per cent. of iron.
Cumberland	1,230,572	50.41
Durham	15,039	39.00
Glamorgan	53,246	51.00
Lancashire	285,305	51.34
From Quarries—		
Leicester	690,345	27.84
Lincoln	3,226,404	24.66
Northampton	2,439,403	31.96
Oxford and Rutland	634,112	30.91

This total is an increase of about 1 per cent. on the previous year's figure.

	Tons.
Total ore from mines and quarries in the United Kingdom	14,613,032
Foreign ore imported (chiefly from Spain)	6,581,728
Pyrites cinders	627,527
Total (less 160 tons exported)	21,822,127

This total is an increase of about 1% on the previous year's figure.

Pig iron production.

Year	1918	1917
Works in operation	119	118
Furnaces built	487	487
Furnaces in blast	317	318
	Tons.	Tons.
Pig iron made	9,107,384	9,338,104
Ore used	22,544,064	22,901,714
Coal used	2,606,840	2,816,318
Coke used	11,286,680	10,961,734

The average prices of pig-iron during 1918 were Cleveland No. 3, £5 13s. 5d.; all kinds of pig-iron exported, £10 4s. 3d.

Iron Pyrites.—The 22,195 tons of pyrites mined was supplemented by imports to the extent of 836,703 tons (mostly cupreous iron pyrites).

Lead.—The 14,784 tons of dressed ore yielded 10,909 tons of lead and 77,795 ounces of silver. The mean monthly price of lead in 1918 was £30 2s. 8d.

Manganese ore.—The North Wales mines have increased their output to 17,456 tons (9.942 tons in 1917), but this quantity is small compared with the 365,606 tons imported.

Oil shale.—The Scotch shales continued to give the same yields as in 1917, viz., 20 galls. of oil and 40 lb. of ammonium sulphate per ton of shale. The average price at the mines was 9s. 11·1d. per ton (8s. 2·5d. per ton in 1917).

Petroleum.—Imports showed a further large increase from 826,895,771 galls. in 1917 to 1,324,495,125 galls. in 1918.

Mercury.—The quantity imported—1,077,460 lb.—was less than half that of the previous year. It was valued at about 5s. 2d. per lb.

Salt.—The amount of British salt (rock and white) exported was 255,272 tons.

Silver.—79,645 ounces of silver was produced, mostly from lead ores (*q.v.*). The average price of standard silver in London was $47\frac{9}{16}$d. per ounce.

Tin ores.—The average tin content of the ores mined was 66·2, so that the 6377 tons should contain 3954 tons of metal. The mean monthly price of standard tin in London was £329 11s. 3d. (£237 in 1917).

Tungsten ores.—The total output (302 tons) shows an increase on that of 1917 (241 tons). The bulk (222 tons) was obtained from the Cornish mines, where the dressed ore contained an average of 60·2 per cent. of tungsten.

Zinc ores.—The output of 9025 tons was a considerable increase on the previous year's figure of 7484. The yield of metal from the 9025 tons was 3245 tons. The mean monthly price of spelter remained practically as in 1917, at £52 4s. per ton.

COMPANY NEWS.

VAN DEN BERGHS, LTD.

The twentieth ordinary general meeting of this company was held in London on January 26, Sir Mackworth Praed presiding. Since June 30, 1919, the date of the last balance sheet, the company has issued one million £1 "C" preference shares, so that the capital of the company now stands at £3,075,000. As it was not possible to raise money in this country during the war, an issue was made in Holland of £1,000,000 in 6 per cent. redeemable notes. A susidiary company has issued to the public abroad a sum of £1,400,000 in preference shares, and another has issued £1,333,000, partly for the conversion of the 6 per cent. notes, of which about two-thirds has been exchanged. The parent undertaking and its affiliated companies, therefore, now have at their disposal a total capital of about £6,250,000. They own nearly 40 factories in different parts of Europe, comprising margarine, condensed milk, soap, oil crushing, extracting, and refining and hardening works and, in addition, maintain control over several other businesses. Organisations have been created and connexions opened up all over the globe, notably on the West Coast of Africa, the Dutch East Indies, the Straits Settlements, Ceylon, North and South America, China and Japan, for the purpose of ensuring the necessary supplies of raw materials. In view of the diminished importation of butter, now about 1,000 tons per week compared with the pre-war average of 4,000 to 5,000 tons, and of its high price, and the unlikelihood of any radical change, the future of the home margarine industry appears to be assured for a long time to come. Competition in the margarine trade is very keen and the percentage of profit on sales in this country is small, the enormous expansion in turnover alone accounting for the increased general profits of the company. Since the de-control, prices of raw materials have steadily risen, and are now about three times those prevailing before the war. The advance is to some extent due to the abnormal rates of exchange, but chiefly to the great and increasing world demand for oils and fats. An innovation in the method of shipping oil consists in the use of tank steamers equipped with steam coils. The company has received several such tank cargoes of about 8,000 tons each of coconut oil, and is now introducing into its factories tanking installations to deal with any class of oil in almost any quantity.

At an extraordinary general meeting held subsequently, a resolution was passed authorising the sub-division of the 625,000 ordinary shares of £1 each into four fully-paid shares of 5s. each, of which three are to be preferred ordinary and one ordinary. The proposal to increase the capital to £3,575,000 was also approved.

BRITISH GLASS INDUSTRIES, LTD.

An extraordinary meeting was held in London on January 28 to consider a resolution for increasing the capital of the company to £2,000,000.

The chairman, Mr. C. Williamson-Milne, stated that the additional capital was required for the following objects:—(1) The acquisition of the controlling interest in the ordinary shares of the United Glass Bottle Manufacturers, Ltd., which owns the entire share capital of the following companies:—Cannington, Shaw, & Co., Ltd., St. Helens; Nuttall & Co., Ltd., St. Helens; Robert Candlish & Son, Ltd., Seaham; Alfred Alexander & Co., Ltd., Hunslet, Leeds; Aire and Caulder Glass Bottle Works (E. Breffit & Co., Ltd.), Castleford; and Moore, Nettleford Co., Ltd .,Woolwich. The company also owns 60 acres of ground at Charlton, near Woolwich, upon which a very large factory is being erected and where the latest automatic machinery will be installed. Transport facilities will be provided by water, rail, and a fleet of motor lorries. (2) To purchase the major portion of the share capital of Webb's Crystal Glass Co., Ltd., which will give it a controlling interest in the following businesses: T. Webb & Son, Ltd., Dennis Glass Works, Stourbridge; Edinburgh and Leith Flint Glass Co., Edinburgh; Corbett & Co., Ltd., Tutbury, Staffordshire; Medway Glass Works, Ltd., Queenborough, Kent; Robert Johnson Lamp-blown Glassware and Accessories Co., Ltd., London; R. Johnston & Co., Ltd., London; and a substantial or controlling share interest in the following:—Samuel Pearson, Ltd., West Bromwich; E. M. Patents, Ltd., London; and Phillips, Ltd., London. The latter acquisition enables the company to instal and use on favourable terms the semi-automatic Empire machine. The output from these firms will be considerably increased by the installation of automatic machines and additional furnaces.

The company has sold its foreign patent rights, and from this source alone a large sum in capital, royalties and dividends is anticipated. The total capital required to cover the acquisitions mentioned above, to extend the company's works at Canning Town, Queensborough and elsewhere, and to instal improved automatic machinery is £2,800,000. Of this sum £2,100,000 will be provided by the issue of 600,000 new shares, which will be offered to shareholders at £3 10s. per share. The remaining 200,000 shares have been taken firm by the Commercial Bank of London at the same price. The bank has been given an option to subscribe for a further 50,000 shares on or before December 31 next at £5 per share. Baron H. de Rothschild has joined the board.

The resolution authorising the increase of capital was carried unanimously.

PAN DE AZUCAR NITRATE CO., LTD.

At the eighteenth annual general meeting held in London on February 3, the chairman, the Hon. H. C. Gibbs, referred to the great change which had occurred in the nitrate position during the last few months. The Association of Nitrate Producers, formed in the early part of 1919, fixed the selling prices at 10s. 1d. for ordinary and 10s. 4d. for refined, but up to the middle of September last only some 2300 tons had been sold. At that time the position looked very unfavourable. Many of the oficinas had closed down, production was reduced to 100,000 tons monthly, as compared with a normal production of 250,000 tons; and stocks in Chile had reached the enormous figure of $1\frac{3}{4}$ million tons. The situation was rendered still worse by the great shortage of tonnage. About the middle of September last an effort was made to rehabilitate the nitrate trade, and 750,000 tons of nitrate was sold at 9s. over October—March, followed by further sales at high prices. During the past four months or so sales by the Association have amounted to about 1½ million tons for delivery up to and including June at increasing prices up to 12s. 9½d. per quintal, and the officinas are rapidly reopening. The next tender sale by the Association is fixed for the 5th inst., at which some 500,000 tons is being offered at minimum prices of 13s. 9d. for April—June and 13s. 11d. for July—December, and doubtless somewhat higher prices than these will be obtained. The policy of selling moderate amounts by tender for delivery at comparatively near dates is certainly having the effect of raising prices, but in view of the disquieting menace of the synthetic product it is to be hoped that the Association has in view some far-sighted scheme for the more permanent advantage of the industry.

During the year ended June 30 last the company realised a profit of £9,300 (capital £110,000). A dividend of 10 per cent. has been declared, and £25,300 is carried forward, as against £27,000 brought in.

LEVER BROTHERS, LTD.

The Niger Company, Ltd., has announced that the offer made by Lever Bros. to purchase the ordinary shares in the Niger Co., at £6 10s. per share, payable in cash on or before July 1 next, has been accepted by over 75 per cent. of the shares, and has therefore become definitive. It is stated that the corporate existence and organisation of the Niger Co. will continue. The authorised capital of this company is £3,000,000, of which £2,000,000 is in ordinary shares of £1 each, and £1,250,000 of these have been subscribed and called up.

UNITED TURKEY RED CO., LTD.

At an extraordinary general meeting in Glasgow, on February 2, it was resolved to increase the share capital to £2,000,000 by the creation of 500,000 ordinary shares of £1 each, and to divide the existing £10 preference and ordinary shares into shares of the same amount. It is intended to issue forthwith 341,250 ordinary shares at par, to be offered in the first place to present holders on a share-for-share basis.

TRADE NOTES.

FOREIGN.

Forthcoming Industrial Fairs.—*Dantzig.*—An international fair will be held from February 18 to 25. Exhibitors may only show goods of which they possess stocks, and which are ready for delivery.

Finland.—The Finnish Industries Fair has been arranged to be held from June 27 to July 6 of this year. Manufacturers and merchants are asked to exhibit raw materials, semi-manufactured goods, tools, and machinery required in Finnish industries, but not manufactured in Finland. Full particulars to be obtained at all Finnish Legations and Consulates during February, and at the office of the Fair: Finska Messan, Helsingfors.

Libau.—The exchange committee of Libau announces that it intends to set up a sample fair in June next. The fair will be annual and international, and will include samples of raw materials, manufactures, engines, etc.

Lyons.—The spring fair, to be held from March 1 to 15 next, will include exhibits of drugs and other pharmaceutical products, disinfectants, laboratory glassware, industrial chemicals, artificial fertilisers, coal-tar dyes, and intermediates, dyeing and tanning extracts, artificial silk, ceramic ware, and photographic supplies. Applications should be addressed to Mr. J. A. Victor, 31, Budge Row, London, E.C. 4.

Milan.—The international sample fair, to be organised on the same lines as those of Lyons and Brussels, will be held from April 12 to 27. Information can be obtained at the Exhibitions Department, Overseas Organisation, Federation of British Industries, 39, St. James's Street, London, S.W. 1.

Foreign Company News.—*Denmark.*—The spirit works "Fortuna," in conjunction with "De Danske Spritfabrike," has bought out all the remaining Danish spirit companies, with one exception. Official regulations and compulsory rationing have reduced the demand both for potable and technical spirit, but the consumption of yeast has increased. (*Z. angew. Chem.*, *Dec.* 30, 1919.)

France.—The Société Industrielle du Celluloid" is about to float a loan of three million francs.

The capital of the Ardennes Phosphate Company is to be increased from 400,000 to 1,000,000 francs, for the extension of the works, workmen's houses, and a railway siding.

During the last financial year the "Société des Produits Azotés" has made a net profit of 792,216 francs, a dividend being paid of 20 francs per old, and 10 francs per new, share. This company has specialised in the production of nitrogenous fertilisers.

The "Stearinerie et Savonnerie de Lyon" has opened a new branch undertaking for the distillation glycerin and the manufacture of artificial rubber. For this purpose the capital is being raised from four to six million francs.—(*Z. angew. Chem.*, *Dec.* 26, 1919.)

The Cement Industry in China.—This industry has reached the stage at which it is able to meet all the home requirements at prices which defy foreign imports. The largest firm, which is entirely Chinese, is the Chee Hsin Cement Company, which has an up-to-date works at Tongshan in North China. The output is about 600,000 barrels (375 lb. net) per annum of grey cement, and this material is the most popular on the Shanghai market. The same firm controls a works at Hankow producing about 200,000 barrels per annum ("Pagoda" brand). The Green Island Cement Company, near Hong Kong, was for many years the chief cement undertaking in China, but of recent years competition from the North, difficulties of fuel supplies, and freight charges have seriously affected its operations. Present quotations in Canadian currency are: Green Island cement, \$5·75; Chee Hsin cement, \$4·6 per barrel. Japanese cement is not quoted, as very little of it is being imported.—(*Bull. Dept. Trade and Comm., Canada, Dec.* 1, 1919.)

The French Chemical Market.—The tendency towards scarcity of supply and enhanced prices still continues. Even acids are difficult to obtain, and the general outlook is accordingly serious. Phosphates have risen in price, those with a content of 58—63 per cent. being quoted at 0·95 francs per unit, and those with 63—68 per cent. at 1·05 frs. per unit. These prices are naturally imparting some vigour to the mining of the phosphate deposits in the French colonies. The prices of sodium salts are at a very high level; crystallised sodium sulphide, for example, has risen from 10 to 75 frs., and the crude salt is quoted at 135 frs. Ammonium salts are in short supply and expensive, the carbonate having risen to 270 frs. Caustic potash is quoted at 685 frs. Soap is in strong demand, owing to the soap factories being held up by shortage of coal.

REVIEW.

Sewage Disposal. *By L. P. Kinnicutt, C.-E. A. Winslow, and R. W. Pratt. Second edition, re-written. Pp. xvii.+547. (New York: Jn. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1919.) *Price* 18*s*. 6*d*. *net*.

The first edition of this book appeared in 1910. In the second edition fresh data are brought in, and the chapters upon screening, sludge disposal and chemical precipitation, together with the Miles acid process, remodelled and expanded, whilst there are additional chapters on two storey tank treatment, activated sludge, general considerations regarding design and operation of sewage treatment plant, and disposal of excretal wastes where a sewerage system does not exist.

Throughout the book the term "sewage treatment" is used in preference to "sewage purification," and the former is doubtless the correct term. Further, the use of the word purification rather leads the layman to suppose that a liquid which has undergone "purification" is innocuous.

It would appear doubtful whether in many cases it is sufficient to treat sewage up to the extent necessary to avoid nuisance and danger to health. In this country, at all events, the treatment of sewage should be carried sufficiently far to preserve the amenities of river life, *e.g.*, fish.

In the chapter upon composition of sewages one would rather have expected to have found some reference to the McGowan formula for ascertaining the strengths of sewages, as some such standard is most important in comparing results obtained at different works. Chapter II., dealing with the subject of dilution, is of marked interest, and contains much useful information. Much of it is derived from the work of Adeney, Letts and Phelps, whilst the Chicago problem is discussed and useful data given regarding self-purification in the Desplaines and Illinois rivers.

Passing on, the authors deal with screening methods, particular attention being focussed upon fine screening, a subject which has hitherto received but scant attention in this country, where the rivers are, however, for the most part, of comparatively small volume. Preliminary treatment of sewage by sedimentation, chemical precipitation, septic and two-storey tanks form the subject matter of Chapters IV. to VII., and this important section of sewage treatment is carefully dealt with. The Miles acid system is described, and data from the Dorr and Weston experiments cited.

Broad irrigation or sewage farming is fairly comprehensively treated in Chapter VIII., and the next chapter is devoted to the disposal of sewage by intermittent filtration through sand. It should be noted that what is termed "intermittent filtration" in America refers to filtration areas which treat sewage at a high rate per acre per day, *viz.*, 30,000 to 100,000 gallons per day, such areas being rarely cropped. The section in this chapter dealing with nitrification is well written and carefully explained.

In the following chapter on contact beds, a considerable amount of the information is naturally derived from English sources, the reports of the 1898 Sewage Commission being often quoted. After the adoption of contact beds by Manchester in 1900 a number of installations was constructed in the States. Dibdin slate beds also receive notice in this chapter, and the de-nitrification process devised by the late Professor Letts to meet the special circumstances of the Belfast sewage problem. A useful summary of the advantages and disadvantages of the contact system concludes this chapter. The authors next deal with the treatment of sewage in trickling or percolating filters, and the development of this type of filter is clearly and concisely set out.

Chapter XII. is devoted to the comparatively recent process of activated sludge, worked out by Gilbert J. Fowler. The authors rightly point out the difficulty—owing to limited experience—of estimating the cost of the process, since the gross cost depends so largely upon the balance between the expense of sludge drying and de-watering and the value of the fats and manurial constituents recovered from the sludge.

The disposal of sewage sludge is carefully and comprehensively handled, and it includes an interesting section on the recovery of grease from the sludge after treatment of the sewage by the Miles process.

Three chapters follow upon "The disinfection of sewage and sewage effluents," "Some general considerations regarding the design and operation of sewage treatment plants," and "The disposal of sewage and excretal wastes in the absence of a sewerage system." The final chapter is concerned with methods of testing sewage and sewage effluents. With respect to the "Standard of Purity" (p. 510), an error requiring correction occurs in the standard attributed to the Royal Commission on Sewage Disposal (second paragraph, line 6)—"*30* parts per million of dissolved oxygen" should read *20* parts.

A feature of the book is the list of references, which, although by no means exhaustive as regards the subject of sewage disposal, will be found very useful by those desirous of seeking further information on any particular point.

"Sewage Disposal" should be in the library of all specialising in this subject.

G. Bertram Kershaw.

PUBLICATIONS RECEIVED.

The Chemistry and Technology of the Diazo-Compounds. *By* J. C. Cain. *Second edition. Pp.* xi.+199. (*London: Edward Arnold*, 1920.) *Price* 12s. 6d.

The Manufacture of Intermediate Products for Dyes. *By* J. C. Cain. *Second edition, with 25 illustrations. Pp.* 273. (*London: Macmillan and Co., Ltd.* 1919.) *Price* 10s.

A Class Book of Organic Chemistry. *Vol. II. By* J. B. Cohen. *Pp.* 156. (*London: Macmillan and Co., Ltd.* 1919.) *Price* 4s. 6d.

Service Chemistry. *By the late* V. B. Lewes *and* J. S. S. Brame. *Being a short manual of chemistry and metallurgy and their application in the naval and military services. Pp.* 576. (*London: Edward Arnold.* 1920.) *Price* 21s.

A Short Handbook of Oil Analysis. *By* A. H. Gill. *Revised ninth edition. Pp.* 215. (*Philadelphia and London: J. B. Lippincott Co.*, 1919.) *Price* 10s. 6d.

Chemists' Manual of Non-Ferrous Alloys. *By* J. R. Downie. *Pp.* 168. (*London: E. and F. N. Spon; New York: Spon and Chamberlain, Ltd.* 1920.) *Price* 10s.

Limes and Cements: Their Nature, Manufacture, and Use. An Elementary Treatise. *By* E. A. Dancaster. *Second edition, revised and enlarged. Pp.* 220. (*London: Crosby Lockwood and Son.* 1920.) *Price* 7s. 6d.

The Chemistry of Coal. *By* J. B. Robinson. *Pp.* 96. (*London: Gurney and Jackson*, 1919.) *Price* 3s. 6d.

Memorandum on Solid Lubricants. *By* T. C. Thomsen *and* L. Archbutt. *Dept. of Scientific and Industrial Research. Pp.* 28. (*London: H.M. Stationery Office.* 1920.)

THE SAFETY LAMP AND ITS USE IN CHEMICAL INDUSTRY.

W. PAYMAN.

The danger of explosions due to the ignition of mixtures of inflammable vapours and air was recently described by the author in this Journal (1918, 406 R), and precautions to prevent such explosions were also discussed. Any very volatile inflammable liquid may give off sufficient vapour to cause the atmosphere above it to become capable of propagating flame. A flame may therefore pass from an unprotected light or flame more or less distant from the inflammable liquid, and ignition and inflammation of the latter would then follow. This important fact is unfortunately little realised, it being too commonly supposed that to cause a fire an unprotected flame must actually come into contact with the liquid. Thus naked lights are to be found in use even where the risk is always present in its most dangerous form.*

The obvious precautions to be taken in order to prevent both explosions and fires wherever inflammable liquids are used are: (1) the use of some form of safety lamp where artificial illumination is required, and (2) the enforcing of rules similar to those usual in coal mines or explosives factories to prevent the introduction of any form of naked light.

Such regulations should apply wherever a large surface of inflammable liquid may be exposed to the air, for example, in the preparation of dopes and varnishes, in waterproofing and dry cleaning, wherever inflammable products like rubber solutions are prepared or used in quantity, and wherever leakage may occur from plant or containers. The possibility of leakages is especially serious where any of the industrial gases, such as hydrogen, coal gas or producer gas are made, used or stored in large quantities. Protected lights should also be used when inflammable dusts, such as coal or flour dusts, are being ground. Perhaps the most frequent cause of gaseous explosions is the use of naked lights in the repair or cleaning out of large holders which have been in use for storing inflammable liquids. The following notes may be of service in choosing a suitable type of safety lamp for use under such circumstances.

The chief use of the safety lamp has always been in the coal mining industry. It is just over a hundred years since Sir Humphrey Davy first described his wire-gauze safety lamp in a paper to the Royal Society in 1818, "On the fire damp of coal mines and on methods of lighting the mines so as to prevent explosions." (See Davy's "Collected Works," Vol. VI.) The essential feature of the Davy Lamp, the wire-gauze shield, is still the means used to prevent the flame of an oil or spirit lamp from igniting an explosive mixture outside the lamp, though many improvements have been added from time to time with a view to increase the safety of the lamp and improve its lighting power.

The safety lamps in use in the British Isles are of two kinds, flame lamps and electric lamps, and both types are available in the form of "porch" lamps for general lighting, and hand-lamps for workmen's use. The usual form of hand-lamp is very strongly made to withstand hard usage, but "deputies' lamps" of lighter construction are also made. The kind of lamp which will be found most useful will be largely a matter of individual preference and requirements. The advantages of each type of lamp have been and are still the subject of much controversy, but the special claims made for each type may be indicated.

Electric lamps.—The electric lamp is convenient in use, and is easily kept in order if electrical energy is obtainable for re-charging, but the first cost is rather high. The electric safety hand-lamp usually consists of a 2-volt storage battery of an "unspillable" type, and a small metallic filament bulb. The former is surrounded by a strong case of sheet steel or iron, and the latter by a thick glass cover held in position by an extension of the battery case, the joint being made flame-tight by the insertion of asbestos or fibre washers. Trouble is sometimes experienced from the spilling of the battery acid, the use of cases on the "unspillable ink-bottle" principle not being altogether satisfactory. It is claimed that the use of a solid ("jelly") electrolyte removes this source of trouble.

The average weight of the electric hand-lamp is 6 lb.

Flame lamps.—Oil and spirit lamps differ only in the construction of the oil vessel. That of the spirit lamp is filled with cotton-wool, which is first moistened with spirit, any excess being drained off.

The spirits in general use are naphtha, colzaline and benzoline. Paraffin, mineral colza (a higher boiling-point fraction of petroleum), or mixtures of these in various proportions, are used in the oil lamp. Vegetable colza, or rape seed oil, is no longer in use for miners' safety lamps, the objection to it being the rapidity with which the small lamp wick begins to char when in use.

The oil vessel is usually made of brass, and is provided with a "pricker" for adjusting and trimming the wick, and an "electrical igniter" to enable the lamp to be lit without being opened. The flame is surrounded by a thick cylindrical heat-resisting glass, and the two safety gauzes (Marsaut type) rest on this. The inner gauze is sometimes replaced by a metal chimney (Mueseler type). The gauzes are protected by a metal bonnet to which are attached four brass pillars which afford partial protection to the glass. These pillars are fastened at the base to a ring which screws on to the oil vessel, and so keeps the gauzes and glass in position. Flame-tight joints are made between glass and metal by means of asbestos washers. The older forms of lamp were without a bonnet, but the bonnet may be regarded as essential in chemical works, since a corrosive dust or liquid might burn a hole through the wire gauzes, rendering them no longer safe.

The average weight of the flame lamp is 3½ lb.

Locking devices.—Both electric and oil lamps are provided with special locking devices so that they cannot be opened in a dangerous place. The "magnetic lock" can only be operated by means of a magnet. Some lamps are locked by means of a lead rivet. A further protection is afforded in some oil lamps by the "protector" device, consisting of an automatic extinguisher which comes into action as the oil vessel is unscrewed.

Testing of safety lamps.—Before any type of safety lamp is approved by the Home Office for use in coal mines samples are subjected to a series of safety tests at the Government Testing Station at Eskmeals.†

The tests are of two kinds, mechanical tests and safety tests in explosive atmospheres. In the mechanical tests the lamp is subjected to rough treatment of a type likely to be met with in the mines. The strength and heat-resisting power of the glasses are also tested, and the lamp once lit must give a certain minimum candle-power (all-

* At the inquest on three men killed by an explosion on an oil steamer at Birkenhead in September, 1918, it was stated that artificial light was necessary for the work on which the men were engaged, and that there was no regulation forbidding them to use naked lights.

† Under Section 33 of the Coal Mines Act, 1911.

round light) for a period of nine to ten hours.* The lamps are tested in explosive mixtures of methane-air and petrol-air, and so the tests can be accepted as satisfactory for lamps to be used near inflammable liquids, but not necessarily so for gaseous mixtures containing hydrogen. (Payman and Wheeler, Chem. Soc. Trans., 1919, 115, 36; this J., 1919, 38, 126 A.)

The flame lamp as gas detector.—It is well known that the flame lamp can be used as a "gas detector." A lamp is sometimes lowered into large containers before men are allowed to enter for repairs etc., in order to make sure that the atmosphere contains sufficient oxygen to support breathing. A more important use of the flame lamp is the detection and rough estimation of inflammable gas by the "cap" method. An experienced mine fireman can readily detect slightly over one per cent. of firedamp in mine air, and can estimate percentages above this without difficulty to within an accuracy of about 0·5 per cent. This method is applicable to any inflammable gas or vapour.

In testing for inflammable gas the flame is first carefully drawn down until the yellow light almost disappears. If any inflammable gas be present a "cap" or "aureole," usually blue in colour, forms above the lowered flame. The greater the percentage of inflammable gas present in the atmosphere the brighter and the more plainly does this cap appear, and the larger does it become.

The height of cap with a given percentage of inflammable gas will vary with different gases and vapours, but it may be accepted that the effect of each gas is inversely proportional to the percentage of gas present in a "lower-limit mixture" of that gas with air. Thus with all gases the amount necessary to give a large cap extending into the gauze will be a little less than that required to form a limit mixture. Evidently a limit mixture would give an infinitely long cap. When testing for "gas" under works conditions it will be only necessary to know when the limit of inflammability of the gas or vapour present is being approached; in a coal mine a much smaller proportion of inflammable gas would be considered unsafe on account of the presence of coal dust. The following description† of the caps in firedamp-air mixtures (limit 5·3 per cent.) will be of use for comparative purposes if used in conjunction with the value for the lower limit of inflammability of the vapour under consideration (this J., 1918, 408 R):—

1 *per cent. methane.*—Cap just visible round edges of oil flame.

2 *per cent. methane.*—Blue cone visible above oil flame, the upper tip being very indistinct.

3 *per cent. methane.*—Cap and tip quite plain, about 3 cm. high from base to tip.

With higher percentages the tip rises rapidly into the gauze until a percentage is at last reached when the cap leaves the flame, which is extinguished, and the methane continues to burn in the top of the gauze. When the cap rises into the gauze the lamp may become unsafe, and should be extinguished, not by blowing or jerking, but by gently drawing down the wick and restricting the air supply to the lamp by folding in a jacket or cap.

The largest caps are visible in artificial light, but the low percentage caps either require a darkened place of operation, or the lamp itself must be suitably shaded.

Lamps are at present constructed to satisfy the special requirements of the coal miner, but modifications will at once suggest themselves for lamps to be used in chemical works to increase their lighting efficiency without in any way interfering with their safety.

* See "Memorandum on the Testing of Safety Lamps." H.M. Stationery Office, London, 1913.

† From the Home Office pamphlet, "How to Test for Firedamp," H.M. Stationery Office, London, 1912, which contains a diagram showing the appearance of the caps.

THE INTERNATIONAL LABOUR CONFERENCE AND THE EIGHT-HOUR DAY.

STEPHEN MIALL.

The proceedings at Washington (this J., 1919, 4 R) were to some extent informal, because the International Labour Office is a part of the League of Nations, and the League of Nations did not come into being until the ratification of the Treaty of Peace. It was therefore necessary to hold a purely formal conference in Paris to affirm the decisions come to at Washington. This Paris conference was held towards the end of January; the convention on the eight-hour day is affirmed, and the International Labour Office is now duly constituted in accordance with the Treaty of Peace. Monsieur Thomas has been appointed director, and Mr. W. H. B. Butler deputy-director, of this office, which will find temporary accommodation in London. In all probability there will be a special conference in June next, at Genoa, to deal with the conditions of employment of seamen. Other subjects are to be discussed in due course, and as soon as a staff can be got together information will be obtained from a number of countries in preparation for the next annual conference, which may possibly be held in Geneva in the early part of 1921.

The actual decisions of the International Labour Conference at Washington have received but scanty attention from the Press, and some information on the application of the eight-hour day may perhaps not be out of place.

No question was so keenly disputed and so long discussed as the choice between the eight-hour day and the forty-eight-hour week, and countless propositions and amendments on this topic were submitted. On several occasions it seemed that the commission dealing with this subject was at a deadlock, and Mr. Tom Shaw, M.P., the chairman, had to exercise considerable patience and tact to induce the members to frame a draft convention which finally met with general acceptance. All concerned—and who is not?—should be grateful to him for the skill with which he brought conflicting views into some sort of harmony.

Articles 9, 10, 11, 12, and 13 of this Convention do not apply to Great Britain; the remaining articles are as follows:—

1. For the purpose of this Convention, the term "industrial undertaking" includes particularly:

(*a*) Mines, quarries, and other works for the extraction of minerals from the earth.

(*b*) Industries in which articles are manufactured, altered, cleaned, repaired, ornamented, finished, adapted for sale, broken up or demolished, or in which materials are transformed; including shipbuilding and the generation, transformation, and transmission of electricity or motive power of any kind.

(*c*) Construction, reconstruction, maintenance, repair, alteration, or demolition of any building, railway, tramway, harbour, dock, pier, canal, inland waterway, road, tunnel, bridge, viaduct, sewer, drain, well, telegraphic or telephonic installation, electrical undertaking, gas work, waterwork or other work of construction, as well as the preparation for or laying the foundations of any such work or structure.

(*d*) Transport of passengers or goods by road, rail, sea or inland waterway, including the handling of goods at docks, quays, wharves or warehouses, but excluding transport by hand.

The provisions relative to transport by sea and on inland waterways shall be determined by a special conference dealing with employment at sea and on inland waterways.

The competent authority in each country shall define the line of division which separates industry from commerce and agriculture.

2. The working hours of persons employed in any public or private industrial undertaking or in any branch thereof, other than an undertaking in which only members of the same family are employed, shall not exceed eight in the day and forty-eight in the week, with the exceptions hereinafter provided for:—

(*a*) The provisions of this Convention shall not apply to persons holding position of supervision or management, nor to persons employed in a confidential capacity.

(*b*) Where by law, custom, or agreement between employers' and workers' organisations, or, where no such organisations exist, between employers' and workers' representatives, the hours of work on one or more days of the week are less than eight, the limit of eight hours may be exceeded on the remaining days of the week by the sanction of the competent public authority, or by agreement between such organisations or representatives; provided, however, that in no case under the provisions of this paragraph shall the daily limit of eight hours be exceeded by more than one hour.

(*c*) Where persons are employed in shifts it shall be permissible to employ persons in excess of eight hours in any one day and forty-eight hours in any one week if the average number of hours over a period of three weeks or less does not exceed eight per day and forty-eight per week.

3. The limit of hours of work prescribed in Article 2 may be exceeded in case of accident, actual or threatened, or in case of urgent work to be done to machinery or plant, or in case of *force majeure*, but only so far as may be necessary to avoid serious interference with the ordinary working of the undertaking.

4. The limit of hours of work prescribed in Article 2 may also be exceeded in those processes which are required by reason of the nature of the process to be carried on continuously by a succession of shifts, subject to the condition that the working hours shall not exceed fifty-six in the week on the average. Such regulation of the hours of work shall in no case affect any rest days which may be secured by the national law to the workers in such processes in compensation for the weekly rest day.

5. In exceptional cases where it is recognised that the provisions of Article 2 cannot be applied, but only in such cases, agreements between workers' and employers' organisations concerning the daily limit of work over a longer period of time may be given the force of regulations if the Government, to which these agreements shall be submitted, so decides.

The average number of hours worked per week, over the number of weeks covered by any such agreement shall not exceed forty-eight.

6. Regulations made by public authority shall determine for industrial undertakings:

(*a*) The permanent exceptions that may be allowed in preparatory or complementary work which must necessarily be carried on outside the limits laid down for the general working of an establishment, or for certain classes of workers whose work is essentially intermittent.

(*b*) The temporary exceptions that may be allowed, so that establishments may deal with exceptional cases of pressure of work.

These regulations shall be made only after consultation with the organisations of employers and workers concerned, if any such organisations exist. These regulations shall fix the maximum of additional hours in each instance, and the rate of pay for overtime shall not be less than one and one-quarter times the regular rate.

7. Each Government shall communicate to the International Labour Office:

(*a*) A list of the processes which are classed as being necessarily continuous in character under Article 4;

(*b*) Full information as to working of the agreements mentioned in Article 5; and

(*c*) Full information concerning the regulations made under Article 6 and their application.

The International Labour Office shall make an annual report thereon to the General Conference of the International Labour Organisation.

8. In order to facilitate the enforcement of the provisions of this Convention, every employer shall be required:

(*a*) To notify by means of the posting of notices in conspicuous places in the works or other suitable place, or by such other method as may be approved by the Government, the hours at which work begins and ends, and where work is carried on by shifts the hours at which each shift begins and ends. These hours shall be so fixed that the duration of the work shall not exceed the limits prescribed by this Convention, and when so notified they shall not be changed except with such notice and in such manner as may be approved by the Government.

(*b*) To notify in the same way such rest intervals accorded during the period of work as are not reckoned as part of the working hours.

(*c*) To keep a record in the form prescribed by law or regulation in each country of all additional hours worked in pursuance of Articles 3 and 6 of this Convention.

It shall be made an offence against the law to employ any person outside the hours fixed in accordance with paragraph (*a*), or during the intervals fixed in accordance with paragraph (*b*).

14. The operation of the provisions of this Convention may be suspended in any country by the Government in the event of war or other emergency endangering the national safety.

15. The formal ratifications of this Convention, under the conditions set forth in Part XIII. of the Treaty of Versailles of June 28, 1919, and of the Treaty of St. Germain of September 10, 1919, shall be communicated to the Secretary General of the League of Nations for registration.

16. Each Member of the International Labour Organisation which ratifies this Convention engages to apply it to its colonies, protectorates, and possessions which are not fully self-governing:

(*a*) Except where, owing to the local conditions, its provisions are inapplicable; or

(*b*) Subject to such modifications as may be necessary to adapt its provisions to local conditions.

Each Member shall notify to the International Labour Office the action taken in respect of each of its colonies, protectorates, and possessions which are not fully self-governing.

17. As soon as the ratifications of two Members of the International Labour Organisation have been registered with the Secretariat, the Secretary General of the League of Nations shall so notify all the Members of the International Labour Organisation.

18. This Convention shall come into force at the date on which such notification is issued by the Secretary General of the League of Nations, and it shall then be binding only upon those Members which have registered their ratifications with the Secretariat. Thereafter this Convention will come into force for any other Member at the date on which its ratification is registered with the Secretariat.

19. Each Member which ratifies this Convention agrees to bring its provisions into operation not later than July 1, 1921, and to take such action as may be necessary to make these provisions effective.

20. A Member which has ratified this Convention may denounce it after the expiration of ten years from the date on which the Convention first comes

into force, by an act communicated to the Secretary General of the League of Nations for registration. Such denunciation shall not take effect until one year after the date on which it is registered with the Secretariat.

21. At least once in ten years the Governing Body of the International Labour Office shall present to the General Conference a report on the working of this Convention, and shall consider the desirability of placing on the agenda of the Conference the question of its revision or modification.

22. The French and English texts of this Convention shall both be authentic.

NEWS FROM THE SECTIONS.

CANADA.

During the past two or three months many successful meetings of the different local Branches of the Canadian Section of the Society of Chemical Industry have been held. Good attendances have marked all the meetings, and the Society can be said to be in a sound and healthy condition. The increasingly large number of plant managers and superintendents who attend the meetings is marked evidence of the interest the management of Canadian chemical industries is taking in the transactions of the Society.

Ottawa.

The opening meeting, on December 18, took the form of a dinner at the Chateau Laurier, when the guest of honour was the Right Hon. Sir George E. Foster, Minister of Trade and Commerce.

After the toast of the King had been honoured, Dr. F. T. Shutt, chairman, referred to the success achieved by the Branch during the previous session. He alluded particularly to the initiative taken by the Branch in the matter of re-classifying the Government Chemical Service, which had been approved by all the chemists in the Dominion. The official classification—based on an alphabetical arrangement—was in every way most unsatisfactory from the standpoint of the chemical service. The special committee appointed by the Ottawa Branch drew up a rational scheme, which was duly presented to, and its adoption urged upon, the Government and Civil Service Commission (this J., 1919, 288 R). It was not accepted as a whole, probably because its acceptance would have entailed the wholesale reconstruction of the official plan, but the committee was successful in obtaining better terms for chemists in the matter of salaries. Unfortunately, the Government has been losing a number of its most promising younger chemists, and if this continues the service will inevitably become a second-class one. There is great need for disseminating among the public a knowledge of the utility of the chemist's work. Dr. Shutt also referred to his address as chairman a year previously (this J., 1919, 117 R), in which he had advocated the founding of a professional organisation for Canadian chemists. This project was now a *fait accompli*. The work of the Canadian Institute of Chemistry will in no way interfere with that of the Society of Chemical Industry. The object of the former is to safeguard the interests of chemists and raise the status of the profession throughout the Dominion, whereas the chief function of the latter is to bring chemists together for the dissemination and interchange of chemical knowledge.

Sir George Foster, in his address, referred to the various activities of the Government service with which he was actively connected and which were of direct service to the chemical world, and then, after some badinage pointed at the chemist by reason of his lineal descent from the alchemist, the necromancer and soothsayer, and the evil one, he dwelt at length on the benefits accruing from the applications of chemistry to industrial life. He emphasised the need for increased production and its necessary counterpart—economy. "With the exception of the United States, which is a wasteful country too, Canada is probably one of the most wasteful countries in the world," and he instanced the enormous wastage that had characterised the lumber industry in the past. A country's material resources may be divided into two classes: those which are exhaustible, *e.g.*, coal and other mineral wealth, and those which can be maintained always if we deal with them in the right way, such as agricultural products, fisheries, and livestock. Science was needed to conserve both. The terrible wastage of the late war would not be entirely in vain if we remembered the lesson that business must not be divorced from nationality. Whilst the business man should be allowed as much freedom as possible, he, on his side, must recognise that he owes a fealty to the nation which protects him and within the borders of which he carries on his activities. Under the old *régime* of internationalised commercialism, some of the most valuable inventions and processes which were discovered in Great Britain went over to the Germans; that must never be allowed to happen again. The war has not only shown up our weakness; it has brought the realisation that we have within the Empire resources, genius and skill equal to those found in any other country in the world.

On January 22, a paper on "Colloidal Fuels," written by Mr. L. W. Bates, was read by Mr. Stansfield, chief engineering chemist of the Fuel Testing Plant. It was shown that Mr. R. C. Cantelo, of the Fuel Testing Division of the Mines Branch, had carried out successfully some preliminary investigations to ascertain whether carbonised lignite could be employed in place of pulverised coal.

Toronto.

At the December meeting Brig.-General C. H. Mitchell, Dean of the Faculty of Applied Science and Engineering of Toronto University, who has recently returned from overseas service on the Intelligence Service of the Allied Armies, was the speaker, and delivered a very interesting address on "The War and Reconstruction as Applied to Chemical Industry." Dean Mitchell referred to the war as a "chemical war," emphasising the important parts which chemists and chemicals had played therein. He firmly believes that were science and scientific men and management allowed full sway, the Allied countries could retain the trade which they have wrested from Germany during the war.

Montreal.

In November "The Zinc and Lead Deposits of Gaspe" were discussed, Mr. Beidleman's paper being read by Mr. Alexander Gray. Geological reports have shown that these ores are practically free from iron, are of high grade, and equal to those at Joplin, in Missouri, U.S.A. In the 50 acres developed the sphalerite has a zinc content of from 62 to 65 per cent., with less than one-half per cent. of iron.

A paper on "The Utilisation of Kelp" was given by Mr. Ball in December. During the war the Hercules Powder Co. developed the kelp industry on the Pacific Coast.

On January 23, Mr. C. F. Bardorf, of the St. Lawrence Sugar Refineries, gave a paper, "Notes on Decolorising Blacks."

The Montreal Branch expects to hold a meeting and to visit the large electro-chemical plants at Shawinigan Falls, Quebec, in May next.

NOTTINGHAM.

The meeting held on February 4 was opened by the chairman (Mr. F. H. Carr) with a reference to the death of Mr. F. J. R. Carulla on January 6, 1920. Mr. Archbutt, in a brief appreciation, alluded to the valuable papers which Mr. Carulla had contributed to the Iron and Steel Institute and other societies. A series of papers was then read on the analytical chemistry of iron and steel and of pharmaceutical products.

The contribution by Messrs. H. Droop Richmond and S. F. Hall consisted of a critical examination of the Reichert-Polenske method of determining soluble and insoluble acids in fats. The original method was followed, but the times of distillation were varied between 20 and 36 or 38 minutes. This variation had no effect on either the soluble or insoluble acid numbers in the case of butter. In the case of coconut oil the soluble acids were not affected, but the insoluble acids showed a steady decrease with increasing time of distillation.

The next contribution was by Mr. J. Davidson on "The Nesbitt Absorption Bulb and 'Ascarite.'" The special feature of the bulb is a stopper which can be turned so as to close the contents (for weighing) or to permit the passage of oxygen carrying carbon dioxide through the absorbent, through a filter of glass wool, and then through a side tube which is sealed at the bottom of the apparatus and also to the neck in such a way that its communication with the exit is through a sunken portion of the stopper. The absorbent material, called "ascarite," consists of caustic soda deposited on an inert material. It absorbs the water produced by the primary reaction between the carbon dioxide and alkali. Owing to the large surface and complete absorption the oxygen can be passed over the melted steel, etc. at the rate of 250 to 300 c.c. per minute and a carbon combustion be completed in 6 to 10 minutes. A single filling suffices for over 250 combustions, and the weight of the apparatus was said to be about 150 grms.

The next paper was read by Mr. A. E. Musgrave on an improved nickel crucible for use in the determination of sulphur in fuels by oxidation with sodium peroxide.

Mr. B. Collitt then gave an account of the standard analysed samples prepared by the Bureau of Standards, U.S.A., and showed specimens of these, including brasses, sugars, pure metals and analytical reagents. He next described some of the advantages of pure sodium oxalate as a standard for permanganate. The "standard" salt with certificate of analysis, if previously dried at 105° C., has a total impurity of not more than 1 in 2,000. Details of experiments were given, the results of which were in very close agreement with those obtained with standard iron wire. In the discussion, Mr. Archbutt emphasised the great necessity for having standard samples of irons and steels, and showed that in the case of brasses, etc., where it was possible for the analyst to standardise his methods on known mixtures, the necessity was not so great. The discordant results sometimes obtained by chemists working on the same steels might in reality all be correct, and the want of agreement due to segregation in the metal.

The last paper was by Messrs. J. M. Wilkie and J. Wain on the analysis of lead plaster. This is the basis of nearly all the plaster masses of the British Pharmacopœia, and are made by digesting lead oxide with olive oil on the water bath. The usual method of analysis does not seem quite satisfactory. In the method proposed, the preparation is dissolved in glacial acetic acid, the fatty acids are extracted with chloroform, and the lead determined in the residual liquid. The authors have not yet decided upon the best method of estimating the lead, but they incline to Moser's method, *i.e.*, precipitation as iodate and determining iodometrically the excess of soluble iodate added.

BRISTOL AND SOUTH WALES.

In the University College, Cardiff, on February 6, Mr. John Myers communicated a paper on "The Bearing of Structure on the Breakdown of Metals. Mr. W. R. Bird presided.

The author dealt with a number of industrial failures and exhibited many photomicrographs, including examples of ingot defects, piping and non-metallic inclusions in steel blow-holes, films surrounding grains, dross inclusions, and excessive lead in yellow metals. Instances of the use of unsuitable material were cited, and the great value of Whiteley's method of etching (see J. Clev. Inst. Eng., 1914) for investigating the earlier history of heat-treated steels was emphasised, particularly for the differentiation between forged and cast motor parts. The importance of correct heat treatment of steels was discussed and cases of annealing errors in tinplate practice were illustrated by photographs of quenched and tempered alloy steels where improper heat treatment had given rise to failure.

At Bristol, on February 12, Mr. J. V. Watt read a paper on "Cement." Following a brief historical sketch, the author illustrated the great value of cement to the world of to-day by quoting statistics of production, the total annual world output being about 30 million tons. He then dealt with the composition of the raw materials and the manufacture, mentioning, among other points, the great influence of fine grinding upon the value of the finished product. Whereas a few years ago the required standard was a maximum of 10 per cent. residue on a 2500-mesh sieve, modern cement gives a residue of about the same amount through 32,400 meshes to the sq. inch. The tests employed for cements, including chemical analysis, time of setting, fineness, tensile strength, and soundness were described and critically discussed. The error in the tensile strength test which may arise if the results of the "neat" test alone are relied upon was pointed out, and the opinion expressed that this test should be abolished, as has been done in many other countries.

MANCHESTER.

Mr. John Allan took the chair at the meeting held on February 6, when over 100 members and visitors attended.

Messrs. F. S. Sinnatt and A. Grounds read a paper on "A New Characteristic for Coal: The Agglutination Curve," giving the results of an investigation carried out under the auspices of the Lancashire and Cheshire Coal Research Association. When caking coal is mixed with a certain proportion of a pulverised inert substance, such as sand or anthracite, and the resulting mixture carbonised, the coke does not form a coherent button if the content of inert material exceeds a certain limit. The limiting proportion of inert substance is a measure of the agglutinating value of the coal. The authors have found that the caking power of the coal may be destroyed by a very small proportion of inert material of a considerable degree of fineness. Curves have been obtained showing the proportion of inert material of varying degrees of fineness a particular coal can sustain and still yield a coherent coke. This curve varies in form for different coals, and has been called the "agglutination curve." It is suggested that the form of curve may be used for ascertaining the type of coke which a coal will produce when carbonised. The authors consider that pulverised electrode carbon is one of the most convenient substances for use as the inert substance when carrying out the test.

The second paper, on the "Estimation of the Nitro-group in Aromatic Organic Compounds," was by Drs. T. Callan, J. A. Henderson and Mr. N. Stafford. Methods of estimating the nitro-group in these compounds may be classified as follows:—(1) Reduction of the nitro-group by excess of a reducing agent (*e.g.*, titanous or stannous chloride), followed by a determination of this excess with a suitable reagent. (2) Reduction of the nitro-compound and subsequent titration of the amino-compound with standard sodium nitrite solution. (3) Modifications of the Kjeldahl method. The authors have found that although the methods of the first class give good results in a very large number of cases, yet with certain substances, *e.g.*, α-nitronaphthalene and *o*-nitroanisole, low and discordant results are obtained owing to the formation of chlorinated amines. To avoid chlorination the authors have successfully used titanous sulphate in sulphuric acid solution in place of titanous chloride in hydrochloric acid solution. The other methods were also discussed.

EDINBURGH.

The fifth ordinary meeting of the Section was held on February 11, with Dr. D. S. Jerdan in the chair. Prof. James Walker read a paper on "Modern Ideas of the Atom," in which he traced the development of ideas regarding the structure of the atom from the time of the Greek philosophers, through the alchemists, Newton, and Dalton, down to the modern views of J. J. Thomson, Rutherford and Mosley, which he dealt with in detail. The influence of the idea of valency on the development of organic chemistry was also discussed.

It was intimated that the annual general meeting would be held on March 9.

BIRMINGHAM.

A meeting was held on February 12, at the University of Birmingham, with Dr. H. W. Brownsdon in the chair. Dr. E. B. Maxted read a paper on "Catalysis," dealing with it mainly from the industrial standpoint. The importance of catalysis in industry was dealt with, and it was pointed out that new catalytic processes were largely discovered by empirical methods, owing to the absence of theoretical principles. In view of the industrial use of impure materials, the study of catalyst poisoning is almost of equal importance to that of catalysis itself. A general theory of catalysis that is applicable to every type of reaction is probably an impossibility. Thus, the selection of types of accelerating mechanism, each involving separate theoretical principles, is the necessary preliminary step to the prediction of the degree of activity of a catalyst under definite conditions. The application by Lewis of the quantum theory of radiation to catalysis in general is an advance in this direction.

A paper on "The Preparation of Cyanogen Chloride on a Large Laboratory Scale," by Dr. T. S. Price and Mr. S. J. Green, was taken as read.

LIVERPOOL.

A meeting of this section was held on February 20, at the Adelphi Hotel, when a paper was read by Mr. W. P. Dreaper on the use of oil fuel in chemical works. The paper described work which had been carried out during the war at H.M. Factory, Sutton Oak, and reviewed the use of oil fuel for such purposes as heating caustic soda pots, or plant other than for steam generation. The types of burners, muffles, and furnaces were described in detail, and the merits of using compressed air or steam to atomise the oil were discussed, particularly with mixtures of oils containing upwards of 70 per cent. of pitch. The economic advantages of oil as against coal or producer gas were reviewed, and it was pointed out that the price of oil must not be considered the only criterion of its utility, as indirect economies, such as ease of manipulation, speed and regularity of heating, etc., played a predominating part in the advantages achieved by the use of oil.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF DYERS AND COLOURISTS.

A lecture entitled "From Munitions to Dyestuffs" was delivered by Dr. J. B. Oesch, of Leeds University, to the West Riding Section on February 5.

After describing the manner in which the dye-making industry had been handicapped during the war owing to the great demands made by the explosives industry on both chemists and plant, the lecturer indicated the ways in which some of the munitions of war and also the plant used in their preparation can be utilised for the preparation of intermediates and some of the more modern dyestuffs. Thus chlorine is used very largely in the preparation of certain intermediates, and also because of its beneficial effect on the shade and fastness of such dyestuffs as the indanthrene colours. Again, phosgene is used in large quantities in the preparation of intermediates, which are further transformed into the excellent direct cotton dyes known as the benzo-fast dyes (of Bayer and Co.). Other types of dyestuffs in the preparation of which phosgene plays an essential part are the helindone series, and practically all types of the triphenylmethane colouring matters.

The lecturer then described the rapid growth in this country during the war of the "phenol" and the "chloro-benzene" processes of making picric acid; by converting this into picramic acid, and subsequently coupling with various azo components, the excellent series of metachrome dyes (Berlin Aniline Co.) results. Interest in TNT centres mainly around the plant used in its manufacture, as the product itself cannot be used as a dye. The plant, however, is easily adaptable for the manufacture of most of the important intermediates.

NATIONAL ASSOCIATION OF INDUSTRIAL CHEMISTS.

The annual meeting was held at Middlesbrough, on February 7, and among the more important matters considered was the formation of a sub-committee to formulate a policy concerning the salaries and conditions of work of industrial chemists and the regulation of the admission of boys into the chemical profession. The rules for admission were so altered as to admit students at approved educational institutions to the associateship; steps were taken to deal with the question of the very serious overcrowding of the profession.

The Hon. Secretary's report states that the registration of the Association as a trade union was a purely legal formality conferring certain rights and privileges, and which did not in any way bind it to the Labour Party or any other political organisation; it emphasises the potentially important *rôle* of the brain worker in industry, and claims for the association the unique distinction of being the only organisation which includes within its scope the totality of industrial chemists. Evidence is adduced showing the influence of the Association has already attained and the progress made. The membership increased by 24 per cent. during 1919, and now numbers well over 1,000. There are local sections at Middlesbrough, Birmingham, Sheffield, Newcastle, London, Glasgow, and Manchester, in addition to a number of members at Scunthorpe who prefer to remain unattached to any section.

Mr. A. J. C. Charlier, in his presidential address, spoke of the serious harm which had been done by the Ministry of Munitions in encouraging the so-called intensive training whereby youths who had undergone a three months' course of training at certain colleges and universities were recognised by the Government as "qualified chemists," and sent into works as such. Extensive and careful investigation had shown him that the best positions in the industry were held by men who had had little or no university training; academic training was of secondary importance, the prime essentials being a knowledge of engineering and a long practical experience. On the other hand, there were thousands of chemists who possess both academic and "practical" qualifications and who were earning lower wages than unskilled labourers. The Association was doing its best to ameliorate their conditions and prospects.

OIL AND COLOUR CHEMISTS ASSOCIATION.

At the February meeting, held on the 12th inst., Dr. R. S. Morrell read a paper on "The Colloid Chemistry of Varnishes and Paints."

In spite of the importance of the problems of surfaces it is surprising that the scientific study of the colloids of varnishes and paints has been so much neglected. The drying oils differ among themselves as to emulsifying power, but no determinations of their comparative drop numbers have yet been published. From the writer's observations, soya bean and linseed oil are more easily emulsified than China wood oil; and polymerised drying oils emulsify less easily than linseed oil. The formation of linoxyn is that of a gel of peroxides probably polymerised (Morrell, J.C.S., 1918, **113**, 111), and is comparable with the behaviour of cyclopentadiene, which gives a dipolymeride on exposure to air. (Stobbe and Dunnhaupt, Ber., 1919, **53**, 1436.)

In the changes occurring during the drying of oils attention must be drawn to the surface action of the metallic drier. The surface tension to air of linseed oil, as determined by the writer by Magie's method (Livingstone and Morgan, J. Amer. Chem. Soc., 1911, vol. 33), is higher than that of a lead drying oil, but lower than that of China wood oil or thickened linseed oil. It is to be expected that the lead soap would concentrate on the surface, whereby its specific surface and its catalytic activity would be increased. Partially oxidised Tung oil showed almost the same value as that of raw oil. The subject requires further investigation. The permeability of a varnish to water and to salt solutions has been examined by the writer (see also Molteni, Oil and Col. Chem. Assoc., 1919, **2**, 37, and de Waele, *loc. cit.* 107). In the case of certain varnishes the coatings are almost impermeable to water. In salt solutions of normal strength the permeability is reduced to a very low figure. Metallic ions vary slightly in their inhibitory power, but no definite evidence could be obtained of anionic or kationic permeability. The kationic permeability is still under investigation. The influence of the percentage of linoxyn on the water-absorbing properties of a film and the inhibitory property of a linoxyn of polymerised oil are very marked.

The so-called chalking of a film in water is ascribed primarily to an emulsion of the water in a dispersed medium of varnish or oil, but in the case of shellac to a disperse phase of the resin in water. The milkiness or chalkiness often disappears on removal from the water except in the case of shellac, where it is permanent. It seems to be dependent on the nature of the metallic ion of the driers present, and from preliminary experiments it appears that the higher the valency of the metal of the drier, the less the milkiness. It was found that the drop numbers of water into an elastic varnish were less for water than for salt solutions; the stronger the salt solution the larger the drop number; moreover, varnishes with the lowest water absorption power containing a high content of polymerised oil give a higher drop number than varnishes containing ordinary linseed oil. The study of the surface tensions of varnishes and their films requires full investigation. In the literature of oil paints the application of the principles of colloid chemistry is very scanty. Gardner (J. Ind. Eng. Chem., 1916, 8, 794) discusses the opacity or hiding power of a pigment as dependent on the fineness, the refractive index of the pigment and medium and the oil absorption of the pigment. The phenomenon of surface adsorption by certain lake bases in the presence of colouring matters is of interest and explains why highly colloid pigments are often preferred. The livering of paints is connected with the gelatinisation of the colloid resin, due to its reduction in acidity by the pigment; skinning would appear to be caused by the oil acids acting on the pigment (Ware and Christman, J. Ind. Eng. Chem., 1916, 8, 879). Under suspensoid pigments the adhesive and cementing properties increase with approach to colloid form.

Although the properties of varnishes and of paints are conditioned by the chemical composition of the mixings, nevertheless the properties which often decide between high and low-class articles or between suitability and unfitness are rather to be sought in the comparison of relationship of phases and in changes of surface energy and adsorption.

THE CHEMICAL SOCIETY.

On February 19, at an ordinary meeting, Sir J. J. Dobbie announced the names of those who had been proposed by the Council to fill impending vacancies. Prof. J. C. Philip has been nominated to succeed Prof. S. Smiles as senior secretary, and Dr. H. R. Le Sueur to become junior secretary. Profs. J. B. Cohen and S. Smiles are nominated vice-presidents, and the following are proposed as new members of Council:—Prof. A. J. Allmand, Dr. E. F. Armstrong, Mr. F. H. Carr and Prof. J. T. Hewitt. It was also announced that the projected soirée to be held in March had fallen through owing to lack of support; that H.M. the King had granted the Society the supplemental charter sought for; and that Miss Roscoe had presented to the library the complete scientific correspondence of the late Sir H. E. Roscoe.

The first paper was by Dr. S. B. Schryver and Mr. C. C. Wood on "A New Method for the Estimation of Methyl Alcohol." The method consists in mixing the aqueous solution under investigation with equal volumes of solutions of ammonium persulphate of varying concentrations, and ascertaining the strength of solution which is just sufficient to give no formaldehyde reaction. For testing formaldehyde, Schryver's method with phenylhydrazine hydrochloride, potassium ferricyanide and hydrochloric acid was employed. For estimating methyl alcohol in ethyl alcohol, the solution of these in water was oxidised with insufficient ammonium persulphate, and the amount of formaldehyde was determined colorimetrically, the same formaldehyde test being employed. Methyl alcohol in acetone can be estimated by a method similar to that used for estimating the alcohol in water, as there is preferential oxidation of this substance.

The second paper on "$\beta\beta'$-Dichlorethyl Sulphide," by Mr. C. S. Gibson and Sir William Pope, was presented in abstract by the latter. The authors prepared this compound by passing ethylene into sulphur dichloride, at 50° C., with agitation, and in presence of finely powdered absorbent charcoal. This method was communicated to the Chemical Warfare Department on January 16, 1918; although superior to methods previously used, it is difficult to control, because the "mustard gas" is rapidly acted upon by sulphur dichloride. Dealing with the interaction between ethylene and sulphur monochloride, Sir W. Pope quoted the work of Spring and Lecrenier (Bull. Soc. Chim., 1887 (2), 629), showing that Guthrie's product yields β-chlorethylsulphonic acid (convertible into taurine) on oxidation, and hence its constitution is $CH_2Cl.CH_2.S.S.CH_2CH_2Cl$. This and other evidence refutes the contention of A. G. Green that the substance produced at 30° C. is identical with Guthrie's. The paper gives full details of the preparation of pure $\beta\beta'$-dichlorethyl sulphide; the absorption of ethylene by the sulphurmonochloride is much accelerated by the initial presence of a little of the finished product. Various constants were determined, including the melting point (13—13·5° C.), density (1·285), heat of combustion (743·3 Cal.), refractive index, etc. The initial action of conc. nitric acid is to convert it into the corresponding sulphoxide, and this fact affords a ready method of distinguishing Guthrie's disulphide from the monosulphide. On treatment with bromine, the sulphoxide yields well-defined bromine addition products.

Prof. A. G. Green expressed the view that certain differences of opinion which had arisen were in part due to the ambiguity of the term "mustard gas"; it had been applied both to the monosulphide and to the Levinstein and Guthrie products (which were identical). The difficulty attending the fact that different workers had obtained the same product at widely differing temperatures disappeared when it was realised that temperature was not the only factor determining the course of the reaction, *e.g.*, rate of reaction and absence of iron were equally important. The monosulphide could be readily prepared at 100° C. in the absence of iron, and working in this manner he had obtained a yield of 80 per cent. of pure distilled product. Sir Wm. Pope's suggestion that the Guthrie product is a true disulphide, $C_2H_4Cl.S.S.C_2H_4Cl$, and differs from the Levinstein product, which is regarded as a colloidal solution of sulphur in the monosulphide, could not, in his opinion, be maintained, since whatever view is held as to the constitution of these products, all the experimental facts support their complete identity. The work of Spring did not throw any light on the question at issue, as it might be equally interpreted in favour of either hypothesis.

THE ROYAL SOCIETY.

At the ordinary meeting held on February 12, Sir J. J. Thomson presiding, Prof. S. Young communicated a paper by Dr. J. W. McBain and Mr. C. S. Salmon on "Colloidal Electrolytes: Soap Solutions and their Constitution." The authors advance a comprehensive theory of soap solutions which leads to a definition of colloidal electrolytes—a class the members of which will probably prove more numerous than acids and bases put together; they are salts in which one of the ions has been replaced by an ionic micelle.

The ionic micelle in the case of soap exhibits an equivalent conductivity equal to that of potassium ion, and double that of the palmitate ion which it has replaced. In concentrated solutions soaps exist chiefly in colloidal form, together with sodium or potassium ion, equivalent to the ionic micelle present, whereas in dilute solution both undissociated and dissociated soap are crystalloids of simple molecular weight. In mixtures of soaps the tendency is to form more micellæ. Addition of electrolytes, however, exerts opposing influences. The conception of the ionic micelle serves to explain the behaviour of solutions of dyestuffs, indicators, and proteins. The authors have devised a modification of the dew-point method by which measurements of osmotic activity and "molecular weight" can be carried out, free from the uncertainties of interpretation of the results obtained for colloids by the osmometer methods, and superseding the well-known but erroneous data of Krafft.

NEWS AND NOTES.

FRANCE.

Proposed Nationalisation of the Coal Industry.—The question of nationalising the coal mines is viewed with mixed feelings in France. The general effect of State control of the coal industry has been to lower the quality of the product. Thus, in some cases, the ash content of coal has increased from 15 to 30, and even to 40 per cent. Further, the quality of the coal imported from Belgium, where the industry is also State-controlled, has been so poor that the French Government had to prohibit the export of iron ore to Belgium until measures were taken there to improve the quality of the coal. In France it is felt that State control would, at any rate, have the good effect of regulating prices; but, on the whole, the opinion prevails that the complete return to private enterprise would be the surest means of increasing production and lowering prices.

Metallurgy.—The continuous rise in the prices of metals and the depreciation of the franc make it imperative for France to restrict her metal importations as far as possible and to develop her native resources. Raw metals could be imported instead of refined ones, thereby utilising the great reserves of water power in the production of the electric current necessary for metal-refining. Copper is a case in point. In fact, two copper refineries are now under construction, one by the Société Electro-metallurgique du Palais at Limoges, and the other at Pauillac. It is estimated that they will produce 25,000 tons of electrolytic copper yearly. There is scope for extension of the electrolytic production of zinc; this process is about to be adopted by the Société de Penarroya, in the Pyrenees, to the treatment of mixed ores of lead and zinc, which are fairly abundant in France. The Compagnie des Métaux will produce tin. In New Caledonia ferro-nickel is now being made in the electric furnace, and a separation process from iron is under contemplation, so that pure nickel only may be sent to France. The natural resources in regard to water power and the steady development in the uses of the electric furnace point to a great future for electro-metallurgy in France.

Prolongation of French Patent Rights.—By the decree of August 14, 1914, the French Government suspended patent rights and at the same time prolonged the periods laid down by the law for the payment of fees and for the practical application of the patents. In order to compensate those who had been unable to work or profit from their inventions during the war the Government, after some tentative proposals, passed the law of October 8, 1919, the detailed application of which is prescribed by the decree of November 8, 1919.

This law prolongs the life of patents provided their owners can give proof that they have been harmed by the war, and a court is established to inquire into each demand for prolongation. Patents rights that have expired since August 1, 1914, can be revived, but persons who have begun to work patents that had lapsed since August 1, 1914, can continue working them in spite of the prolongation of the patent rights. The payment of delayed fees is also regulated, and, if good cause can be shown, the payment may be reduced or even cancelled. The substance of the first clause of the law is that patentees who, owing to the war, have been prevented from working their patents normally may, in the case of patents not expired before August 1, 1914, or of those applied for or granted before August 1, 1919, have their patent rights prolonged. This applies to foreigners, even former enemy subjects, as well as to Frenchmen. The term " normal working " applies in the case of lack of raw materials, labour, markets, and when raw materials have been requisitioned for national defence. It is laid down that, while those who have suffered from the war have a right to compensation, it must not be at the public expense.

The period by which the patent may be prolonged is calculated by taking into account the time during which normal working has been suspended or hindered. A supplementary and exceptional prolongation of one to three years is further provided for those who have been serving with the Colours for more than two years and whose business has been destroyed or disorganised by the war, if such delay appears necessary for the reconstruction of their business. The total prolongation may be as much as eight years.

When a person has, in good faith, begun to work a patent lapsed since August 1, 1914, in a " serious and effective " manner, and provided that such working took place before October 10, 1919, then he cannot be proceeded against under the patent law, which in this case recognises that he has a " personal ownership " in the patent.—(*Chim. et Ind., Jan.*, 1920.)

BRITISH INDIA.

The Indian Science Congress.—This year's Congress was held in January at Nagpur under the presidency of Sir Prafulla Chandra Ray. The presidential address dealt mainly with the position and prospects of science in India. After pointing out that the Indian is naturally more prone to metaphysical speculation than to positive science, Sir P. C. Ray sketched the early history of science teaching in Bengal, emphasising the absolute dependence of progress on a high development of science. He deplored the want of education among the people of India; their illiteracy, he said, is colossal, barely 3 per cent. of the whole population receiving instruction in educational institutions. It is therefore small wonder that new methods of agriculture make very slow progress. The speaker then criticised the methods used in filling scientific posts in India. " The scientific services of the Government of India are posts of great value, prospect and security; they afford their holders unique opportunities, rare and valuable materials, for study and investigation. But with what studied care the Indians are excluded from these services will appear from the following table compiled from a recent Government report." The table shows 195 European officers of the higher grade in 11 scientific services and only 18 Indians. The average pay of the Europeans is about Rs.1000, and that of the Indians about half that amount. Sir P. C. Ray also criticised adversely the methods of filling professorial chairs in India, and especially in Calcutta University: " Either a raw, untried graduate is brought out from England, or it automatically falls to some senior man in the service whose only title to the post is his seniority, which often goes hand-in-hand with senility. In ninety-nine cases out of a hundred the successor so chosen has no original work to his credit, and may have lost all touch with the progress of his subject. Enormous facilities at his disposal thus remain unused as long as he encumbers the post."

Sir P. C. Ray has been severely criticised for using a scientific occasion for political purposes, and it is pointed out that the low standard of the Indian universities is sufficient in itself to prevent the immediate " Indianisation of the scientific departments." The principal obstacle to the raising of the standard is the state of opinion in the classes of the community which send their sons to the university. These insist on giving degrees for what in Europe would only be considered sufficient for matriculation. The introduction of Indians has, moreover, been taking place as rapidly as the supply of really good Indian scientists will allow, and meets with little opposition from the Europeans, one reason for this being that the scientific services are relatively so badly paid that there is not much hope of getting good men from England in the future.

Among the papers read before the whole Congress was one of great interest by Prof. C. V. Raman on " Theories of Ferro-magnetism," which discussed the constitution of the atom in the light of recent researches; and Dr. C. L. Bose, in an address on " The Choice of Food," showed that the ordinary diet of the Bengali is deficient in proteids, and to this cause he ascribes largely their poor health and physique.

UNITED STATES.

Nitrogen Fixation.—It is announced that the General Chemical Co. of New York and the Solvay Process Co. of Syracuse, N.Y., have jointly undertaken the organisation of a new company, called the Atmospheric Nitrogen Corporation, to develop the nitrogen fixation processes. The capital of the new undertaking is $5,000,000, and a plant is to be erected at Syracuse at an estimated cost of $1,000,000.

American Pottery in 1918.—The year 1918 was unusual and difficult for American pottery manufacturers owing to restricted imports of raw materials, shortage of labour, and the exceptional demands of the military authorities. In few works was the output more than 70 per cent. of the capacity. The high wages actually prevented some men from working full time. No extensive replacement of men by women occurred.

The shortage of labour resulted in a great increase in the amount of labour-saving machinery, tunnel kilns, etc., employed, and made the year 1918 notable in this respect. Considerable interest was aroused by the delivery to the White House for the official use of the President of the United States of a dinner service comprising 1,700 pieces of cream and ivory china decorated with the Stars and Stripes and the President's seal. This is the first wholly American-made official dinner service.

The only pottery products the manufacture of which was restricted by reductions in the use of fuel were sanitary ware and stoneware other than for chemical purposes. Many firms simplified their output at the request of the Potters' War Service Committee, and a conservative order was issued limiting the number and variety of porcelain articles to be manufactured during the war. Special designs already prepared by any pottery were not to be copied by others during the war. Each manufacturer of vitrified china was restricted to two shapes of ware for hotel use and one shape for family use.

Every class of ware (except red earthenware) increased in value, that of the china made in 1918 being four times as great as that made in 1908. The decrease in the total value of the red ware produced is attributed to the fuel restrictions on florists, who are the chief users of this ware (for flower-pots). Chemical pottery also increased both in quantity and value.

The total value of the pottery imports in 1918 was within 1 per cent. of that of 1917. Decorated earthenware showed the largest increase—nearly ten per cent. The value of the clay products exported in 1918 was 14 per cent. more than that of 1917. Of this 72 per cent. was brick and tile, 19 per cent. was pottery, and the remainder was unclassified. Exports of firebricks and sanitary ware had a total value in 1918 greater than in any previous year.

A vigorous attempt was made to use only American clays, but little progress has yet been made in this direction. (*U.S. Geol. Surv., Nov.* 12, 1919.)

American Gypsum in 1918.—Owing to the reduction in building operations nearly 24 per cent. less gypsum was mined in the United States in 1918 than in 1917, the output being less than any year since 1909. The reduction was due solely to the war. On the other hand the total value of the gypsum produced in 1918 was greater than in any previous year. This increase was confined to Michigan, New York and Oklahoma.

The chief uses of gypsum reported in 1918 were (a) as a retarder for Portland cement, (b) for land plaster, (c) for wall plaster and plaster of Paris, (d) for Keene's cement, which is now made in twelve States, (e) dental plaster, formerly made in six States, but in 1918 by only one firm, (f) plate-glass works, which use about 12,000 tons per annum, (g) plaster board, tile blocks made by 28 plants in 1918, as compared with 19 plants in 1917, (h) temporary buildings erected by the U.S. Government for military and civilian purposes, including 16,000 tons of paste and 18,000,000 sq. ft. of plaster board used by the Emergency Fleet Corporation and 8700 tons of plaster, 1,658,374 sq. ft. of plaster board and 10,540 sq. ft. of gypsum wall board used by the U.S. Housing Corporation, as well as large quantities used by the War Department.

The decline of imported gypsum from 400,000 tons in 1914 to 60,000 tons in 1918 was due solely to the war. Almost all the imported material came from Canada.

The value of the plaster or wall board exported in 1918 was nearly four times that exported in 1916. Japan took a quantity equal in value to that of the whole amount exported in 1916, the next largest buyers being Cuba, Australia and Canada.

Among new uses of gypsum may be noted its employment as an acid reagent in baking powder, and as agricultural gypsum after a light crushing. A list of the manufacturers of plaster and allied products is given in *Mineral Resources of the United States*, 1918, II., 282—298.—(*U.S. Geol. Surv., Nov.* 12, 1919.)

JAPAN.

The Camphor Industry.—The production of camphor in Japan, especially in Formosa, has been diminishing for the past few years in spite of the strong efforts made by the Formosan Government-General to counteract it. Producers of crude camphor, who have suffered from labour shortage and high wages, have been given relief by the increase in the official purchasing prices. Refiners have been induced to amalgamate their interests, but results are not to be expected for some time. There has recently been a boom in camphor, and the present price is now far above the old level of 700 yen (yen=2s. 0½d.), being nearly three times the price in October last; but even these high prices do not affect the camphor trade.

The Japanese Monopoly Bureau has assumed the equitable distribution of camphor in Japan, Europe and the United States. Inevitably, however, the share of each customer is smaller although his demand is much bigger. The Japanese celluloid manufacturers, who have recovered from the effects of the armistice, in particular absorb an enormous amount, but they, too, have to go short. The export trade is also expanding; in fact the increased demand is largely due to foreign orders. The United States is the most important buyer. England, British India and other countries are also buying quite actively. Refiners are pressed for supply, and any stock offered is quickly absorbed. At present there is scarcely any floating stock on the market.

The following table shows the production and export of camphor for the period 1907—1917:—

Production.

	Japan.		Formosa.	
	Camphor.	Camphor oil.	Camphor.	Camphor oil.
	Kin.	Kin.		
1907	746,729	959,316	3,780,227	4,314,620
1908	836,812	1,031,859	3,557,636	4,630,873
1909	832,271	1,143,454	3,538,108	3,870,254
1910	1,054,347	1,063,329	5,360,642	5,858,145
1911	1,103,058	1,845,403	4,509,412	5,306,044
1912	976,734	1,687,015	4,138,909	5,386,222
1913	995,934	1,691,152	4,580,577	5,704,354
1914	1,115,812	1,977,294	4,749,971	6,411,404
1915	1,600,815	3,001,421	4,620,182	6,881,232
1916	1,567,735	3,032,922	5,349,497	7,997,137
1917	938,652	1,853,382	3,185,139	6,003,975

Exportation.

	Camphor.		Camphor oil.	
	Kin.	Yen.	Kin.	Yen.
1907	3,057,657	5,026,858	1,870,581	307,778
1908	1,807,565	2,063,410	1,259,983	212,947
1909	4,050,782	3,469,398	1,272,765	220,319
1910	3,275,102	2,964,369	1,686,861	309,990
1911	3,441,099	3,143,684	1,741,721	368,052
1912	3,062,462	2,826,754	1,131,226	242,238
1913	2,478,285	2,235,784	1,961,483	410,776
1914	3,073,824	2,780,001	1,366,937	216,640
1915	3,880,031	3,475,415	2,313,326	318,763
1916	5,753,863	6,287,795	1,971,680	308,275
1917	—	5,304,157	—	—
1918	—	3,686,377	—	—
1919	(1st 6 mths.)	3,020,000	—	—

The average annual output of Japanese refined camphor is 8—9 million kin, and that of crude camphor oil is 3—4 million kin. The annual total world demand in recent years has been 10 million kin or more.

GENERAL.

Testing of Volumetric Glassware at the National Physical Laboratory.—The manufacture of volumetric scientific glassware is an industry which was practically non-existent in this country before the war, but latterly it has been developed to an important extent, and it is clearly desirable that it should remain as a permanent British asset. To attain this it is most important that British-made graduated apparatus should be of reliable accuracy. With the growth of the industry in this country it was felt that the scope of the work carried out at the National Physical Laboratory should be widened. Consequently, in co-operation with manufacturers and users of scientific glassware, a pamphlet was issued in July, 1918, containing regulations relating to Class A tests, *i.e.*, tests on apparatus required to be of the highest accuracy (this J., 1918, 301 R). A new building has just been completed at the laboratory specially equipped for dealing with this class of work on a large scale. At the outset it was urged that in addition to the tests already referred to provision should be made for testing apparatus intended to possess only commercial or Class B accuracy. Pending the settlement of a permanent scheme for commercial testing by the State, or by State-approved institutions, a matter which is now under the consideration of the Government, the National Physical Laboratory is now prepared to undertake Class B tests at the request of manufacturers and others, such tests being carried out for the time being at Teddington.

It is hoped eventually to arrange for this work to be done at local centres.

A full account of the tolerances allowed, methods of test, details of construction, test fees, etc., is given in the new edition of the Laboratory Test Pamphlet relating to "Volumetric Tests on Scientific Glassware," published in November, 1919. Copies of this pamphlet, which was drawn up in co-operation with both manufacturers and users of volumetric apparatus, may be obtained free of charge on application to The Director, The National Physical Laboratory, Teddington, Middlesex.

Relations of the State to the Dye Industry.—The Board of Directors of the Manchester Chamber of Commerce has approved the following resolution, which was passed by a special committee of the Chamber appointed to consider the question of supplies of dyeing materials:—

"This Committee considers that the Imports and Exports Bill will not meet the requirements of national safety and would be detrimental to research and the development of industry."

"The Committee, in viewing the Imports and Exports Bill, has concentrated particularly on the dye situation, and considers that the only satisfactory way of firmly and permanently establishing the dye-making industry in this country is for that industry to be subsidised by the State.

"The Committee has endeavoured to look at the problem from every angle of view, and in consideration of the fact that plant such as that used in dye-making is necessary for producing materials of war, is of opinion that the Government should state what amount of plant it desired to be kept in commission for national safety.

"The Committee feels that subsidy will be the means of rendering the dye industry the necessary assistance to enable it to become permanently established.

"Dye-making in this country, on account of the merging of Messrs. British Dyes, Ltd., and Messrs. Levinstein, Ltd., is so largely in the hands of this one corporation that it nearly becomes a monopoly. For this reason also the Committee considers that a body of consumers ought to be appointed, who should have monthly returns of all the dyes imported into this country, so that they could review the whole situation and, if necessary, bring pressure to bear on the British Dyestuffs Corporation, Ltd., should that corporation not support the consumer to the fullest extent.

"This information, which should also be available to the dye makers, would also be of great assistance to the Government, who would thereby be able to see if the money it gave in subsidy was being wisely and energetically used.

"The Committee feels that the Board of Trade should be interviewed on the whole question, and how best to collect these returns.

"The following machinery is suggested as a means to this end:—

"1. The Board of Trade to make it compulsory that the exact particulars of price, etc., of all dyestuffs brought into this country are made in the form of a monthly return for the Board of Trade.

"2. That there should be a voluntary Committee of Colour Users.

"3. That for the purposes of subsidy the Board of Trade representative should take evidence when necessary from the Committee suggested under Clause 2.

"The Committee feels that there is only one other possible way of fostering the dye industry; that is by protection in the form of tariffs. Tariffs, it submits, though helpful to the dye industry, do not meet the requirements of national safety, as the Government thereby would have no guarantee that the necessary plant would be kept in commission. Also tariffs are against the interests of consumers of dyes.

"The Committee feels that any form of prohibition or licence would be detrimental to the dye users."

The Belgian Glass Industry.—The pre-war output of plate glass was 2,800,000 square metres per annum; at present the production hardly exceeds 1,000,000 square metres. This industry did not suffer under the German occupation to the same extent as the metal and textile plants, and the present reduced output is chiefly due to want of raw materials and to labour troubles. Heavy sales, however, have recently been made in England, and the manufacturers hope to do increasing business with the United States. The Belgian makers have now formed a separate syndicate, and intend to have no further connexion with the German factories; before the war all the Continental factories were in one ring.

The window-glass plants are now all in operation, and the output is nearly half the pre-war figure. Prices have so increased that with this small output the value of the exports amounts to 10,000,000 francs per month, which is more than twice the pre-war export. With the increased production costs, it is difficult to estimate what the price will be when the normal output is resumed. During manufacture breakage amounts to 6 per cent., made up of 2 in blowing, 3 in flattening, and 1 in cutting (see also this J., 1919, 231 R).—(*U.S. Com. Rep., Nov.* 21. 1919.)

Critical Position of the Norwegian Pyrites Industry.—The development of the Norwegian pyrites industry was formerly greatly assisted by low freights, cheap wages and low production costs generally. After the outbreak of war the mines were worked at very high pressure, largely owing to the demands of the Central Powers, but subsequent to the agreement concluded with America exports fell off considerably, Great Britain obtaining the greater part of the supplies. The output of iron pyrites in 1915 was about 530,000 tons; in 1916 it was from 200,000—300,000 tons, at which figure it has since remained. Simultaneously with the decrease of output the cost of production and freight charges began to increase, and the latter factors have finally led to the closing down of the mines. Norway's chief competitor is Spain, whose output of pyrites is ten times larger, so that the Norwegian production exercises little influence upon the price of pyrites in the world's markets. The daily wage of the Spanish miner is 4 pesetas (3s. 2d.), while that of the Norwegian is from 15—20 kroner (16s. 10½d. to 22s. 6d.) [5s.—6s. for Spain and 15s.—20s. for Norway are more correct figures.—ED.] The outlook for the Norwegian industry is very unfavourable.—(*Z. angew. Chem., Oct.* 31, 1919.)

Chrome Ore Deposits in Asia Minor.—As Asia Minor has never been scientifically surveyed but very little reliable information is available. Mining methods are extremely primitive, while bad roads and transport facilities added to general insecurity have prevented exploitation and development. The chief districts where chrome mining has been carried on are the provinces of Brusa, Smyrna, Adana and Konia, but of the 40 mines for which concessions have been granted only 18 have been worked. The Germans have been interested in some of the Brusa mines, and during the war obtained 5000 tons of ore from this source. The Smyrna mines have been worked for over 20 years. Specimens of ore taken from different districts contain from 40 to 55 per cent. of CrO_3. It is estimated that available stocks for shipment at present amount to about 20,000 tons. The latest figures published are for 1911 and 1913; in the former year the total exports were 17,000 tons, of which 46 per cent. went to United States, 32 per cent. to France, 8 per cent. to Germany, and 6½ per cent. to Austria. In 1913 the exports were 26,000 tons, of which 70 per cent. was shipped to United States, 17 per cent. to

France, and 11 per cent. to the Netherlands.—(*Bd. of Trade J., Jan.* 29, 1920.)

Developments in German Electro-metallurgy and Electro-chemistry during the War.—The progress of electro-metallurgy was determined by three factors—increase in production, improvement in quality, and introduction of substitutes. The electric production of pig iron was practically negligible amongst the belligerents, but some progress was made in Scandinavia, where furnaces up to 6,000 kw. are now working satisfactorily. Whether the industry will acquire any importance in Central Europe it is premature to discuss. Electro-steel was produced in all countries in much larger quantities, but the process has not been modified; both arc and induction furnaces are employed. The shortage of ferro-manganese caused German steel producers to introduce the use of calcium carbide as a deoxidiser. It is considered likely that this mode of working will be permanently retained, as it gives satisfactory results with converter metal containing a minimum of one per cent. of manganese. Two plants, each with a monthly output of 200 tons of electrolytic iron, were completed at the time of the armistice. The process consists in electrolysing a hot solution of ferrous chloride with addition of hygroscopic salts; the metal was destined to be used as a substitute for the copper guide-bands of projectiles.

The demand for copper was met by electrolytically refining commandeered copper articles; existing refineries were enlarged and new ones erected; the multiple cascade system was used. After the exhaustion of the copper reserves, brass ware was melted down and blown in converters, the zinc being recovered as oxide and the crude residual copper (98 per cent.) cast into anodes. When brass was no longer available, bronze (chiefly church bells) was used as a source of copper. As tin cannot be removed by converting, the alloy was subjected to direct electrolysis. Considerable difficulty was experienced owing to the production of insoluble stannic acid; most of this went into the slime, but the liquors were cloudy, the anodes became coated, and the resistance of the bath increased considerably. These difficulties were overcome by the use of special processes. Electrothermic plant and methods for the smelting and refining of copper were not introduced during the war.

Electrolytic or electro-hermic processes for the production of zinc received much less attention than in the United States, the combined retort capacity of Germany and occupied Belgium being very large. Tin was recovered from the anode slime obtained in the electrolytic refining of copper, using bronze anodes, as well as from old antifriction metal. These materials were worked up in induction furnaces in two plants which proved a complete success. Certain works introduced electrolytic for tin plating, which proved more economical than the hot process. The process for the preparation of aluminium underwent no change, and several new works started operations. In place of French bauxite, deposits in various parts of Austria and Hungary were opened up. The problem of the purification of common clay does not appear to have been completely solved.

The electrolysis of alkali chloride solutions was conducted on an enormously increased scale to furnish chlorine used in gas warfare. A number of electric furnaces was erected for supplying ferro-silicon of various grades, partly for use in steel manufacture, partly for the preparation of hydrogen for captive balloons. The requirements of abrasives were met by artificial corundum fused in electric furnaces. All the electrodes required in the above industries were manufactured in Germany, whereas before the war the entire supply had been obtained from the United States.—(*Schweiz. Chem. Z., Nov.* 12, 26, 1919.)

Graphite in 1918.—The sales of American crystalline graphite in the United States in 1918 were larger than ever before, the total amount being 5742 tons, with a value of £290,000, and showing an increase of 22 per cent. by weight and 33 per cent. by value over 1917. Of this quantity 76 per cent. by weight and 94 per cent. by value was flake graphite, the remainder being dust or low-grade flake containing less than 50 per cent. of graphitic carbon. All restrictions as to importing graphite were removed on January 16, 1919, so that American producers have to face keen competition from Madagascar and Ceylon simultaneously with a great reduction in the demand, especially for crucibles.

Artificial graphite is chiefly manufactured by the Acheson Graphite Co., at Niagara Falls; it may replace natural graphite for all purposes except crucibles. Ceylon graphite is best for this purpose. Two important patents were granted in the United States in 1918 (Nos. 1,289,578 and 1,289,996) for the production of artificial graphite (a) from a mixture of natural graphite, fused bauxite, and clay, and (b) a similar method in which zirconia is used instead of fused bauxite.

Specifications for graphite for crucibles require 85—90 per cent. of carbon, the particles passing through 86—125-mesh sieves. G. D. Dab (Bureau of Mines, War Min., Ind. Serv., 1918, 3) recommends the following specification for No. 1 flake graphite: At least 85 per cent. of carbon remaining after the dried sample has been burned for 3 mins. at 800° C. The particles should leave less than 3 per cent. residue on a No. 35 standard screen, less than 65 per cent. on a No. 65 standard screen, and should remain completely on a No. 100 screen. If it is required to have a graphite containing 90 per cent. of carbon the cost is very greatly increased, as the particles must be more finely ground.

For foundry use, amorphous graphite and dust are largely used, being cheaper than flake graphite. The use of graphite as a lubricant is increasing, and that formerly employed in lead pencils is now replaced largely by Mexican amorphous material.

Outside the United States the chief occurrences of graphite are in Canada (3 per cent.), Mexico (7 per cent.), Italy (12 per cent.), Spain 2 per cent.), Ceylon (27 per cent.), Korea (6 per cent.), and Madagascar (35 per cent. of world output). In 1913 Austria-Hungary produced 39 per cent. of the world output of graphite, but as it was wholly amorphous its value was low. The reserves in Bohemia, Moravia, Lower Austria, and Styria are still very large. Italy requires very little graphite for its own use, and therefore exports to England, France, and Germany. Immense deposits of graphite were discovered in Rumania in 1918; they lie on the south slope of the Carpathians at Baia de Fier. The whole of the material obtained during the next 73 years is to go to Germany and Austria. The production of graphite in Spain showed considerable development in 1918. The greater part of the graphite used in the United Kingdom is imported from Ceylon and Madagascar, both of which countries increased their exports very largely druing 1916–7, but they fell below the level of the previous five years in 1918 owing to the scarcity of shipping, and in the summer of 1918 the export of graphite from Madagascar practically ceased.

A large number of papers on graphite were published in 1918; the more important of these are:

Alling, H.L., The Adirondack graphite deposits: New York State Mus. Bull. 199, Albany, 1918.
Bleininger, A. V., Notes on the crucible situation. Metal Industry, Vol. 16, pp. 15—16, January, 1918.
Dub, G. D., Preparation of crucible graphite: Bur. Mines War Min. Inv. Ser. 3, December, 1918.
Gillett, H. W. and Rhoads, A. E., Melting brass

in a rocking electric furnace: Bur. Mines Bull. 171, 1918. Moses, F. G., Refining Alabama flake graphite for crucible use: Bur. Mines War Min. Inv. Ser. 8, December, 1918. Newland, D. H., The mining and quarry industry of New York State: Mus. Bull. 196, 1918. Prouty, W. P. Alabama graphite in 1918: Eng. and Min. Jour., vol. 107, No. 4, pp. 194—195, 1919. Spearman, Charles, The graphite industry: Canadian Min. Jour., vol. 40, pp. 87—88, Feb. 12, 1919. Toronto University, Department of Mining Engineering, Preliminary report of an investigat.on into the concentration of graphite from some Ontario ores: Canadian Min. Jour., Vol. 40, pp. 189—197, 1919. Wilson, M. E., Graphite in Port Elmsley district, Lanark County, Ontario: Canada Geol. Survey Summary Report, 1917, pt. E., pp. 29—42, 1918.—*(U.S. Geol. Survey, Oct.* 20, 1919.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Nationalisation of Coal Mines.

In the debate on the Address, Mr. Brace moved, on behalf of the Labour Party, an amendment regretting the absence from the King's Speech of any proposal to nationalise the coal mines on the lines recommended by the Royal Commission on the Coal Industry (1919). On a division the amendment was negatived by 329 votes to 64.—(Feb. 11.)

Motor Fuel from Home Sources.

Sir Harry Brittain asked the Prime Minister if the Government proposed to take steps to increase the supply of motor fuel from home sources; if he were aware that the output of benzol had decreased from 30 million gallons per month at the time of the armistice to less than 20 million gallons at the present time; and if he would consider the proposal that all benzol made in this country should be handled by the National Benzol Association.

The Prime Minister replied that every encouragement would be given to the home-production of motor fuel; he was aware of the diminished output of benzol; and the question of the means of marketing benzol is hardly one in which the Government can interfere.—(Feb. 12.)

Importation of German Potash.

In reply to Sir R. Cooper, Sir A. Geddes said that no inport licences are required for the importation into this country of potash from Germany. Certain quantities of potash salts have been received from Germany by H.M. Government as part payment for food supplied to Germany. They are taken over from the British Government by the British Potash Co. for resale under the authority of the Potash Distribution Committee, which was set up to regulate the prices and conditions of sale. Maximum prices to consumers have been fixed, and the profits of the British Potash Co. are limited to 1 per cent. of the gross turnover of the contract plus one-third of any further profit, the remaining two-thirds reverting to the Government.—(Feb. 16.)

Canals and Inland Waterways.

In answer to Mr. N. Chamberlain, Mr. Neal, Parliamentary Secretary to the Ministry of Transport, stated that the Minister of Transport proposes to appoint a committee, of which he hopes Mr. N. Chamberlain will be chairman, to consider the practicability of developing canals and waterways, having regard to the present financial position of the country.—(Feb. 16.)

Sugar-Beet Industry.

Asked by Lieut.-Col. W. Guinness if it were proposed to reopen the factory at Cantley, Norfolk, Sir A. Boscawen said that the Kelham Estate (Notts) was selected as the most favourable spot for experimenting to find out if the sugar-beet industry can be made profitable in England. In the present state of public funds the Government is little likely to make further grants, and is not disposed to purchase a factory, the design and situation of which are, in its opinion, unsatisfactory. Moreover, the machinery at Cantley is not of the most efficient type.—(Feb. 16.)

Empire Cotton.

Sir A. Geddes informed Mr. Doyle that the Government was fully alive to the importance of developing the production of cotton within the Empire, and it is giving earnest consideration to the recommendations contained in the report of the Empire Cotton Growing Committee. These recommendations had met with widespread approval in Lancashire, and he hoped to announce the Government's intentions at a very early date.* —(Feb. 16.)

Oil-Borings in Derbyshire.

Sir H. Greenwood, in reply to Mr. Holmes, said that in order to make a thorough test of the Derbyshire district a chain of seven wells was planned covering a distance of about 20 miles. The Hardstoft well has produced approximately 1,900 barrels of oil, and indications have been met with in some of the other borings. Work is proceeding. —(Feb. 16.)

German Dyes.

Sir A. Geddes stated, in answer to Major M'Kenzie Wood, that 650 tons of dyes have been received in this country from Germany under the Treaty of Peace, and practically the whole has been allocated to users so far as possible on the basis of their requirements. Distribution is now being effected by the Central Importing Agency. The prices charged for the dyes are based on the values placed on them by the German manufacturers in their stock lists, with allowances for the low German exchange rates. The Committee of Dye Users is responsible for the distribution.—(Feb. 16.)

Public Utility Companies (Capital Issues) Bill.

The second reading of this Bill was moved by Mr. Bridgeman, who explained that it authorised gas, waterworks, and certain other companies to pay a higher rate of dividend or interest and issue capital in excess of that permitted under the original Act, subject to certain conditions; thereby saving expense to the companies in the matter of private Bill legislation and also the time of the House. The Bill was read a second time and committed to a Standing Committee.—(Feb. 18.)

Benzol Prices.

Replying to Sir H. Brittain, Mr. Bridgeman said he had seen reports to the effect that some purchasers have been offering higher prices for crude benzol than those arranged by the National Benzol Association. The question whether the use of the term "benzol" as a description of certain mixtures is a "false trade description" under the Merchandise Marks Act, 1887, is one for the courts and, as at present advised, he was not prepared to recommend legislation on the point.—(Feb. 19.)

Silver Coinage Bill.

Owing to the rise in the price of silver from under 30d. to about 88d. per ounce it is not possible to mint British silver coins except at a loss, hence a Bill has been introduced by the Chancellor of the Exchequer to reduce the fineness of the silver from 925 to 500, *i.e.*, when the Bill has been passed, British silver coins will contain 500 instead of 925 parts of silver per thousand.

* In an address to the Manchester Chamber of Commerce on Feb. 20, Sir A. Geddes announced that the Government had decided to grant £10,000 a year for five years for this purpose.

REPORT.

Report on the Conditions and Prospects of British Trade in India at the Close of the War. *By* H.M. Senior Trade Commissioner in India and Ceylon. [*Cmd.* 442. 2*s. net. H.M. Stationery Office.* 1919.]

The aim of this report of 148 pages is to impress upon British manufacturers and exporters the recent far-reaching changes in the import trade of India. Many of these changes very considerably weaken the British position in the Indian market, and must be met by revised methods and organisation of trade. The report embraces five parts:—

Part I. surveys the present position. The Empire as a whole during 1917—1918 increased its share in the overseas trade of India from 53 to 57 per cent. compared with the pre-war average; imports from the United Kingdom fell by about 9 per cent. In 1913 textiles were imported from the United Kingdom to the value of £40,000,000, being 60 per cent. of the whole. The value of imported chemicals, drugs, etc., averaged Rs.2,12,73,000 during the years 1909—1914, Rs.3,50,87,000 in 1916-17, and Rs. 4,30,10,000 during 1917-18 (rupee =1s. 4d.). For the same periods mineral oil imports were valued at Rs.3,72,03,000, Rs.4,43,93,000, and Rs.3,64,07,000 respectively. While importation from the Central Powers has been eliminated, Japan and America have enormously increased their shipments to India. German trade with India was based largely upon the German position in the hides trade, large establishments being maintained chiefly on the profits derived from export trade in hides. It is remarked that in the Indian market cheapness and outside appearance are far more important than quality. Goods should be quoted c.i.f. Indian port and not f.o.b. The requirements of India demand minute attention. It is anticipated that the United Kingdom will be able shortly to supply the whole of India's requirements in the matter of dyes. In 1913 American shipments to India were valued at about £3,000,000 (of which 50 per cent. consisted of mineral oils), and in 1917—1918 at £7,876,000. Japan occupies second place in India's import and export trade. Her shipments to India were valued at over £22,000,000 during 1918-19 compared with £51,000,000 worth from the U.K. Before the war Japan's share of India's import and export trade was 2½ per cent. and 7½ per cent. respectively. Japanese houses are now prominent as distributers of imports in India. A patriotic combination of Japanese interests operates favourably in furthering trade in the country and should be emulated by British firms. An era of industrial expansion is dawning for India, and there will presently be great scope for British capitalists and industrialists to erect works in India. Preference is already shown for goods made in the country. There is not the same intensity of feeling against former enemy States as there is among the Allies, and cheapness alone decides whether British, American, or German goods secure the market.

An appendix to Part I. details the value of trade in various materials with the U.K., Germany, Austria-Hungary, the U.S.A., and Japan for the period 1913—1919.

Part II. examines in detail changes in the character, volume, and origin of Indian imports during the years of war. Imports of cotton yarns from the U.K. decreased from 37,836,092 lb., valued at £2,378,346 in 1913—1914 to 9,611,527 lb., valued at £2,238,057 in 1918—1919. During the same period imports of this material from Japan increased from 1,000,260 lb., valued at £92,771 to 27,280,386 lb., valued at £3,552,767. The output of the Indian mills was practically stationary at about 40,000,000 lb., valued at about £650,000,000. Prior to the war the U.K. supplied about 60 per cent. of India's requirements of iron and steel; in 1917 the share was about 51 per cent., and that of the U.S.A. about 41 per cent. The following table shows the imports of chemicals, excluding chemical manures and medicines, during the war:—

Source.	1913-1914.	1914-1915.	1915-1916.	1916-1917.	1917-1918.
	£	£	£	£	£
United Kingdom	505,271	556,851	799,260	868,827	1,219,976
Germany.. ..	84,072	37,276	6,555	182	—
Italy	35,112	35,721	44,576	70,121	5,775
Japan	10,110	15,166	63,210	215,772	371,078
United States ..	1,862	10,641	28,098	56,589	195,505
Total for all countries	676,506	683,361	972,426	1,251,322	1,815,004

The total imports of acids have declined from 78,435 cwt. iu 1913—1914 to 6,876 cwt. in 1917—1918, due principally to the manufacture of sulphuric acid in the country. Imports of bleaching material have increased from 75,628 cwt. to 100,236 cwt., the supplies being now derived principally from Japan, and imported soda compounds have risen from 662,962 cwt. to 1,012,649 cwt. The U.K. has well maintained its position in this trade. Sulphur imports have increased from 126,541 cwt. to 195,692 cwt., Japan supplying 95 per cent. of India's requirements. Imports of calcium carbide have fallen from 1000 tons to 640 tons per annum, of which 37 tons only is derived from the United Kingdom. Imports of potassium compounds have fallen from 728 tons to 384 tons, the British share falling to one-third of the pre-war amount. Imports of disinfectants increased from 1,270 tons, valued at £26,394 in 1913-14 to 1,570 tons, valued at £67,415 in 1917-18. The total imports of drugs and medicines (excluding chemicals and narcotics) advanced from £780,490 to £889,210, but shipments from the U.K. receded from £401,000 to £354,000. The total imports of dyeing and tanning materials fell from £943,000 worth in 1913—1914 to one-third of that figure in 1915—1916, but rose to £941,000 in 1917-18, and to £1,060,000 in 1918-19. The following table shows the total importation of coal-tar dyes (almost entirely alizarines and anilines):—

Countries of consignment.	Quantities.			Value.		
	1916-1917.	1917-1918.	1918-1919.	1916-1917.	1917-1918.	1918-1919.
	lb.	lb.	lb.	£	£	£
United Kingdom	610,436	1,580,200	2,697,907	150,241	363,273	362,015
Switzerl'nd	41,713	49,035	152,753	12,562	14,540	60,852
U. States	372,354	385,614	875,338	258,938	247,777	337,164
Other countries	50,038	122,317	48,817	14,377	20,460	19,534
Total ..	1,074,541	2,137,166	3,774,815	436,118	652,050	779,565

Japanese competition is becoming serious in the paint trade, particularly in white and red lead; but the soap import trade is almost exclusively in British hands, 335,068 cwt. of the 351,944 cwt. of soap imported in 1917-18 being derived from the U.K. The only serious competitor is Japan, which supplies toilet soaps. In tanned or dressed hides and skins the British Empire holds a very strong position, and in unwrought leather the U.K. supplied in 1917-18 68 per cent., Australia 16 per cent., and the U.S.A. 10 per cent. of the imports. India's normal imports of glass and glassware are valued at £1,250,000, composed principally of cheap bangles. The U.K. occupies a most favourable position in regard to polishes, principally those used in the leather and metal trades. The imports of coal, coke, and patent fuel fell from 559,190 tons in 1913—1914 to 24,789 tons in 1917—1918. Of the total imports of mineral oils, valued at £938,228 in

1917—1918 the share of the U.K. was £125,028 and of the U.S.A. £672,618; the British share should be increased.

Part III. deals with methods of representation and distribution in India. A complete overhaul of our agency and selling methods in India is imperative. More and more reliance must be placed on merchants' own distributing organisations in the country rather than upon the local mercantile agents. The subject is dealt with by individual reference to the principal trades. Few suggestions can be offered in regard to the heavy chemical trade. British manufacturers of dyes are recommended to follow the German system of sales; offices and laboratories should be opened in Bombay, and depôts and Indian agencies established throughout the market.

Part IV. recounts the development of Indian industries and its significance, reference being made to the Indian Munitions Board, methods of Government assistance of industry, availability of capital, labour conditions and wages, and similar topics. A mountain range of iron ore has recently been discovered in Singbhum (Orissa). An appendix details the production of metals in India for 1901, 1905, and 1908 to 1918. Although the import trade in several articles is bound to decline, the general volume of our trade with India will probably increase.

Part V. deals with the prospects for the sale of Canadian produce and manufactures in India, more especially lumber, canned goods, etc. The early dispatch of a commercial mission to the country is strongly urged. The report includes a map of India on the scale of 64 miles to the inch, showing railways open and under construction on March 31, 1918.

COMPANY NEWS.

GAS LIGHT AND COKE CO.

At the ordinary general meeting, held in London on February 6, Mr. D. Milne Watson, the governor of the company, said that the last year was a record one so far as the output of gas (30,509,000 cub. ft.) and income (about £9,850,000) were concerned. The increased business does not benefit the shareholders, as the dividend is fixed at 3 per cent. per annum, the same as the previous year. After paying this dividend a balance of £323,971 will be carried forward, showing a decrease of £56,773 on the previous year. The cost of transporting the coal in the company's own colliers during the last six months averaged only 6s. 6d. per ton of coal carried (inclusive), while owners are asking freights of 12s. 9d. for large and 17s. for small boats on the open market. The price of gas was increased in October last to 4s. 8d., owing to the rise of 6s. per ton in the cost of coal, but this price, high as it seems, represents only an increase of 87 per cent. over the pre-war price, whereas the chief costs have increased much more, *e.g.*, coal 116%, oil 340%, freights 525%, and wages 145%. The recent reduction of 10s. per ton in the price of coal used to manufacture gas for domestic consumption has enabled the company to make a rebate of 7½d. per 1,000 cub. ft. It should be noted that though some 90 per cent. of the consumers use gas for domestic and 10 per cent. for industrial purposes, yet this differentiation in the price of coal has the result that the sliding scale principle, which was based on the price of the gas supplied to the consumers as a general body, is now apparently regulated by the price nominally charged to 10 per cent. of the consumers, *i.e.*, to the industrial gas users. Thus the sliding scale principle has been virtually abandoned; it is now of the utmost importance to the gas industry that the sliding scales or maximum prices should be revised. In spite of the temporary relief afforded by the Temporary Increases of Charges Act of 1918, which enabled the company to distribute a dividend of 3 per cent., the financial position of the company has been steadily deteriorating. A deputation has recently waited upon the President of the Board of Trade to remind him of the promise, made in 1918, that, after the war, the sliding scale would be revised. As a result the Government has promised to introduce a public bill during the coming session to deal with the financial position of the gas industry.

SOUTH METROPOLITAN GAS CO.

Dr. Charles Carpenter, chairman of the company, addressing the ordinary half-yearly meeting on February 11, said that one of the greatest difficulties of the business was the ever-growing cost of labour. Taking the direct increases alone, the labour bill had advanced by £1,000,000 per annum. Although the extended use of labour-saving devices and the sympathetic attitude of the employees were an aid to efficiency, they did not, and would not, balance the increased cost of labour. The application of the method of purifying coal gas from carbon bisulphide, which was worked out in 1913 (this J., 1914, 737; 1915, 9. J. Gas Lighting, 1914, 928), had to remain in abeyance during the war period, but the scheme would shortly be introduced in a simpler and more economical form than originally devised. Too much importance should not be attached to the gratifying increase in the sales of gas, as the delivery of solid fuel has of late been very restricted and irregular.

An extraordinary general meeting followed at which the Bill promoted by the company, now before Parliament, was considered and approved. The main object of the Bill is to enable the company to sell gas on a heat unit basis (this J., 1919, 407 R, 414 R), and it also includes provisions for enabling profits to be allocated on a new basis, *viz.*, after payment of the authorised devidend, three-fourths of the surplus to be allocated to reducing the price of gas to consumers, and one-fourth to be applied equally to increase the dividend to stockholders and to give the employees a co-partnership bonus. It is also proposed to alter certain details of the existing scheme for the election of representatives of the employees upon the board of management.

Brunner, Mond and Castner-Kellner Fusion.—The proposed exchange of shares between these companies has been ratified, over 85 per cent. of the share interests in the Castner-Kellner Co. (exclusive of the 250,000 ordinary shares already held by Brunner, Mond and Co.) having approved of the offer (this J., 1920, 21 R). The basis of exchange is two £1 ordinary Brunner, Mond shares for one £1 ordinary share in the Castner-Kellner Co.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for February 12 and 19.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of firm or agent.	MATERIALS.	Reference number.
Australia	Chemicals, dyes, essential oils, tartaric acid, tartar, waxes ..	183
"	Glass paper, parchment, wax paper	184
"	Proprietary articles in the paint, ink, boot polish, soap, candle, paper and rubber trades ..	186
do. & New Zealand	Oil, grease, twine	189
British India ..	Chemicals, dyes	232
do. & Persian Gulf	Oilmen's stores, perfumery ..	233
Canada	Castile soap	*
"	Fuller's earth products	*
"	Oleic acid for soap manufacture	†
"	No. 3 castor oil, vegetable oils, for soap making	†
Egypt	Glass, china, aluminium, leather, ink, printing paper	240
do. Palestine, Syria	Soap, water paint, linseed oil, mineral oil, turpentine, glass, paper, leather, steel	197A
Malta	Leather	198
New Zealand	Druggists' sundries	195
Belgium	Paint, varnish, asbestos, rubber	201
"	Oil-seeds and cake, rubber, wax, lard, gums, tanning materials	204
Bulgaria	Sheet iron, tin, caustic soda, sodium bicarbonate, chemicals, drugs	243
do. & Turkey ..	Drugs	243A
Czecho-Slovakia ..	Manila and sisal twines.. ..	244
France	Petroleum, lubricating oils, motor spirit	207
"	Chemical manures	209
"	Tinplate	246
Greece	Soap, tinplate, iron sheets ..	210
Italy	Chemicals used in manufacture of soap, glass, paper, dyes; perfumes and essences ..	213
"	Printing inks	248
do. & Latin Amer.	Chemicals, etc.	250
Switzerland ..	Oils, fats, grease, chemicals, drugs	217
" ..	Chemicals, lubricants, dyes, oils, wax, leather, disinfectants ..	258
" ..	Sugar, crude rubber, certain metals, technical linseed, coconut, palm-kernel and ground nut oils	259
Turkey	Matches	218
United States ..	Heavy Chemicals..	225
Argentina	Window glass	226A
Chile	Drugs, medicines	262
Cuba	Candles, soap, bottles, ink powder, glass, pottery	264
Panama Republic ..	Glass, china, earthenware, paper	229

* The High Commissioner for Canada, 19, Victoria Street, London, S.W. 1.
† The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

MARKET SOUGHT.

A firm in Australia wishes to get into touch with U.K. importers of yacca gum and eucalyptus oil. [187.]

TARIFF. CUSTOMS. EXCISE.

Australia.—Importation of goods from Czecho-Slovakia and other States formerly under the jurisdiction of Austria, as well as exports thereto, will be allowed.

Belgium.—The export of linseed cake is no longer subject to licence.

Egypt.—The import of sugar is prohibited, except under licence, until January 31, 1921.

France.—The reduced rates of import duty on certain kinds of paper and on cellulose pulp remain in force until June 30.

France and Algeria.—The "coefficients of increase" on certain kinds of iron and cardboard have been reduced, and coefficients have been fixed for bricks and other fireproof products, crucibles and wares of graphite, and imitation silk.

France (New Caledonia).—The export duty of 5 per cent. *ad valorem* on hides, skins, copra and mother-of-pearl shells continues until December 31.

Germany. — The export of candle-making materials, candles, manufactures of wax, soap and other manufactures of fat, oil or wax (except night tapers of waxed thread), chemical and pharmaceutical products, colours and dyes is prohibited, except under licence.

Greece.—The import of alcohol and alcoholic beverages (except in bottle) is prohibited until December 31.

Hungary.—Among the articles exempted from import licence are fish oil, seal oil, palm oil, tallow, palmkernel oil, coconut oil, vegetable wax, stearin, palmitin, oleic acid, ceresine, vaseline, lanoline, axle grease, technical oils and fats (with some exceptions), celluloid, galalith, certain ores, gypsum, white chalk, lime, emery, colours, asbestos, cement, cryolite, talc, magnesite, felspar, kaolin, clay, slate, graphite, natural phosphates, camphor, dyeing and tanning materials, tar (except lignite and schist tar), pitch, rosin, bitumen, asphalt, turpentine, gums, coal-tar oils, certain vegetable fibres, paper, rubber, gutta-percha, hides, calf leather, timber, cork, certain kinds of glass and glassware, pottery, certain manufactures of iron, many common metals, scientific instruments, many chemicals, tar dyes, lac varnishes, candles, common soap, matches, fertilisers, and glue stock.

Mexico.—Recent customs decisions affect glycerin, fibres, and cotton seed.

Netherlands.—The export prohibition on leather has been removed and that on certain classes of paper re-imposed.

New Zealand.—The import of goods manufactured or produced in any place which on August 4, 1914, was situated in Germany, Austria-Hungary, Turkey or Bulgaria, is prohbited save with the consent of the Minister of Customs. Alsace-Lorraine is exempted from this Order-in-Council.

Nigeria.—The export duties on palm kernels and on palmkernel oil are, respectively, £2 and £3 per ton.

Peru.—The export of unginned cotton, cotton seed and cottonseed cake is prohibited except under licence.

Spain.—The customs duty on kerosene has been increased to 10 pesetas per 100 kilo.

Turkey.—The customs *régime* and import and export restictions applying to territories of the former Ottoman Empire are given in the issue for February 19.

GOVERNMENT ORDERS AND NOTICES.

EXPORT PROHIBITIONS.

The Board of Trade (Licensing Section) has announced the removal from List A of Prohibited Exports of linseed cake and meal (as from February 19); and also that Privy Council licences, granted before January 1, 1920, for the export of "all coal-tar products, excluding finished dyestuffs, but including aniline oil and salts," are revoked as from February 21, 1920.

INDUSTRIAL EXPLOSIVES.—Iceland has been added to the list of countries to which industrial explosives and certain arms and munitions may be exported under the Open General Licence granted in January last (this J., 1920, 41 R). The prohibited areas, exportation to which requires a Specific Export Licence, include (1) the whole of Africa except Algeria, Libya and the Union of South Africa, together with adjacent islands, (2) Transcaucasia, Persia, Gwadar, the Arabian Peninsula, and former Turkish Possessions in Asia, and (3) a maritime zone including the Red Sea, the Gulf of Aden, the Persian Gulf, and the Sea of Oman.

TRADE NOTES.

BRITISH.

Nigeria in 1917.—The total value of the exports from Nigeria in 1917, exclusive of specie, was £8,602,486, and was higher than in any previous year in the history of the colony. The exports included rubber (878,281 lb.), tin ore (9,966 tons), palm oil (74,619 tons), palm kernels (185,998 tons), and groundnuts (50,334 tons).

Sixty-six tin mining companies continued operations during the year, their nominal capital being £5,717,407 and their working capital £2,678,858. Gold mining operations were continued near Minna, in the Niger Province, and 2,865.7 oz. of gold, all alluvial, was won. The general development of the Udi Colliery has been very rapid, 83,405 tons of coal being mined.

The Director of Agriculture reported that great developments are possible in the cultivation of maize, cotton and groundnuts; maize and groundnut seed were distributed as an initial step towards the end of the year.

The season was a fair one for most crops except cotton, which was a serious failure. With the exception of groundnuts and palm produce, crops for export were restricted by the shortage of shipping facilities.

The rubber market was not active, but satisfactory prices were obtained. The methods of getting the rubber are wasteful, and the industry is barely profitable. Rubber tapping was again carried out at the Government agricultural stations at Calabar and Agege Para with a view to thinning out these plantations. The cultivation of the sugar cane makes progress on native plantations, approximately 150 acres being under cultivation.—(*Col. Rep.—Ann., No.* 1008, *Nov.*, 1919.)

Ashanti in 1918.—Exports from Ashanti in 1918 were valued at £1,292,736 as compared with £1,378,706 in 1917, and included gold (£421,736), cocoa (£360,000), kola (£360,000), rubber (£36,000), and hides and skins (£20,000). Trade in general decreased owing to low prices occasioned by a lack of shipping facilities and by war restrictions. The price of rubber was disappointing, the market declining steadily throughout the year. The amount of gold produced during the year was 99,278.85 oz., valued at £421,736, as compared with 116,456.36 oz., valued at £494,706 14s., in 1917.—(*Col. Rep.—Ann., No.* 1012, *Dec.*, 1919.)

FOREIGN.

Calcium Carbide Importation into China.—The Canadian Government Trade Commissioner at Shanghai states that the importation of calcium carbide into China is probably about 300 tons per annum, some 250 tons of this being imported by one firm for use in acetylene-gas welding. Scarcely any calcium carbide is used for lighting purposes in China.—(*Bull. Dept. Trade and Comm., Canada*, Dec. 29, 1919.)

Graphite Situation in Madagascar.—The demand for graphite has decreased considerably, and most of the small mines have been compelled to shut down. The larger undertakings are working on a reduced scale, and in order to meet present competition are producing higher grade material. The average grade produced in 1917 was 80—82 per cent. carbon; to-day considerable quantities of 90 per cent., and even higher, material are being marketed. It is estimated that the 1919 production will be about 6,000 tons, while a reliable authority places the total stocks in the country at 25,000 tons. The average price in July was 550 francs per metric ton for 90 per cent. quality. The prospects are not at all favourable, as the largest buyer of Madagascar flake has recently cancelled its contrasts.—(*U.S. Com. Rep., Nov.* 21, 1919.)

OBITUARY.

CHARLES EDWARD GROVES.

By the death of Mr. C. E. Groves this Society loses one of its original members. Groves was born at Highgate in 1841, and was educated at Brixton College and under Hofmann at the Royal College of Chemistry. For many years he was lecturer in Chemistry at Guy's Hospital, retiring in 1901. He took an active part in founding the Institute of Chemistry, was secretary thereof until 1892, and vice-president from 1892 to 1895. Twice he served on the council of the Chemical Society, once as vice-president, and was editor of the Journal from 1884 to 1899. He also edited Calvert's "Dyeing and Calico Printing, two volumes of Chemical Technology, two volumes of Miller's Chemistry, and two volumes of Fresenius's Analysis. In these capacities his knowledge of several languages stood him in good stead.

Most of his research work was carried out in conjunction with Dr. J. Stenhouse, and dealt with organic substances; naphthol, orcinol, gardenin, berberine, erythrin, rocellinin, and leacin all engaged his attention. He exhibited specimens of original substances at the Franco-British Exhibition in 1908. Chemists owe much to Groves for his introduction of what is now an indispensable article in every laboratory, the indiarubber cork; he also originated the *glass* Liebig condenser. He gained his F.R.S. in 1883, and was a regular attendant at the meetings as well as at those of other scientific societies. He was consulting chemist to the Thames Conservancy for over twenty years, retiring in 1909. For a few years longer he was able to maintain his interest in scientific work and progress, but failing health finally necessitated complete retirement, and he died on February 1, at his home at Kennington. Apart from his technical attainments, Mr. Groves was a man of marked literary ability and great personal charm.

HERBERT F. STEPHENSON.

With deep regret we record the death, on February 17, of Prof. J. Emerson Reynolds, who served as president of this Society in 1891—1892.

REVIEW.

IONS, ELECTRONS, AND IONISING RADIATIONS. *By* J. A. CROWTHER. *Pp. vi.*+276. (*London: Edward Arnold.* 1919.) *Price* 12*s.* 6*d. net.*

The older philosophy taught that an impassable gulf was fixed between the realm of physics and that of chemistry. A physical change was defined in the text-books of some twenty years ago as a change in which the molecule of the substances involved remained intact. In contradistinction, any change accompanied by the production of new atomic groupings was described as a chemical change. Modern philosophy teaches that physics and chemistry merge into one another, the gulf previously assumed to exist being bridged by the recognition of physical chemistry as a transition subject. The reviewer would go further and contend that chemistry and physics are one and indivisible. Physical chemistry is not a kind of "No man's land," but rather an "Everyman's land"—to chemist and physicist impartially. The work under review illustrates this contention. Physical chemistry, as taught to chemists, is generally regarded as possessing a chemical bias. Nevertheless, the tranformations mainly considered in such treatment are such as involve no destruction of the molecule. The newer physical chemistry—that of the electron—would, we think, be regarded as physical chemistry with a physical bias; but, curiously, it is concerned entirely with atomic and sub-atomic disintegrations.

The work under review is offered by the author as an attempt to supply the student entering upon the study of the "new Physics," with "the same help and guidance which is already provided for him in other branches of physics by numerous text-books, elementary and advanced." The work is not intended to be either a "popular" exposition of the matter nor a compendious synopsis of the whole subject. The author's previous book, "Molecular Physics," and his distinguished contributions to the growth of the subject, afford sufficient guarantee of his ability to undertake the task. It can at once be said that the author has succeeded to a very considerable degree in presenting a concise and clear account of the diverse phenomena contained in the classic works on the subject. The text embraces sixteen chapters, and among the subjects treated are the phenomena attendant upon the passage of a current through an ionised gas, the characteristic properties of the gaseous ions, ionisation by collision, cathode, positive and X-rays, photo-electricity, radio-active changes, the electron theory of matter and allied subjects. The author starts out with the laudable intention of emphasising the underlying physical principles at the expense of mathematical treatment of the subject, wherever possible. In spite of this intention, the reviewer is left with the impression that the usefulness of the work would be very considerably extended if it were found possible to curtail further the mathematical treatment, additional experimental details being substituted therefor.

A careful perusal of the work tempts the writer to offer the following as amongst a number of minor points which should receive attention when the issue of a second edition of the work is being considered. It is incorrect to state, as on page 4, "the ions were thus rendered visible . . . ." The reader is left with the impression that the ions themselves are made visible. On page 10, line 11, the current should be $3{\cdot}3\times10^{-15}$ ampères, and not $3{\cdot}3\times10^{-16}$ ampères as given. On the same page, equation (1) should read $i = -\frac{dQ}{dt} = -C\frac{dv}{d}$, the minus sign is of no little importance in another connexion. The introduction of λ on page 19 is a little obscuring, as subsequently in the paragraph it is not used. Incidentally, it may be remarked that this symbol λ is used in the work with the separate significance of mean free path, wave length and co-efficient of absorption—a literal Pooh Bah! There appears to be some confusion of the symbols v and v^1 in § 12. To speak of "complicated constants," as on page 22, tempts one to enquire what a constant really is. The reproductions of Wilson's photographs—Figs. 17 and 18—could be considerably improved. Occasional use is made of the expression "sign of the point" as on page 70, when what is meant is the sign of the charge on the point. Fig. 62 would be improved by drawing in the reflected wave front. It is distinctly misleading to speak, as on page 158, of the crystal diffraction structure as the exact analogue of the ordinary diffraction grating. The contrast between the two is clearly seen from the fact that no path difference is introduced in the case of regular reflection from the ordinary diffraction grating. Among a number of minor points, we consider that the numerous graphs illustrating the texts would be improved if the significance and the scales of ordinates and abscissae were inserted in every case. Reference might also be made to the various sources whence further details of the various researches might be derived. The concluding paragraph of the text leaves one with the impression that the development of the subject waits upon the further development of the quantum hypothesis before the principles of the subject can be definitely laid down. In the reviewer's opinion this is not so. The fundamental principles can be, and indeed have been, stated in Schott's "Electromagnetic Radiation," without reference either to the quantum hypothesis or the now "popular" Postulate of Relativity. Parenthetically it may be remarked that it appears that a strict application of the Postulate of Relativity excludes the possibility of a mechanical explanation of the electron.

Wherein consists the importance of the subject to the industrial chemist? Principally, though not entirely, in the matter of future supplies of energy. However well the New York striker's reply to the query as to the strikers' requirements, "I don't know what we want, but we want it mighty bad and we want it mighty quick," may epitomise things generally at present, the immediate and insistent demands of industrial chemistry can be stated with no little precision. Chemical industry needs an abundant and consequently cheap supply of readily available energy. Atomic energy is certainly abundant. The total heat emitted from one gram. of radium emanation (see page 249) is $2{\cdot}44\times10^{9}$ calories. Contrast with this the $3{\cdot}8\times10^{3}$ calories of heat liberated in the formation of one gram of water from its elements—the most energetic chemical reaction known. There are some—Sir Oliver Lodge is among the prophets—who visualise a not very distant future when atomic energy will be available for the everyday purposes of industry. Others regard the tapping of these almost inexhaustible supplies as about as probable as the importation of coal from the moon. The future holds the solution. It can only be said that progress is being made, and that possibly we are on the threshold of big discoveries. Chemical technologists need to be abreast of these possibilities, and the present work is heartily recommended to such as possess the necessary modicum of mathematical training. J. S. G. THOMAS.

PUBLICATIONS RECEIVED.

CHEMISTRY FOR TEXTILE STUDENTS. *By* BARKER NORTH, *assisted by* NORMAN BLAND. *Pp.* 379. *Cambridge Technical Series.* (*Cambridge: The University Press.* 1920.) *Price* 30*s.*

A TEXT-BOOK OF QUANTITATIVE ANALYSIS. *By* A. C. CUMMING *and* S. A. KAY. *Third edition, revised and enlarged. Pp.* 416. (*London: Gurney and Jackson.* 1920.) *Price* 12*s.* 6*d.*

THE MINERALOGY OF THE RARER METALS. *By* E. CAHEN *and* W. O. WOOTTON. *Second edition, revised by* E. CAHEN. *Pp.* 246. (*London: C. Griffin and Co.* 1920.) *Price* 10*s.* 6*d.*

PUBLICATIONS OF THE UNITED STATES BUREAU OF MINES. DEPARTMENT OF THE INTERIOR. (*Washington: Government Printing Office.* 1919.)

- BIOGRAPHY OF PETROLEUM AND ALLIED SUBSTANCES IN 1916. *Bull.* 165. *By* E. H. BURROUGHS.
- RECOVERY OF ZINC FROM LOW GRADE AND COMPLEX ORES. *Bull.* 168. *By* D. A. LYON *and* O. C. *Ralston.*
- ILLINOIS MINING STATUTES ANNOTATED. *Bull.* 169. *By* J. W. THOMPSON.
- RECENT DEVELOPMENTS IN THE ABSORBTION PROCESS FOR RECOVERING GASOLINE FROM NATURAL GAS. *Bull.* 176. *By* W. D. DYKEMA.
- THE DECLINE AND ULTIMATE PRODUCT OF OIL WELLS: *with Notes on the Valuation of Oil Properties. Bull.* 177. *By* C. H. BEAL.
- PETROLEUM INVESTIGATIONS AND PRODUCTION OF HELIUM. *By* VAN H. MANNING.
- THE DETERMINATION OF COMBUSTIBLE MATTER IN SILICATE AND CARBONATE ROCKS. *By* A. C. FIELDNER, W. A. SELVIG *and* G. B. TAYLOR.

SOCIETY OF CHEMICAL INDUSTRY.

COMMITTEES OF THE COUNCIL.

The Council of the Society recently approved a scheme which had been prepared by the President, Mr. John Gray, for the appointment of a number of small standing committees with the object of facilitating as much as possible the work of the Council, and with a view to providing an appropriate series of such committees appointed annually to which matters requiring special consideration could be at once remitted. These committees will report to the Council on all matters that are remitted to them, and they will also submit for the consideration of Council questions and recommendations bearing on the subjects with which they are particularly concerned. Each committee is empowered to appoint such sub-committees as may be thought desirable for the consideration of specific subjects, and may co-opt a number of members of the Society whose special knowledge or experience it may be considered desirable to benefit by in connexion with any matter under discussion. The President and Hon. Treasurer are *ex officio* members of every committee, and the other members are as follows:—

Finance Committee.—Messrs. C. C. Carpenter (convener), E. F. Armstrong, J. L. Baker, E. V. Evans, C. S. Garland, H. Levinstein, R. Messel, W. F. Reid, and E. Thompson.

General Purposes Committee.—Messrs. S. Miall (convener), C. C. Carpenter, F. H. Carr, W. R. Hodgkinson, H. Louis, G. T. Morgan, L. Guy Radcliffe, A. Rée, and E. Walls.

Publications Committee.—Messrs. E. V. Evans (convener), E. F. Armstrong, W. J. A. Butterfield, C. C. Carpenter, F. H. Carr, J. W. Hinchley, W. R. Hodgkinson, C. A. Keane, A. R. Ling, R. Messel, W. F. Reid, and E. Thompson.

Transactions and Abstracts Sub-Committee.—Messrs. J. L. Baker, E. R. Bolton, W. J. A. Butterfield, C. C. Carpenter, F. H. Carr, C. F. Cross, J. T. Dunn, E. V. Evans (chairman), J. W. Hinchley, W. R. Hodgkinson, E. Grant Hooper, C. A. Keane, A. R. Ling, H. Main, G. T. Morgan, R. Messel, H. R. Procter, W. J. Rees, W. F. Reid, Watson Smith, L. T. Thorne, and W. G. Wagner.

Review Sub-Committee.—Messrs. E. F. Armstrong, R. Brown, W. J. A. Butterfield, C. C. Carpenter, E. V. Evans, C. A. Keane (chairman), A. R. Ling, R. Messel, E. Thompson, and W. G. Wagner.

Annual Reports Sub-Committee.—Messrs. W. J. A. Butterfield, C. C. Carpenter, E. V. Evans (chairman), W. R. Hodgkinson, E. G. Hooper, A. R. Ling, and G. T. Morgan.

Literary and Libraries Committee.—Messrs. W. J. A. Butterfield (convener), P. P. Bedson, A. G. Bloxam, A. Holt, R. L. Mond, G. T. Morgan, H. Talbot, J. Walker, and L. P. Wilson.

Government and Parliamentary Committee.—Messrs. W. F. Reid (convener), J. L. Baker, W. A. Bone, C. S. Garland, A. R. Ling, W. McD. Mackey, S. Miall, A. Rée, and Sir Robt. Hadfield.

Technical, Research and Allied Societies Committee.—Messrs. C. A. Keane (convener), J. Allan, P. P. Bedson, W. A. Bone, J. W. Cobb, J. W. Hinchley, A. Holt, D. S. Jerdan, H. Levinstein, H. Louis, F. R. O'Shaughnessy, and W. J. Rees.

The Finance Committee was initiated about two years ago on the suggestion of Prof. H. Louis (who was then President) in order that matters of finance might be considered and reported on before being brought under the consideration of the Council. Since its inception it has been under the chairmanship of Dr. C. C. Carpenter, and the work which it has done has been of great service to the Council, and has saved much time at Council meetings. The General Purposes Committee is at present engaged on the revision of the Society's by-laws, and has also under consideration a number of other matters of immediate importance to the members of the Society.

The Publications Committee deals with general questions of policy relating to the Society's publications; under it are three sub-committees, dealing respectively with the Transactions and Abstracts, the Review and the Annual Reports. The Literary and Libraries Committee has at present under its care the organisation of the Society's books and periodicals, and also the very complete catalogue of chemical journals in the various libraries throughout the country which has been prepared by Dr. A. Holt, of Liverpool. The Government and Parliamentary Committee deals with Parliamentary Bills, Government Orders and similar matters. The Technical Research and Allied Societies Committee nominates for the approval of Council representatives of the Society on outside bodies; it also deals with matters in which co-operation with allied societies is desirable, and with research work carried out under the auspices of the Society. Finally, the Emergency Committee has been set up to deal with matters of extreme urgency; it consists of the conveners of the above six committees, and is convened by the General Secretary.

The following have been appointed representatives of the Society on outside bodies:—

Federal Council for Pure and Applied Chemistry: the President, Dr. C. A. Keane and Dr. S. Miall.

National Physical Laboratory (General Board): Dr. E. F. Armstrong and Prof. F. G. Donnan.

Conjoint Board of Scientific Societies: Dr. A. Holt and Dr. C. A. Keane.

British Empire Sugar Research Association: Mr. A. R. Ling and Mr. J. W. Macdonald.

Institute of Chemistry Standards Committee: Dr. A. Holt, Mr. A. R. Ling and Mr. W. G. Wagner.

British Association Fuel Economy Committee: Mr. E. V. Evans.

Industrial Alcohol Joint Committee: Dr. E. F. Armstrong and Mr. D. Lloyd Howard.

The British Dye Industry Committee of the British Science Guild: Mr. E. V. Evans.

British Engineering Standards Association:—*Aircraft Sub-Committee on Chemicals:* Prof. W. A. Bone; *Sub-Committee on Textiles:* Mr. C. F. Cross; and *Sub-Committee on Dopes:* Mr. J. F. Briggs.

The Imperial Mineral Resources Bureau:—*Lead, Silver, Zinc and Cadmium Sub-Committee:* Mr. H. M. Ridge. *Aluminium, Magnesium, Potassium and Sodium Sub-Committee:* Dr. R. Seligman. *Minor Metals Sub-Committee:* Mr. W. G. Wagner. *Chemical Industries Sub-Committee:* Sir R. A. Hadfield, Bart. *Publications and Libraries Sub-Committee:* Mr. W. J. A. Butterfield. *Abstracts Sub-Committee:* Prof. H. Louis and Mr. T. F. Burton.

ALCOHOL DENATURANTS.*

SIR J. J. DOBBIE.

The object of denaturing is to prevent duty-free spirit from being put to uses other than those authorised. For this purpose the spirit must be rendered impotable, and be so ear-marked that it can be readily identified when mixed, even in small proportion, with duty-paid alcohol.

The following are the chief conditions which a denaturant should fulfil:—

1. It should impart a taste or smell sufficiently disagreeable to prevent the alcohol being drunk even after dilution, sweetening, or flavouring.
2. It should not be capable of being eliminated easily by filtration, distillation or any other process which can be readily applied, or which is ordinarily used in manufacturing operations.
3. It should be capable of being easily and certainly detected even when present only in minute quantities.
4. It should mix readily with the alcohol and produce a mixture of essentially the same properties as undenatured alcohol and capable of being used in the same way as undenatured alcohol in manufacturing processes.
5. Its cost should not materially add to the price of denatured spirit as compared with that of ordinary alcohol.

While many substances fulfil one or more of these conditions, no single substance has yet been discovered which fulfils them all satisfactorily. The one which approaches most nearly to a perfect denaturant is crude methyl alcohol or wood naphtha, which is used by all European countries, Canada and other British Colonies. It has also been adopted by the United States as the result of an investigation by a Commission which visited and inquired into the denaturing systems of the principal European countries. Russia, Sweden, and other countries have at different times offered large money prizes for the discovery of a cheaper or more suitable general denaturant, but nothing has been suggested which would serve satisfactorily as a substitute for wood naphtha.†

Wood naphtha only partially fulfils the first of the above conditions, experience having shown that its admixture with ethyl alcohol even to the extent of 10 per cent. does not prevent the alcohol being drunk.

On the other hand conditions 2 and 3 are efficiently fulfilled by wood napththa in virtue of the comparative ease with which it can be detected and of the difficulty of removing it except by methods too expensive to be used for illegal purification. The presence of even a minute quantity of wood naphtha enables the Revenue authorities to follow the denatured alcohol through all the manufacturing operations.

The fourth and fifth conditions are mainly concerned with the suitability of the denatured alcohol for use in manufacturing operations.

As regards the fourth condition, wood naphtha is generally a suitable denaturant. It mixes easily with ordinary alcohol in all proportions, and the denatured alcohol is, for the great majority of purposes for which it is employed, just as useful as the undenatured alcohol. As a solvent for gums and resins, in the preparation of varnishes, polishes, stains, lacquers, paints, dyes, fats, and other similar substances, in which over 75 per cent. of this spirit is used, the denatured alcohol is quite as efficient as undenatured alcohol. With a few exceptions the same may be said of all large manufacturing operations in which alcohol is used.

Wood naphtha does not quite satisfactorily fulfil the fifth condition, inasmuch as it renders the denatured alcohol slightly more costly than the pure alcohol.

During the years immediately preceding the war wood naphtha cost nearly twice as much per gallon as ordinary alcohol exclusive of the duty. The price of wood naphtha during these years varied from 2s. 6d. to 3s. per bulk gallon at a nominal strength of somewhat over 60 o.p. In the years 1912, 1913, and 1914 the prices were more uniform, varying only from 2s. 7d. to 2s. 9d., and during the period from 1906 to March, 1915, the average price was 2s. 8d. per gallon.

The tables overleaf give the prices of alcohol, wood naphtha, industrial and mineralised methylated spirits in London in the years stated, and the amounts by which the cost of the latter spirits is increased by denaturing.

It will be seen from these tables that the price of alcohol gradually rose from 10d. a proof gallon in 1906 to 1s. 4d. in 1914. This was largely due to the fall in the price of yeast, which, from 8d. per pound or over in 1904, dropped to 3d. per pound in 1913.

It will also be observed that the price of industrial methylated spirit for the years 1907 to 1914 inclusive is less than that of pure alcohol. This is due principally to the fact that under the Revenue Act, 1906, methylators receive a drawback of 3d. per proof gallon (equal to nearly 5d. per gallon at 66 o.p.) on all alcohol used for making this kind of denatured spirit. And since 1907 rebates amounting to about 1d. per proof gallon or over have been given on all alcohol sold by the Spirit Association to the Methylators' Association. The net cost of 95 per cent. alcohol used in making industrial methylated spirit is thus about 6d. less than the price of pure spirit.

Any manufacturer using this spirit can himself become a methylator, and would then obtain the Revenue drawback of 3d. per proof gallon on all the alcohol he received, but it is doubtful if under present conditions it would pay him to do so unless he used at least from 1500 to 2000 galls. annually.

While wood naphtha, as has already been pointed out, is an excellent ear-marking substance, it does not impart a sufficiently nauseous character to alcohol to render the alcohol impotable, and on this account it is usually employed in conjunction with some other denaturant, such as mineral naphtha or pyridin, where the conditions under which the alcohol is to be used do not admit of strict Revenue supervision.

Thus in nearly all countries denatured alcohol is divided into two main classes:—

1. Denatured alcohol for general use by the public for burning, cleansing, household, and minor manufacturing purposes.
2. Denatured alcohol for manufacturing purposes on the large scale and for use generally where the first variety is unsuitable.

1. Denatured alcohol for general use is commonly mixed with a larger percentage of wood naphtha than alcohol for manufacturing purposes, and in addition contains a very small quantity of some other substance to increase its nauseous character. It is also often lightly coloured with an aniline dye.

In this country this alcohol, which is known as "mineralised methylated spirit," contains 90 parts of ordinary alcohol and 10 parts of wood naphtha, with the addition of ⅜ of one per cent. of mineral naphtha and sufficient dye to give it a violet tint.

* Report drawn up for the Alcohol Motor Fuel Committee (see this J., 1919, 250R), and published by permission of H.M. Petroleum Executive.

† The special committee appointed to inquire into the Production and Utilisation of Power-Alcohol in Australia, having reported in favour of the use of the distillate obtained from coal tar oil at a temperature of from 170° C. to 230° C. as a suitable denaturant, experiments with this material are now being made at the Government Laboratory.

Practically the same mixture is used in France, the United States, Canada and the other British Colonies. Such a mixture becomes milky on dilution, and is so nauseous that it is almost undrinkable even when sweetened or flavoured.

It is possible, therefore, to allow this alcohol to be sold to the public in small quanties with very little Revenue supervision. Practically the only conditions are the possession by retailers of a licence costing 10s. annually, and the observance by them of some simple regulations as to the method by which their supplies of spirit are obtained.

Under normal conditions this kind of methylated spirit can be obtained by anyone in quantities not exceeding 4 gallons at a time from oil merchants, grocers, or chemists as easily as petroleum, and anyone can obtain larger quantities by special permission of the Revenue authorities.

2. The denatured alcohol in general use in this country for manufacturing purposes is known as "industrial methylated spirit." It contains 95 parts of alcohol and five parts of wood naphtha. This mixture is not undrinkable when diluted, sweetened or flavoured, and greater precautions have to be taken by the Revenue authorities to prevent its illegal use than are necessary in the case of mineralised methylated spirit.

In the first place, any manufacturer who desires to use it must make application to the Board of Customs and Excise for permission, and must state clearly the purpose or purposes for which it is to be used, and give general details of the methods of manufacture to be employed. A bond must usually be given providing monetary penalties against breaches of the general and special conditions imposed on the use of the spirit, and Revenue officers must be allowed to visit all parts of the factory where the spirit is used, and to take samples of the spirit and products at any stage of the manufacture.

Generally the Revenue regulations, together with frequent inspection and sampling by the Revenue officer and the ear-marking of the spirit by wood naphtha, are relied on for prevention of any illegal use of this spirit by the manufacturer or his workmen. Manufacturing operations, which often include dilution, filtration, and redistillation, may remove the nauseous character, but have practically no effect on the methyl alcohol of the wood naphtha. It is to be observed that the regulations which are possible where the use of denatured alcohol is confined to a particular set of premises would be inapplicable if the spirit could be obtained by any one and used anywhere.

The proportion of wood naphtha used in different countries for denaturing varies considerably, and is related roughly to the amount of the Revenue tax or duty on the undenatured alcohol.

Where the duty is high the admixture of very small quantities of more or less denatured alcohol with duty-paid alcohol will occasion a considerable loss to the Revenue. Thus with the duty at 30s. per proof gallon, as in the United Kingdom at the present time, an admixture of less than 7 gallons of 95 per cent. industrial methylated spirit (=10 gallons proof spirit approximately) with 90 gallons of proof spirit would entail a Revenue loss of £15. This proportion of denatured alcohol would give less than 0·3 per cent. of methyl alcohol in the mixture, which approaches the limit at which the ear-

I.—*Mineralised methylated spirit.*

Year.	Selling Price of Alcohol. Per proof gallon.	Selling Price of Alcohol. Per bulk gallon at 60 o.p. 91% alcohol.	Average price of wood naphtha per bulk gallon.	Increase in cost of denatured spirit due to mixture with 10% wood naphtha.	Cost per bulk gall. of spirit denatured with 10% of wood naphtha.	Selling price of mineralised methylated spirit (300 galls. or over).	Difference between columns 3 and 7.	Difference between cols. 6 and 7.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1906	10d.	1s. 4d.	2s. 8d.	1·60d.	1s. 5½d.	1s. 7d.	+ 3d.	+ 1½d.
1907	11½d.	1s. 6½d.		1·36d.	1s. 7¾d.	1s. 9d.	+ 2½d.	+ 1¼d.
1909	1s. 2d.	1s. 10½d.		0·96d.	1s. 11½d.	2s. 1d.	+ 2½d.	+ 1½d.
1914	1s. 4d.	2s. 1½d.		0·64d.	2s. 2½d.	2s. 7d.	+ 5½d.	+ 4½d.
1919	4s. 6d.	7s. 2½d.	11s. 6d.	5·16d.	7s. 7½d.	9s. 6d.	+2s. 3½d.	+1s. 10½d.

A comparison of Columns 5, 8 and 9 shows that, for the earlier years, the total increase of the cost of the methylated spirit over that of an equal quantity of undenatured duty-free alcohol was approximately equally divided between (1) the increase due to the admixture with the wood naphtha, and (2) the expense of mixing, storing, carriage and methylator's profit given in Column 9.

II.—*Industrial methylated spirit.*

Year.	Selling price of alcohol. Per proof gallon.	Selling price of alcohol. Per bulk gallon at 66 o.p. 95% alcohol. Actual.	Selling price of alcohol. Per bulk gallon at 66 o.p. 95% alcohol. After allowing for the drawback of 5d. per gallon from 1907 & after.	Average price of wood naphtha per bulk gallon.	Increase in cost of denatured spirit due to mixture with 5% wood naphtha.	Cost per bulk gallon of spirit denatured with 5% wood naphtha	Selling price of industrial methylated spirit (300 gallons or over).	Difference between columns 4 and 8	Difference between columns 7 and 8.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1906	10d.	1s. 4½d.	1s. 4½d.*	2s. 8d.	0·77d.	1s. 5¼d.	1s. 6d.	+ 1½d.	+ ¾d.
1907	11½d.	1s. 7d.	1s. 2d.		0·90d.	1s. 3d.	1s. 4d.	+ 2d.	+ 1d.
1909	1s. 2d.	1s. 11¼d.	1s. 6¼d.		0·68d.	1s. 7d.	1s. 9d.	+ 2¾d.	+ 2d.
1914	1s. 4d.	2s. 2½d.	1s. 9½d.		0·52d.	1s. 10d.	2s. 2d.	+ 4½d.	+ 4d.
1919	4s. 6d.	7s. 5¾d.	7s. 0¾d.	11s. 6d.	2·66d.	7s. 3½d.	8s. 7d.	+1s. 6¼d.	+1s. 3½d.

The figures in Column 9 give the net increased cost of industrial methylated spirit over the cost of an equal quantity of undenatured alcohol, after allowing for the drawback of 5d. per gallon paid by the Excise since 1907 on all spirit used for making this kind of denatured alcohol. The figures in column 10 give the amount charged by the methylators for mixing, storing, carriage, and profit.

* No drawback.

marking substance can be easily and certainly detected. A mixture of only 3½ gallons of industrial methylated spirit with 95 gallons of duty-paid spirit entails a Revenue loss of £7 10s., which cannot be regarded as negligible. In this case the ear-marking substance is only present in the mixture to the extent of about 0·15 per cent., and the demonstration of the presence of so small an amount to the satisfaction of a court of justice is not an easy matter.

In Germany, where the tax on alcohol is only about 3s. per proof gallon, it is obvious that the Revenue is better protected by the smaller amounts of wood naphtha prescribed (1 per cent. and 2 per cent.) than the Revenue of this country, with the tax of 30s., is by 5 per cent. and 10 per cent. of the same denaturant. Besides, the manipulation and partial purification of large quantities of denatured alcohol under German conditions is a much more risky and costly proceeding than it would be under British conditions. As a matter of fact, the only fraud the German Revenue authorities have to fear is the sale of denatured alcohol very slightly purified and mixed with sweetening and flavouring matters, whereas in the United Kingdom extensive frauds have been carried out by mixing comparatively small percentages of methylated spirit with duty-paid spirits. In one important case several thousand gallons of duty-paid spirit were found to have been mixed with from 3 to 10 per cent. of methylated spirit.

CORRESPONDENCE.

THE DYESTUFF SITUATION.

Sir,—The present outcry by, amongst others, the Manchester Chamber of Commerce, composed largely of shippers and merchants, arises from the fact that they are not able to get all their dyeing requirements fulfilled; and they attribute this to the present control. The dyestuff question is a very complicated one and is understood by very few. The fact is, that at the present moment there is a world shortage of the more important raw and intermediate materials for the manufacture of dyestuffs, and until the supply is increased there will be a world shortage of dyes. No alteration in the method of protection of the industry in this country will affect this fact. Owing to shortage of coal, labour, and important raw materials, Germany is not in a position to manufacture on a large scale. Her output at this moment does not reach 20 per cent. of her pre-war production. The Allies lay claim to 50 per cent. of her stocks, and to 25 per cent. of her production, and such as remains is largely mortgaged ahead to neutrals.

The coal of this country is the richest in the world in the materials for dyestuff manufacture, and our extensive gas industry provides the means for their extraction. It is esential for the dyestuff industry that these should be retained in the country. To ensure this, control of exports is necessary.

Dissatisfaction is expressed in some quarters at the slow development of the industry in this country, but in the opinion of the best informed, progress has been greater than could have been anticipated. Production of the full range of dyes depends upon money, plant, experience and time. It will take years before it is physically possible to erect all the necessary plant, and the money involved will run into very large sums. The training of process men, research and works' chemists, judging by past experience, will proceed as quickly, or more so, than the erection of plant. There is a complaint that the British Dyestuffs Corporation has concentrated on the common colours, to the exclusion of the finer colours; and yet we see that it has produced a fairly full range of the vat colours and alizarine wool colours, derived from anthraquinone, indigo and carbazol. The fact is that there is no other country in the world so well supplied with dyestuffs, in both quantity and variety, as this country.

Again, the plea has been put forward that the textile trades are suffering through the dyestuff shortage. In answer to this one may state with accuracy, certainly as regards the cotton trade and probably also as regards the woollen trade, that there is not at the present time, and will not be for the next two or three years, one loom idle or one piece less woven on account of lack of dyestuffs. It is quite impossible for us to have all we want, but with what we have, there is no country in the world that can give greater variety or better results. The true and permanent interest of the textile trades is that this country should be independent in the matter of dyestuff supply. To adopt any expedient that would jeopardise this main object would in the end be disastrous. To achieve this purpose, in my opinion, control, as exercised by the Board of Trade, is necessary. This control, as I understand it, provides for the freest granting of licences for such dyestuffs as are not made in this country or are not made in sufficient quantity. It also provides for importation of dyestuffs which are made in this country. if the prices charged are, in the opinion of the Board of Trade, unreasonably high. It also provides that all such dyestuffs must be introduced through the Central Importing Agency. What it does prevent is the direct contact between the British consumer and the German manufacturer. There is no question but that the German firms, if they were able and willing to relievo present necessities, would be able to impose conditions on users for the future, which would militate against our home industry.

As regards subsidy or tariff, I do not see why these are necessarily alternative policies. There is no reason why subsidies should not be granted under control, but I think there is very little chance of any government, under existing financial conditions, granting such a subsidy. And in regard to tariffs, in the present world shortage they would only serve as a check to imports, *e.g.*, from Switzerland, which we cannot afford to lose; they would raise prices, and they would not materially hasten the production of dyestuffs in this country.

The only true policy is: (1) To admit freely, from any source, such dyestuffs as are not made in this country, or not made in sufficient quantity. (2) To exclude such dyestuffs as are made in abundant quantity. (The very fact that a dyestuff is being imported freely would be an incentive to the British makers to supply that dyestuff). (3) Direct contact between the British user and the German maker should be avoided.

Whilst regarding control as necessary, I think the present machinery might be improved. The necessity for dealing promptly with the applications of some thousand or more users, needs a considerable permanent staff, both expert and clerical. There should also be a permanent staff in Germany in order to keep in close touch with the producers. The work is done at present partly by the Central Importing Agency, partly by the Licensing Committee and the Sub-Licensing Committee, and partly by the Colour Users' Association. Such committees, composed of business men occupied with other interests, are bound to move slowly. What is required is a well-selected permanent staff to act upon definite lines laid down by the Advisory Committee.—I am, Sir, etc.,

G. E. Burgess.

Walkden, Manchester.
February 25, 1920.

NEWS FROM THE SECTIONS.

CANADA.

Ottawa Branch.

At the January meeting a memorandum was read from Mr. A. Burton (Hon. Sec. of the Canadian Section) suggesting that the Canadian Section be reorganised so that the Toronto, Montreal, and Ottawa Branches would become independent Sections, dealing directly with the parent Society in London. It was also hoped that the Maritime Chemical Society and the Manitoba Chemical Society would form similar independent Sections. Federal control of the affairs of the Society would be vested in a Council consisting of the chairmen and secretaries of the various Canadian sections. This group would then elect its own officers and thus form a representative body to take action in matters of national interest to the chemical profession. The matter was referred to the Branch Committee with a request that a report on the subject be presented at the next meeting.

Toronto Branch.

On January 22 Mr. David Gilmour, president of the Standard Chemical Co., who recently came to Canada from England, where during the war he occupied an important position at the large explosives works at Gretna, gave a description of the operation of these works. The address was one of the most successful ever heard at any meeting of the Toronto Branch. Mr. Gilmour is sure to prove of great assistance to the Society in Canada.

The different technical groups of the Toronto Branch, each holding its own monthly meeting are proving very successful. The Paint and Varnish Industries Group, the Rubber Group, the Pharmaceutical and the Packing-House Groups have arranged excellent programmes. At the meeting of the Rubber Group, on January 30, Mr. C. W. Drake, of the Westinghouse Company, read a paper on "Electrical Applications to the Rubber Industry," describing the different types of motor and other installations for rubber plants. The discussions following these papers are, perhaps, the best feature of the meetings, and many members take advantage of the fact that they may ask any questions of the speaker or express any ideas of their own. An informal dinner always precedes the reading of papers.

NOTTINGHAM.

A meeting was held at Derby on February 16, by invitation of the Derby Society of Engineers. Mr. Price Abell, chairman, communicated a paper on "Lubricants and Lubrication," by Mr. L. Archbutt.

Friction between solid surfaces covered with a continuous oil-film is entirely dependent on the viscosity of the lubricant. At 40° C. large increases of pressure increase the viscosity of a mineral oil 27 times and of castor oil 4·5 times. With mineral oils rise of temperature causes the running to become unsteady at a specific temperature, well below 100° C., but vegetable oils show no change in lubricating power at 75° C. Friction between two metal surfaces bearing against one another with heavy pressures at low speeds is affected to different extents by different oils. The "Deeley" machine measures accurately the static friction between such solid surfaces under varying conditions. The figures for "oiliness" so obtained are much higher for vegetable and animal than for mineral oils. There is no relation between "oiliness" and viscosity. It is supposed that a friction surface is formed of an oil-metal compound, the thickness of which does not exceed one-millionth of a millimetre. The remarkable effect of small quantities of free fatty acids on this type of friction was also considered (this J., 1920, 53 R).

YORKSHIRE.

The second meeting of the session was held in Leeds on February 23, when a paper on "The Analysis of Lime-Liquors" by Messrs. Atkin and Palmer was read by Mr. Atkin. By way of introduction the author enumerated the various constituents of a tanning lime-liquor, hydrates and sulphydrates of soda and calcium, ammonia, amines, amino acids formed by the hydrolysis of the proteins of the epidermis and hair, together with salts of fatty acids produced by the further action of amidases on the amino acids. A detailed account was given of a method for determining the caustic alkalinity, an important control test, as the swelling of the pelt depends very largely on the concentration of caustic alkali. The method was based on the previous work of Bennett, and consists of two titrations with addition of formaldehyde. The chief point made by the authors was that Bennett had overlooked the action of formaldehyde on the the salts of the fatty acids present.

Dr. H. M. Dawson's paper on the "Recovery of Phenol from Spent Liquors" was an account of some work performed for the Ministry of Munitions with the view to preventing loss of phenol during manufacture at a time during the war when phenol supplies were short. Both in the extraction from tar oils and in the manufacture of synthetic phenol, carbolic acid is obtained in the form of carbolate (solution of sodium phenate), from which the phenol can be recovered by treating with sulphuric acid. The aqueous sodium sulphate layer which separates contains up to 10 per cent. of phenol in solution. Chemical methods, as well as adsorption methods using charcoal, were tried for the recovery of this phenol, but without success. Extraction with a number of organic solvents was then attempted, and the most efficient material found was cresylic acid, which recovered about 75 per cent. from a solution containing 10 grms. of phenol and 200 grms. of sodium sulphate per litre.

EDINBURGH AND EAST OF SCOTLAND.

At an extra meeting, held on February 27, Dr. D. S. Jerdan in the chair, Dr. G. H. Bailey, of the Aluminium Co., Kinlochleven, read a paper on the "Corrosion of Metals—Particularly Aluminium." After discussing the unsuitability of the methods used in the earlier investigations into the nature of corrosion, the author described recent work and gave details of the methods used in his own researches on the corrosion of aluminium.

Air and most gases in the dry condition have, at ordinary temperatures, no recognisable action on aluminium, nor have water and most aqueous solutions in the absence of air. Therefore in experiments on corrosion the reagent under consideration must be kept well aerated. When the rates of corrosion produced by various strengths of typical reagents are plotted on curves in logarithmic terms, it is found that the actions of the various alkali hydroxides appear as very nearly parallel lines. In the case of ammonia and nitric, sulphuric, and acetic acids the curve, after a certain concentration is reached, rises rapidly to a maximum and then rapidly falls with further increase of the concentration until at a concentration approaching the anhydrous condition it is evident that the action of these substances on aluminium is practically nil.

Of the conditions affecting rate of corrosion with the same concentration of reagent, physical condition is of comparatively minor importance, but the presence of impurities has a much greater effect, the rate of corrosion with pure aluminium being much less when impurities, such as iron, are present. The effect of difference of temperature is also very considerable. The first effect of increasing time of exposure of metal to a liquid is an increase in the rate of corrosion, but this is followed by a very marked decrease, which is due to the formation on the surface of the metal of a coating consisting chiefly of alumina and small amounts of the oxides of iron and silicon. This reduction is more marked in the case of impure metal because with such metal the rate of corrosion is greater in the initial stages and consequently there is more alumina formed and also more of the other oxides. There should be a future for those aluminium alloys which show this property of self-protection against corrosion combined with a greater tensile strength than that of aluminium itself.

LONDON.

A joint meeting of this Section and of the Faraday Society was held at Burlington House on March 1. The chair was occupied successively by Mr. Julian L. Baker and Prof. A. W. Porter.

A paper entitled "The Properties of Powders" by T. M. Lowry and F. C. Hemmings was read by Dr. Lowry. The caking of salts and other crystalline powders is in general dependent on the presence of a solvent—usually water. The case of ammonium nitrate has been studied in detail, and a full description was given of the difficulties which had been met with in dealing with this material. Very hard caking follows the change of state which ammonium nitrate undergoes at 32° C., but such caking can be prevented if very special care is taken to dry the salt thoroughly. Hard caking also follows the mechanical disintegration of the warm salt, and this, too, is probably connected with the liberation of moisture resulting from grinding. An interesting property of this salt is the fact that in summer it absorbs moisture from the atmosphere, while in winter, when the air is drier, it loses it. When crystallised from alcohol, ammonium nitrate shows but little tendency to cake, while the caking due to mechanical working is but slight when conditions are such as to favour the escape of moisture from the powder. When absolutely dry, ammonium nitrate does not cake. Caking of sodium nitrate, when stored in bulk, can be prevented by commercial drying, which is just the treatment giving rise to the most serious caking in the case of the ammonium salt. This difference is probably due to the polymorphism of ammonium nitrate. Potassium nitrate, which is less soluble than the other two, cakes to a much smaller extent during storage. Serious caking is met with in other anhydrous compounds such as common salt, soda ash, potassium chlorate, potassium perchlorate, citric acid and tartaric acid. In the last four cases caking frequently accompanies or follows the grinding of the dried crystals owing, in all probability, to the liberation of traces of moisture; this can be prevented by drying the compound during or after grinding and packing in a dry condition. Since it is difficult completely to dry hydrated salts without decomposing them, they must be dealt with in a different way. When these are ground there is usually a slight loss in weight, which is quickly recovered from the air, though this is probably not sufficient to account for the caking which occurs; it is more probable that this is due to recrystallisation following the disturbance of the normal distribution of water on grinding. Finally, the case of copper sulphate was dealt with, and slides were shown illustrating the contraction and swelling which accompany loss and absorption of moisture between various limits. The caking of hydrated salts is, in general, preventable by the presence of a small amount of a lower hydrate, since this serves to absorb the traces of moisture which produce caking in the salt if fully hydrated.

The second paper was on "The Setting of Dental Cements," by T. M. Lowry and S. Wilding. Phenomena of caking or setting may be divided into five classes:—I, which covers all the cases described in the previous paper, includes cases of recrystallisation of anhydrous or hydrated salt without change of chemical composition; II, comprises the formation of hydrates as met with in the setting of plaster of Paris; III, the hydrolysis of complex salts by water, as in the setting of barium silicate and Portland cement; IV, the formation of new salts, such as the magnesium oxy-cements and the zinc oxy-phosphate cements, used in dentistry, and "silicate" cements in which various silicates and salts of aluminium are converted into phosphates by the action of an aqueous solution of phosphoric acid sometimes saturated with aluminium or zinc phosphates. V, amalgams in which mercury takes the place of water. The best of the amalgam-cements is that made by the action of mercury on an alloy of silver and tin; Prof. J. W. McBain has shown that this is formed by the replacement of the tin in the alloy by mercury.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

The thirty-second meeting of the Society was held in Sheffield on February 18, Dr. M. W. Travers presiding.

After the Chairman had handed to the Vice-Chancellor a cheque in respect of the establishment of the "Wood" Medal and Prize (this J., 1919, 11 R), Mr. E. B. Christmas read a paper on "The Preservation of Glass-Furnace Refractories by Water-Cooling," in which were described certain water-cooling devices of the Blaw-Knox Co., U.S.A., which had been used successfully on steel-melting furnaces. The principle of these is also applicable to glass-making tanks, and their use increased the life of the blocks, reduced the number of hot settings and repairs, and improved the working conditions of the tanks—in fact, the introduction of such water-cooling devices would diminish working and labour costs and lead to increased production. The second paper, by Dr. Travers, described in detail a glass furnace embodying a new principle of gas-firing, which had been found extremely efficient at the Dennis Glass Works at Stourbridge.

The secretary announced that arrangements had been made for the Society to visit the United States in August and September next.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At the monthly meeting, held on February 17, Sir Frederick Black, president, in the chair, a paper was read by Dr. W. R. Ormandy entitled "Recent Patents on Mixed Fuels."

Attention was drawn to the rapid increase in motor traffic; in America alone, during 1919, the production of vehicles provided with liquid-fuel engines was approximately 1,900,000, whilst the demand for fuel amounted to 1,000,000,000 gallons, representing about 15,000,000 tons of crude oil based on the somewhat high yield of 20 per cent. petrol.

Examination of the Patent Office files during the years 1913—1919 indicated that the attention of inventors was being increasingly given to blends of volatile fuels, alcohol being assumed to be a component of the motor fuel of the future. It is well known that commercial alcohol, containing 5 to 10 per cent. of water, requires a third liquid before it will mix with the straight-run petrol distillate. Fusel oil or a higher carbinol was suggested as the menstruum in a 1913 patent. In the next year ethyl ether was put forward as a means of increasing the vapour tension of motor-alcohol, the more volatile component being incorporated to the extent of about 10 per cent.; whilst later it was proposed to increase the ether content to 40 or 60 per cent. "Natalite" is approximately a 50 per cent. by weight mixture of alcohol and ether, containing ammonia or trimethylamine to overcome the alleged tendency of alcohol to cause corrosion. Finally a mixture of alcohol and ether diluted with 5 to 50 per cent. of any suitable distilled hydrocarbon oil (No. 133,434) was recently covered.

A number of inventors has attempted to blend liquid motor fuels with inflammable gases; methane, acetylene, and hydrogen have been suggested.

The author criticised the granting of patents which protect blends of inflammable volatile liquids on the grounds that such blends are known to be possible motor fuels by the chemist and engineer.

THE ROYAL INSTITUTION.

The Friday Evening Discourse on February 27 was given by Mr. W. B. Hardy on "Problems of Lubrication."

The lecturer started with a simple experiment which had much interested and puzzled the late Lords Kelvin and Rayleigh, namely, that a teacup slides off its saucer much less readily after the bottom has been wetted with water. The phenomenon is not simply an effect of surface tension. A common glass bottle was then made to slide down a tilted glass plate, the lower half of which had been wetted; on reaching the moistened surface the bottle came to rest. A similar experiment was made with a plate of ebonite; in this case the motion of the bottle was accelerated when it reached the wetted surface. Using a plate of different (unspecified) material, it was seen that the bottle's motion was unaffected by the moisture. It followed, therefore, that the statement, "once a lubricant, always a lubricant" was not correct. Mr. Hardy then experimented with a teacup and a tilted glass plate which had been thoroughly cleaned; in this case the angle of inclination of the plate had to be increased considerably before motion occurred. The explanation was that surfaces exposed to ordinary impure air became coated with an imperceptible film of impurity, the thickness of which is about one-250-millionth of an inch, and which acts as a perfect lubricant. He then showed that a really clean glass bottle almost refused to slip on an approximately clean glass plate inclined at a certain angle, but that after the plate had been rubbed with a reputably clean glass-cloth motion at once ensued. A similar experiment was performed with cup and saucer. Evidence was then adduced that when two really clean glass surfaces move over one another, in the absence of a lubricant, slipping does not take place, but one surface is actually torn away, the scratches being alternately pits and plates. The difficulties attending experimentation with very clean surfaces and the means of effectually purifying the surrounding air—in order to prevent the deposition of the lubricating film—were next described. In conclusion, the lecturer indicated some remarkable results he had obtained with solid lubricants acting between glass and bismuth surfaces. It was found that the lubricating power of the paraffinoid hydrocarbons increased with increasing molecular weight; that their acid derivatives lubricated better; and the alcoholic derivatives better still, the best lubricants of all being substances like lactic acid which contain both carboxyl and hydroxyl groups. Exactly the reverse was found to hold with the corresponding derivatives of the benzenoid hydrocarbons. The interpretation of the results has yet to be found.

THE INSTITUTE OF CHEMISTRY.

At the 42nd annual general meeting, held on March 1, Sir Robert Robertson, vice-president, presided, and read the address of the president, Sir Herbert Jackson, who was absent through illness. Reference was made to the position of professional men under prevailing economic conditions. Notwithstanding the limited number of appointments carrying reasonably high salaries, most of the professions were attracting such a high proportion of the educated youth of the country that they were likely to be overcrowded. On the other hand, the Government and the industries were becoming more alive to the necessity of making appointments for chemists more attractive to the best qualified. The Institute was ready to help them to secure suitable appointments and endeavoured to encourage the employment of the competent. The situation was far more promising than at the tim eof the armistice; over 530 chemists whose names had been on the Appointments Register had now no further need of this assistance.

The Institute had been in communication with several of the Whitley Industrial Councils for industries on which chemistry had a bearing, and although under the constitution of these Councils no provision was made for the direct representation of chemists, several were acting as employers' representatives, and the Councils were prepared, where occasion arose, to turn to the Institute for assistance. The roll of the Institute now numbered nearly 3000 fellows and associates and over 500 registered students. The Council was engaged in work of reconstruction, remodelling the by-laws, providing for district representation on the Council, and revising the regulations for admission to the membership. It had taken up the question of securing representation of chemistry in the Ministry of Health, and Sir William Tilden had been appointed a member of the Council on Medical and Allied Services, and Dr. J. F. Tocher chemist to the Scottish Board of Health. Attention was being given to the continued production by British manufacturers of glass apparatus, chemical reagents and other laboratory requirements. Jointly with the Institute of Metals a committee was engaged on questions affecting the status and organisation of chemists and metallurgists in the Navy, Army and Air Force.

SOCIETY OF PUBLIC ANALYSTS.

A meeting was held on March 3 at the Chemical Society's Rooms, Burlington House, Mr. A. Smetham presiding.

Mr. C. A. Mitchell read a paper on the "Detection of Finger-Prints on Documents." The persistence of finger-prints was illustrated by means of specimens 56 years old. The various methods of detecting finger-prints on documents, *viz.*, mechanical, dyes, ink, chemical reagents, iodine vapour, etc., were fully discussed. The persistence of stains on paper, including blood finger-prints, was then dealt with. The paper contains a full bibliography on the subject.

Mr. T. J. Ward, in his paper on "Photomicrography with Simple Apparatus," described methods for obtaining low-power photomicrographs, and demonstrated his apparatus for magnifications not exceeding ×40. Various methods of illumination were also discussed.

A "Note on the Solubilities of Theobromine" was given by Mr. R. V. Wadsworth, in which the solubilities of theobromine in most of the commoner solvents were compared with solubilities given by various authorities, great divergencies being found in some cases.

THE CHEMICAL SOCIETY.

An ordinary meeting was held at Burlington House, W., on March 4. Sir J. J. Dobbie, president, announced the following nominations for honorary and foreign membership:—Messrs. W. D. Bancroft, V. Grignard, Kamerlingh Onnes, E. Paterno, P. Sabatier, J. B. Senderens, S. P. Sörensen and G. Urbain.

The lecture to have been delivered by Mr. J. C. Burnham was unavoidably postponed, and in its stead papers were read by Prof. M. Chikashige, of Kyoto, on "Ancient Oriental Chemistry and its Allied Arts," and on the activation and adsorptive capacity of sugar and wood charcoals by Prof. H. B. Baker with Mr. R. M. Winter, and by Prof. J. C. Philip with Mr. S. Dunnill and Miss O. Workman.

Prof. Baker's paper dealt with the adsorption of sulphur dioxide by highly purified sugar charcoal. It was found that the volume of gas adsorbed increased with the duration of the previous exposure to heat (at 900°—1000° C.) of the charcoal, *e.g.*, the quantity adsorbed after 45½ hours' heat treatment was 3 times as great as after 4 hours' preheating. The absolute specific gravity also increased, *viz.*, from 1·76 after 4 hours to 1·84 after 40 hours' treatment.

Prof. Philip's researches were concerned with the adsorption of gases and of dissolved methylene blue by preheated wood charcoals. The effect of heat treatment was greatly to increase the adsorptive capacity for gases, and the activation of the charcoal was conditioned primarily by the decrease in its bulk density during such treatment, the adsorptive power increasing as the bulk density diminished. The proportion of dye adsorbed from solution was also a function of the duration of the heat treatment, ranging, for charcoal made from Japanese ash, from 0·6 per cent. for 1 hour to 52 per cent. for 42 hours. Under the same conditions the adsorptive power of animal charcoal increased from 17·8 to 69·6 per cent. after 18 hours' treatment. No correlation was found to be possible between the adsorptive power and either the nitrogen content or the inorganic-salt content of charcoal. Activation does not occur to any extent unless the temperature of preheating reaches 800—850° C. The authors also advanced a hypothesis to account for the phenomena observed. In the discussion Capt. Pratt referred to the very active charcoal obtained in Germany by soaking it in a 12 per cent. solution of zinc chloride prior to heat treatment; attempts to produce the same results here had failed, as the carbonisation of the wood and the activation of the charcoal had been attempted in one operation.

The annual meeting will be held on March 25.

Basic Slag.—A general discussion on "Basic Slags: Their Production and Utilisation in Agricultural and Other Industries" will be held under the auspices of the Faraday Society, at Burlington House, W., on March 23, from 7.30 to 10.30 p.m. Prof. F. G. Donnan will preside, and the following, amongst others, will read papers or take part in the discussion: Sir Daniel Hall, Sir T. H. Middleton, Dr. E. J. Russell, Prof. C. H. Desch, Prof. D. A. Gilchrist, Dr. J. E. Stead, Mr. G. S. Robertson, and Mr W. S. Jones.

NEWS AND NOTES.

FRANCE.

Industrial Notes.—*Chemicals.*—The scarcity of chemicals is growing daily more serious, and its effects are becoming widespread. Thus the short supply of sulphuric acid, due to transport difficulties, is responsible for lack of superphosphates which are much needed by farmers. Trade with Germany offers no practical solution, because that country is unable to supply many of the products wanted, and it is also adopting obstructive tactics by exacting payment in dollars, pounds, or Swiss francs. Many sodium and potassium salts are unobtainable; in particular there is a great shortage of sodium sulphide, which is much used in France, and the price of which has risen phenomenally. In view of the diminished importation of chemicals, following the unfavourable rate of exchange, increased attention is being given to promote and control home production and distribution. With these ends in view, an association of producers, called *L'Union des Fabricants de Produits chimiques,* is in course of formation. Interest is also being aroused in the production of synthetic nitrogenous products. The new processes of M. G. Claude are being tested with great success at some experimental works near Montereau, and patent rights for the Haber process have been acquired by the firm Kuhlmann, in conjunction with the colliery companies at Lens and the Banque de Paris. The construction of large factories for the production of synthetic ammonia, nitric acid, etc., is about to be taken in hand, and the capital to be invested in these undertakings will amount to 50 million francs. Attention must also be drawn to the formation of the *Société l'Hydroxyl,* at Asnières (225, Quai Aulaguier), with a capital of 8 million francs, to engage in the hardening of oils by hydrogenation. It is an offshoot of La Société l'Oxylithe, and Lever Bros., Ltd. has an interest in it. In the dye industry the chief event to be noted is the amalgamation of "La Société nationale des Matières Colorantes" with "La Société des Colorantes français." The programme of the combine includes the erection of a new factory to produce aniline, and another to manufacture liquid chlorine, caustic soda, calcium chloride, etc., by electrolysis. Another new promotion is *La Société Générale pour la fabrication des couleurs et produits chimiques,* with a capital of 4,200,000 francs.

Petroleum.—The daily output of the new well at Pechelbronn has risen from 30 to 60 tons, thus bringing the total daily production in Alsace to 200 tons. Madagascar is also mentioned as a great potential source of petroleum, and the creation of a British company, The Majunga Oilfields of Madagascar, Ltd., with a capital of £200,000, is announced.

UNITED STATES.

Cost of Production of Helium.—The Committee of Congress appointed to consider the industrial production of helium at Fort Worth and Petrolia, Texas, where plants were erected at a cost of over $6,000,000, has reported against the method in use owing to the heavy operating charges involved. It is stated that the cost of manufacture of the helium required to inflate a dirigible airship exceeds the sum required to build the ship itself. The Committee recommends further investigation of other possible methods before further expenditure is incurred.—(*Board of Trade J., Mar.* 4, 1920.)

The Alloy Research Association.—In connexion with the February meeting of the American Institute of Mining and Metallurgical Engineers, the Division of Research Extension of the National Research Council will hold a meeting for the purpose of discussing problems which have been suggested as suitable for the work of the proposed Alloy Research Association. More than thirty-five problems have been submitted, and these include data on corrosion, comparative metal technology, development of tests which do not involve the destruction of the sample, the physical and chemical properties of pure metals and alloys, and the effect of traces or small percentages of the rare elements as well as those usually regarded as impurities. Following the selection of a programme of work, it is expected to make an early appeal to the industries to become members of the proposed association.

The Massachusetts Institute of Technology.—As the result of a campaign based upon a contract offered to industries by the Massachusetts Institute of Technology, 153 industries have subscribed $1,081,875 in the form of retainer fees, for which they will have the services of the Division of Industrial Co-operation and Research of the Institute. The Institute agrees to permit the corporations to make use of its library, files, and plant, to consult the members of the staff and faculty on problems relating to the industries concerned, to place at the disposal of these industries a record of the qualifications and experiences of the *alumni*, and to assist the companies in obtaining special knowledge on any given subject. The companies subscribing to the contracts will also be given the first opportunity to secure the services of graduates in technology. The plan is unique, and its development will be watched with interest.

Useful Publications.—We have received copies of the first three numbers of the Bibliographic Series prepared by Dr. Clarence J. West and issued by Arthur D. Little, Inc., of Cambridge, Massachusetts, entitled respectively "Chemical Warfare," "The Production of Alcohol from Sulphite Waste Liquors," and "Industrial Research." These booklets, which are intended primarily for the student, contain useful references to all the articles, etc., which have appeared in recent years on the subjects mentioned, and in two cases the bibliographical portion is preceded by a short introduction of an informative character.

The Chemical Catalogue Co., Inc., of New York, has arranged to publish a compendium of quantitative analytical chemistry, which will include every method to be found in chemical literature, both English and foreign. The volume dealing with inorganic chemistry will be published first.

BRITISH INDIA.

Chemistry at the Indian Science Congress.—The following are brief accounts of some of the papers read before the Section of Chemistry:—

"The Perishing of Paper in Indian Libraries," by J. J. Sudborough and Miss M. M. Mehta. A number of books from various Indian libraries was examined, and in many instances it was found that after periods varying from a few decades to some centuries the paper had become quite brittle and destitute of strength, whereas copies of the same works which had been kept in Europe were still quite good. It was found that paper made from esparto grass was particularly liable to deteriorate, and the same probably applies to wood cellulose paper, but this has not been in use for a sufficiently long period to make it possible to express a definite opinion. Some flax papers had also become very weak, and apparently cotton papers were the best. The sizing material also exerts a considerable influence, rosin having a very bad effect. Overbleaching causes the papers to become weak. The deleterious action is apparently sometimes due to bacteria and sometimes is entirely chemical. The papers become acid owing to the formation of organic acids. There is a proposal to provide the more important libraries with refrigerated chambers in which the valuable books can be kept.

"Studies in the Fermentation of Cellulose," by G. J. Fowler and G. V. Joshi. Various cellulosic materials were inoculated with mud from the bottom of a septic tank, and the rate at which they were broken down was observed. The gas given off contains about 85 per cent. of methane, and it can be collected and used for heating and lighting. The principal product is acetic acid, and it was suggested that this might be recovered. Raw cotton and raw ligno-cellulose are attacked but slowly; chemical wood pulp and hemi-celluloses much more rapidly. Banana skins are readily fermented. The optimum temperature is 35° C., and the liquid should not be allowed to become too acid. The presence of salts of lead, copper, and zinc impedes the fermentation.

"Some Fish Oils of the Madras Presidency," by A. K. Menon. By far the most important Indian fish oil from the commercial standpoint is that obtained from the Indian "sardine" (*Clupea longiceps*). The indigenous method of obtaining the oil was to allow the fish to putrefy in earthenware vessels or disused canoes, and naturally the oil was of poor quality. Sir F. Nicholson, Honorary Director of Fisheries, introduced, about ten years ago, the method of boiling the fresh fish and skimming off the oil, a further quantity being obtained by pressing the residue. The yield of oil is about 10 per cent., and the solid remainder is used as guano. The oil is used for leather, for making germicidal soap and many other purposes, and is largely exported. Before the war much of it went to Germany and Belgium. Two analyses of the skimmed oils gave: Sp. gr. 0·9241, 0·9251; acid value 1·69, 5·63; saponification value 194·7, 195·4; iodine value 172·6, 173·2; and refractive index 1·476, 1·475. Pressed oil: 0·9242, 36·1, 195·9, 165·5, and 1·474 respectively. In a good year the quantity of the fish caught amounts to 100,000 tons. There are other fish oils, the production of which could be developed, notably those from the livers of the shark and skate.

"The Action of Alcohol on the Sulphates of Sodium," by G. S. Butler and H. B. Dunnicliff. On treating sodium bisulphate or nitre cake with alcohol, sulphuric acid is dissolved, leaving as a solid residue the compound Na_2SO_4, $NaHSO_4$. If some water be present a slow subsidiary reaction takes place with the liberation of more sulphuric acid and the formation of the normal sulphate.

On January 16 there was an excursion to the Kandri manganese mine at Ramtek. The ore here is of high quality, containing about 54% of manganese, 7% of iron, and up to about 0·18% of phosphorus. Up to the present it has been obtained by quarrying into the side of a hill, but preparations are being made to work underground as well. This district is one of the most important in the world for the production of manganese ore.

SOUTH AFRICA.

Industrial Enterprises in the Union.—The following notes on the new industries which are still springing up in all parts of the Union of South Africa are culled from the latest Annual Report of the General Manager of Railways.

Iron works.—The production of pig iron started at Pretoria in July, 1918, and it has been definitely established that the ore is capable of reduction. The pig iron is of good quality. Production is still on a comparatively small scale, but the extension of the works and the installation of an up-to-date steel-manufacturing plant are contemplated. An encouraging report has been received regarding a large deposit of iron ore situated about 10 miles from Navar on the Indwe-Maclear line. Iron ore has also been found near Wolhuterskop, and again in payable quantities in the Lydenburg district.

Leather and Tanning.—Much expansion has taken place in the tanning industry. Four additional factories have been opened at Port Elizabeth for the manufacture of leather goods, and extensions have been effected at Oudtshoorn. A new boot factory has been completed at Great Brak River, and the output is rapidly increasing. There is also a tannery and boot factory at Somerset East, and at Bedford a boot factory has commenced operations in conjunction with the local tannery. The tannery at King Williamstown dealt with approximately 70,000 hides last year. The large military contracts have ceased, and the factories are now manufacturing for civil requirements.

Wattle Bark.—Large quantities of South African tannin are now used in the local factories. Wattle bark to the value of £287,220 was exported in 1918, an increase of £67,787 as compared with 1910. Factories established for the reduction of the bark to tannin extract are doing increased business, exports of bark extract being as follows:—1916 (when export commenced), £14,930; 1917, £49,520; 1918, £124,887. The value of hides and skins exported shows an increase of £1,000,000 compared with 1910, notwithstanding the additional numbers used in local manufactories. Exports of mohair have also risen by £740,000 since 1910.

Minerals.—Gypsum is being consigned from Riverton Road to the cement factories in increasing quantities, the value of the 1918 output being £7,000. The value of the tungsten production was £3,647, as compared with £252 in 1916—the first recorded output. Mica to the value of £1,681 was exported to Great Britain, Japan, and America. The 1918 output of iron pyrites was valued at £7,000; production commenced in 1915, the output for that year being valued at £939.

Tin.—The value of the tin produced in 1918 reached the record figure of £440,995, an increase of £94,9779 compared with the previous year. Tin ore and concentrates to the value of £239,926 were exported to the Straits Settlements.

Corundum.—The value of the corundum exported during the year amounted to £45,140, an increase of £11,500 over the previous year. Exports were mainly to Great Britain, America, Japan and East Africa. Production started in 1912 with an output valued at £659. The corundum deposits of the Northern Transvaal are stated to be the largest and most important in existence so far as is at present known.

Asbestos.—The local supply is practically inexhaustible, but scarcity of shipping has affected the output and export of asbestos, though large quantities were, nevertheless, shipped to the United Kingdom, Australia, Japan, America, France and East Africa in the order named. The quality of the fibre is such that it finds a ready market in Europe, and there should be a considerable increase in production when freight conditions improve. The value of the 1918 output was £54,037.

Lime.—The production of lime continues to increase, and the 1918 figures constitute a record. The value of the output during 1918 was £158,245, an increase of £26,872 over the previous year. Large quantities of lime are being sent to the gold mines, to Rhodesia, to the sugar estates in Natal, and to Lourenço Marques. An extensive deposit of pure limestone, estimated to contain over 7,000,000 tons, is being opened up at Taungs.

Salt.—The output of salt in 1918 was valued at £163,722, an increase of £53,156 over the previous year. The output would have been greater but for the disorganisation of the industry during the influenza epidemic.

Magnesite.—The 1918 output was valued at £2,184—a record production.

Arsenic.—The 1918 output of arsenic was valued at £1,759, and is the first recorded output of this mineral, which occurs in gold and tin mines in the Union.

Nitrates and Potash.—It is stated that steps are being taken to exploit extensive deposits of potassium nitrate in the Prieska and adjoining districts. The development of the undertaking will be watched with interest, as the successful exploitation of this commodity would be of inestimable benefit to agriculture, to industry, and to the country generally.

Considerable activity is taking place in the Upington district in burning a bush called "Melkbosch," from which carbonate of potash is derived. This bush is present in enormous quantities in the the South-West Protectorate, and apart from the value of the product the destruction of the plant is said to benefit the soil.—(*South African Mining J., Jan.* 17, 1920.)

GENERAL.

Dyestuff Purchases in Germany.—Since the judgment *in re Attorney-General v. Brown* (this J., 1919, 481 R) British dye-users have been in business communication with German manufacturers, but in view of the declared intention of the Government to reimpose some form of control over imports the Commission sent to Germany under the auspices of the Colour Users' Association (this J., 1920, 40 R) resolved to act on the assumption that importation by individuals might be stopped at any moment, and to adopt a policy of communal buying and distribution. The Commission, which was charged with the duties of investigating the dye situation in Germany and of buying such stocks of colours as were not already ear-marked for delivery to the Allies under the reparation clauses of the Peace Treaty, has reported that visible stocks of dyes are very small; and that, with the exception of the large works situated in the zone occupied by the British, dye manufacture in Germany is practically at a standstill owing to lack of coal and raw materials. Apparently French, Italian, Belgian and American buyers have already traversed the unoccupied areas with the object of purchasing surplus supplies. The Commission has succeeded in buying 140 tons of dyes, valued at about £191,720, for immediate export to this country, and arrangements have been made for further and larger purchases in the near future, subject to certain conditions in regard to delivery and prices. The Commission has made urgent representations to the Board of Trade to expedite the appropriation of the balance of "reparation" dyes, as surplus stocks within the occupied areas can only be released as and when corresponding amounts of "reparation" dyes are delivered to the Allies. Firmly convinced that a well-organised plan of purchasing foreign dyes is the best method of coping with the present and prospective shortage, the Colour Users' Association intends to pursue the policy of supervising collective buying and equitable distribution, although its main objects are to approach Government Departments on behalf of colour users and to assist in building up a valuable dye-making industry in this country.

Future of Chemical Warfare.—The following passages, bearing on the future of chemical warfare, are taken from a memorandum issued by the Secretary of State for War relating to the Army Estimates for 1920–21 (Cmd. 565. 3d.):—

"So long as there is any danger of other nations continuing these methods of warfare research and experiment in chemical warfare must be pursued. Research must not only be directed towards the gases and apparatus likely to be employed in the future, but also towards protection against all possible gases. Training in the use of gas will be confined to appropriate branches, but training in defensive measures will include the whole Army.

"We must, unfortunately, continue our studies of what is known as chemical warfare. No nation has renounced the use of poison gases as the result of the Peace Conference. There are nations whose word we could not respect if they did renounce it. It is essential to study the offensive side of the chemical warfare if we are to be prepared for defence. The great importance of adequate defensive appliances arises from the fact that preparations for the offensive use of gas can be made in peace time with great secrecy, and may have far-reaching and even fatal results in the early stages of a war.

". . . . For these reasons it is necessary to make adequate provision for research, experiment, and design in connexion with war material. It is equally necessary to avoid overlap, duplication of effort and the setting up of military institutions for scientific research which can better be done by existing civil institutions. It is our policy to farm out to civil scientific institutions, such as the universities, the National Physical Laboratory, the Imperial College of Science and Technology, etc., all pure research that can profitably be farmed out, and, generally speaking, to restrict military institutions to applied research and the preliminary design of apparatus. The question of overlap has been dealt with by an influential Committee, under the presidency of Mr. Balfour, in connexion with the Department of Scientific and Industrial Research. This Committee has recommended, and the Cabinet has approved, the establishment of four Co-ordinating Boards in connexion with research for the fighting services, for radio-research, chemistry, physics and engineering. The action of these Boards should lead to the detection of overlap, where such exists, and its elimination, and also to the dissemination of information."

Petroleum Production in Trinidad.—In Trinidad, which has an area of 1862 sq. miles, the petroleum indications are confined to the southern part of the island. The oil beds occur in the Tertiary strata, which are estimated to be from 6000 to 7000 ft. thick. Though indications were known to exist for many years previously, it was not till 1901 that any oil was obtained by boring operations. By December 31, 1918, however, the total number of wells drilled in the colony amounted to 410, of which 236 are on Crown lands and 174 on private lands. During 1918 twelve companies were engaged in producing oil, the total output for that year being 72,872,398 imperial galls., as against 56,808,914 in 1917. The difficulty with oil production in Trinidad is that while wells produce encouragingly at first, the production tends to fall off quickly, and good "gushers" often become quickly choked with sand. The chief reasons why Trinidad attracts attention as a centre for the petroleum industry are:—(1) The favourable indications of oil extending over long distances. (2) The favourable structure of the strata in which the oil sands are situated. (3) The satisfactory yields often obtained from shallow wells drilled at widely separated localities. (4) The proximity of the most promising oil districts to the sea. (5) Trinidad's exceptional geographical position with regard to the world's markets and trade routes.

There is a good local market for petroleum, and facilities are provided for bunkering vessels with oil. So far no drilling has been carried below 3000 ft., but deeper drilling is said to have interesting possibilities. The refineries in Trinidad at present only produce fuel oil, petrol and kerosene, and more refining equipment is needed.—(*U.S. Com. Rep., Dec.* 27, 1919.)

Production of Emery Ore in the Levant.—The Smyrna district and the Greek islands are the only localities in the Levant where emery ore is produced. Before the war the Smyrna district had an annual output of 50,000 to 60,000 tons, mostly consisting of soft emery. In Greece there is an annual output of from 12,000 to 15,000 tons. The Greek ore is very hard and is mainly sold for the manufacture of emery wheels, while the Smyrna ore is sold for polishing purposes.—(*U.S. Com. Rep., Nov.* 24, 1919.)

Vegetable Oils in Palestine.—The chief vegetable oils in Palestine are sesame and olive oils, both of which were exported in moderate amounts before the war, olive oil preponderating. The olive-oil industry has suffered severely during the war, and it is estimated that it will take 50 years to recover. The oils are extracted by primitive methods, but very little modern machinery is in use.—(*U.S. Com. Rep., Jan.* 8, 1920.)

Measures Proposed for the Protection of the German Aluminium Industry.—During the war there was a great shortage of copper in Germany, and aluminium was used as a substitute to a considerable extent (see this J., 1919, 418 R). The consumption in 1904 was 2000 tons, and in 1913 10,000 tons; at the end of the war it was estimated at about 32,000 tons. Owing to the many factories erected during the war Germany's production of aluminium increased about forty-fold as compared with a three-fold increase of the entire world production. The following three firms, which were started in 1915-16, own practically all the factories now in operation in Germany:—The Erftwerk Aktien-Gessellschaft, the Vereinigte Aluminiumwerke A.-G., and the Innwerk Bayerische Aluminium A.-G. There is now a feeling that the German aluminium industry is doomed to failure unless measures are taken to protect it from foreign competition and unless a way is found for maintaining the use of aluminium as a substitute for copper. The difficulty arises from the fact that copper can now be freely imported and that Germany owns no aluminium ore that can be operated profitably in competition with foreign mines. The only German ore that occurs in workable quantities yields about 15 to 20 per cent. of aluminium as compared with the 25 to 30 per cent. yielded by bauxite in France and the United States. Further, the possibility of importing bauxite is very uncertain. In order to protect the aluminium industry, therefore, it is proposed that a company should be established which should have a monopoly of the wholesale trade in imported and home-produced copper and aluminium. This firm, which might be called the State trading company for copper and aluminium, would be modelled on the lines of the great German metal companies which exercised a monopoly of the entire German metal trade before the war. It would consists of an amalgamation of all existing wholesale dealers and importers of these metals, together with the aluminium and copper departments of firms of a more general character. Anyone could import, but all imports would have to be turned over to the company, upon clearance through the German customs. Further, domestic aluminium and copper factories would be allowed to deliver only to the State trading company. The prices for imported and domestic copper and aluminium would be fixed by a semi-governmental committee at such a level as to safeguard the industry. The domestic commission and retail trade would not be interfered with in any way. It might be necessary to levy import duties on aluminium products, aluminium, and copper, and it is estimated that a protective duty of about 0·50 mark per kilo. for both products would counterbalance the higher cost of production in Germany (15 per cent. higher than the import price for aluminium and about 7 per cent. higher for copper).—(*U.S. Com. Rep., Jan.* 5, 1920.)

The Spanish Mineral Industry.—Spain is rich in minerals, the output at the pit mouth in 1916 being some 44,295,204 tons, valued at 382,855,785 pesetas (peseta=9½d.). The value of the industrial products derived from minerals was estimated at 578,000,000 pesetas in 1916 (the last year for which complete statistics are available. Figures showing the production of the various minerals and mineral products in that year are given below:—

Description.	Tons.	Description.	Tons.
Soft coal	4,847,475	Sulphuric acid	140,788
Anthracite	268,087	Coal briquettes	655,975
Lignite	473,106	Iron ore briquettes	363,784
Asphalt	7,316	White lead	2,493
Mercury	19,960	Tar and pitch	19,211
Sulphur	46,923	Antimony	425
Copper	1,968,974	Asphalt	2,591
Zinc	166,053	Arsenic acid	73
Tin	86	Quicksilver	795
Phosphorite	14,111	Sulphur	10,629
Iron	5,856,861	Benzol	1,644
Iron pyrites	953,678	Creosote	390
Manganese	14,178	Calcium carbide	19,511
Ochre	800	Natural cement	289,950
Silver	274	Portland cement	246,387
Lead	260,282	Zinc products	8,526
Argentiferous lead	7,370	Copper products	32,880
Salt	348,938	Iron and steel products	820,657
Wolfram	454	Coke	759,754
Graphite	1,240	Sulphate of ammonia	1,710
Granite	1,658	Heavy oils	3,006
Bismuth	10	Naphthalene	173
Asbestos	83	Colours	5,377
		Silver	140
		Lead	147,407
		Common salt	646,990
		Caustic soda	19,940
		Potassium chlorate	152
		Sodium chlorate	152
		Calcium chlorate	4,075
		Copper sulphate	7,600
		Sodium sulphate	10,100
		Superphosphates	315,177

—(*Bull. Dept. Trade and Comm., Canada, Dec.* 8, 1919.)

Resources of Morocco.—*Minerals.*—Iron, copper, zinc, and argentiferous lead have been shown to be present. Manganese has been found in various places between Djebel Narquechoum and Djebel Masseur. The ore is generally found in thin, nearly horizontal layers, from about 1 to 3 feet in thickness, containing 50 per cent. of manganese and free from sulphur and phosphorus. There is another easily workable deposit at the Djebel Bon Arfa, but owing to transport difficulties it has not yet been touched. The deposits of iron seem fairly important, especially those found at Beni-Saf, near Oran, and at Ouenza. Near the Zaers and Camp-Boulhaut, where important exploration is being carried out, the ore is found in veins 3 to 6 feet thick running from north to south in old calcareous soils, or in true sedimentary layers. Copper mines have for many years been worked in the Lower and Little Atlas. Recently, specimens of ore containing 30 per cent. of copper were found at Glaoua. The phosphates which occur near El Botoudj, are not yet worked, but it is probable that they will become of prime importance in the mineral wealth of Morocco on account of their export value. They are found in veins of varying thickness: from a few inches to about 25 feet. They extend all over the vast plateau between Guisser and El Boroudj. The El Boroudj deposit is estimated to contain roughly over one million metric tons. Various other minerals are found, such as salt, sometimes in large amounts, as in the salt mountains of Souk-el-Arba at Zissa. Gypsum is also common, and is sometimes of remarkable purity. Slate has been found in a few places south of Meknes in the Middle Atlas.

Fuel.—In Morocco, like all new countries, there is wide scope for development. So far, however, abundant supplies of coals do not seem to be present, except for some good quality anthracite which is said to exist near the Atlas Mountains. Peat is probably present in greater quantities, especially near the province of Oran. Timber is scarce in Morocco; the forests are situated near the Atlas Mountains and in the north-west. The wood is mainly fig, pine, palm, eucalyptus, plane and aspen. The natives mostly utilise charcoal obtained by carbonising the wood in small heaps, and this fuel is employed to obtain relatively high and regular temperatures. Reliable information of the existence of petroleum has been given in official reports and by different missions. The north-east and north-west regions and the neighbourhood of the last spurs of the Middle Atlas appear to be particularly favoured in this respect. Four oil zones have been located in the north-east, one of which—Sidi Brahim—might be worked and could supply the north-eastern regions. In 1912 crude petroleum was found at a depth of about 40 feet at Oued-Mellah. In the miocene soils, which prevail in the east of the Ouezzan-Fer road, the crude liquid flows from the naphtha-impregnated sands, and is workable at certain places. In 1918 geological experts came to the conclusion that workable petroleum deposits may exist in various localities such as:—North of Morocco, in the Gharb, towards Absoua, and on the banks of the Sebou and the Ouergha, at Tselfort, Zerhoun and in the valley of the Tunaoucin, near Tuza.

Morocco could easily become an important producer of alcohol, as the cultivation of cereals occupies a great part of its territory, but so far distilleries are practically non-existent.—(*Rev. des Prod. Chim., Nov.* 15, 1919.)

PERSONALIA.

Mr. Arthur R. Ling has been appointed to the Adrian Brown professorship of chemistry in the University of Birmingham.

Sir James Dewar has been appointed corresponding member of the French Academy of Sciences.

Mr. Hugh Ramage has been awarded the fellowship diploma of the Royal College of Science for Ireland.

The death is announced of Prof. Dr. H. Fresenius, director of the Fresenius laboratory in Wiesbaden, aged 73.

Dr. Stephen Miall has been appointed co-secretary and treasurer of the Federal Council for Pure and Applied Chemistry.

It is now reported (by the *Z. angew. Chem.*) that Prof. R. Willstätter, of Münich, has declined the offer of the chair of chemistry in the University of Berlin.

The Senate of London University has appointed Dr. Sidney Russ, president of the Röntgen Society, to be the first Joel Professor of Physics at the Middlesex Hospital Medical School.

Among the fifteen candidates recommended by the council of the Royal Society for election to the fellowship are Dr. E. F. Armstrong, Mr. A. Chaston Chapman, Dr. T. R. Merton, and Prof. Robert Robinson.

Dr. R. C. Maclaurin, president of the Massachusetts Institute of Technology, died on January 15 last at Cambridge, U.S.A. He was born in Scotland in 1870 and graduated at Cambridge University in 1897. After serving as professor of mathematics in the University of New Zealand he was appointed to the chair of mathematical physics at Columbia University, N.Y., in 1907, which he vacated two years later to become president of the Massachusetts Institute. Dr. Maclaurin had just completed the work of raising for the Institute a $4,000,000 endowment fund, and this sum has been supplemented by a donation of an equal amount by Mr. G. Eastman, of the Eastman Kodak Co.

REPORTS.

Report to the Board of Trade of the Empire Cotton Growing Committee. *Pp.* 74. [*Cmd.* 523. 1*s.* 6*d.*] *H.M. Stationery Office.* 1920.

The Committee strongly advocates the establishment of a central research institute to co-operate with the British Cotton Industry Research Association and to undertake the study of the life of the cotton plant and the development of its lint. There appear to be two main lines of investigation: The effects of heredity, by which the constitution of the cotton plant is determined and can be controlled; and the effects and limitations of environment, such as the seasonal period available for growth, the temperature, rainfall, and humidity and the characteristics of the soil, also bacterial, fungoid and insect organisms. These researches would further be divided into questions of purely local and those of general importance. Such an institute would compile and take charge of a seed index, and should arrange for the propagation of all potentially valuable strains of cotton and for the recording of their agricultural and commercial properties. The Committee emphasises the immediate importance of greatly enlarging and strengthening the Agricultural Departments of British Colonies and Protectorates. In order to increase the supply of trained scientific men financial provision should be made at British universities for readerships in plant physiology, plant genetics, mycology, and entomology, also for research studentships. The establishment of a bureau for the interchange of knowledge of cotton growing and the publication of a quarterly review are also recommended.

The Governments of all cotton-growing areas in the Empire should be advised to take full powers for exercising strict control over all essential matters connected with cotton-growing. This control would be most advantageously applied to the production and distribution of seed and the preservation of the purity of cultures. Suitable measures against cotton pests should be taken on a compulsory basis. Where it is possible and seems desirable such Governments should be encouraged to establish local associations of cotton growers to advise on matters of general interest to the industry. It is recommended that the services of the British Cotton Growing Association be engaged for the purpose of marketing crops when desired by the local Government, at any rate so long as the industry is on an experimental scale.

Funds for the promotion of cotton growing in the Empire should be drawn from the British Treasury, the local revenues of the cotton-growing areas, and from the cotton industry in proportions allocated according to certain general principles to be agreed upon.

Commenting on the local conditions in various parts of the world, the Committee points out that the almost total failure of the "Sea Island" crops in Georgia and Florida, owing to the attacks of the boll weevil, throws a heavier demand on the West Indian growers. In Egypt there has been a considerable falling off in production during the war, and no steps should be neglected to make good this decline. Measures were projected before the war to remedy the unsatisfactory condition of parts of the Delta as regards drainage and the control of excess water. It is also of the utmost importance that water should be available for the reclamation and irrigation of the lands referred to as well as of those farther north, which will be restored to cultivation by the new drainage works. An adequate supply of water is available in the White Nile, and until this work is done the full advantage of expenditure already incurred in the Northern Delta cannot be obtained. The completion of this scheme would provide for an increase in the production of 900,000 bales of 400 lb., equivalent to about 50 per cent. of the 1914 production. The magnitude of such a possible increase in the Egyptian crop overshadows the importance of what can be done in Nigeria and Uganda, where some such figure as 100,000 bales may be expected as the result of development work. A portion of the serious reduction in the average yield of the Egyptian crop is due to the devastations of the pink boll worm, and no time should be lost in organising systematic measures to combat this pest. Subject to the requirements of Egypt, the irrigation works in the Sudan offer a most promising return in the way of development of cotton-growing areas. The pioneer work in Mesopotamia, though on a very small scale, is regarded as most encouraging. The results in Uganda, Nigeria, and other African provinces show considerable progress, but development is rather waiting on transport facilities.

As regards India, what is chiefly required is an improvement in quality, which can only be obtained by systematic co-operation between the Agricultural Departments and the cotton industry, with the institution of research on selection and breeding. This branch of the subject must go hand in hand with work directed towards the improvement of agricultural practice generally. Attention should also be paid to the organisation of marketing conditions and co-operative farming by small holders. The formation of an East Indian Cotton Association is recommended.

Manchester Steam Users' Association Memorandum for 1918—1919. *By* C. E. Stromeyer, *Chief Engineer.*

The first part of the report deals with fuel economy, and includes a classification of the uses to which fuel is put.

In high-temperature operations, gas works, metal furnaces, etc., the advisability of recovering waste heat, as in boilers, is dependent on the value of the material in the furnace and on the space required around the furnace for handling gear. The waste-heat boiler must never jeopardise the process proper. Where power is the main requirement an efficient central station is probably the best.

In factories requiring power and also steam for heating and boiling, a study of the relative proportion of these two requirements is important. In the case where more steam is used for heating purposes than can be supplied by power-producing engines, advantage can be taken of the fact that when passing through the engine, steam only parts with the mechanical equivalent of heat for the power produced, which may be taken at about 2·5 lb. of steam or $\frac{1}{3}$ lb. of coal per IHP., all the exhaust steam being used for heating. The mutual advantage of combining works using power with those requiring steam for heating is apparent. Examples are given showing the application of this policy, and to what extent engine efficiency is vital. To avoid the use of low-pressure distributing mains, a high back-pressure may be put on the engine—which will be inefficient from a steam consumption point of view—provided that by so doing effective use can be made of the waste steam. This would appear to be particularly suitable for isolated processes requiring both power and steam heat; it then becomes a question of deciding how the steam shall be used after being suitably deprived of its mechanical energy before passing to the heating operation. The other alternative is to use low-pressure distributing mains, and from data obtained from Fischer, which are quoted, it is shown that the radiation losses in low-pressure mains are not materially greater than in high-pressure mains, provided that pipes of adequate size are employed. The diameters of the pipes should be in inverse ratio to the squares of the steam pressures.

The author also reviews in detail the question of the safety of cast-iron economisers and furnace failures, his conclusions being often at variance with those contained in the reports of the Board of Trade.

COMPANY NEWS.

BRADFORD DYERS' ASSOCIATION, LTD.

The twenty-second annual meeting was held on February 27, at Bradford. Mr. Milton S. Sharp presided and delivered an address.

Whereas only 10 per cent. of the dyes required in the country was manufactured at home before the war, the production is now 25,000 tons, or 20 per cent. above pre-war consumption. Exports of dyed and printed textiles in 1919 were valued at £181,990,350, while a total of 3,234 tons of aniline dyes, worth £1,826,574, was imported. There is, however, a lack of certain specific dyes, which is hindering the establishment of the dyeing industry on a firm footing, and British manufacturers should devote special attention to this shortage. Although grants in aid of the dye makers had been advocated, they are inadvisable at the present time. Judging from reports on the present condition of the German dye industry, the makers still have time in which to establish themselves on a sound basis. British dye-makers have before them the most magnificent opportunity ever offered to leaders of industry, and it will be entirely their fault if they do not secure within a measurable time, and throughout the world, the position which was formerly held by Germany. The best way to protect the industry is not by imposing import duties, but by prohibiting the importation of dyes except under licence. The licensing authority must be able to act in the promptest way and have full power to grant licences not only for dyes which are not made here, but also on account of inferior quality or higher price of the British article.

The gross profits for the past year amount to £911,252, and the sum available for distribution is £707,051. The directors recommend the allocation of £50,000 for workmen's superannuation, and the payment of a dividend of 22½ per cent. on the ordinary shares, leaving £399,321 to be carried forward. The increased profit over the previous year of £155,197 is more than accounted for by fortuitous amounts which are not due to the year's trading; actually the profit was less than in 1918. The profits from the American works for 1919 have not been included as they are not yet available. The following figures show the percentage of net profits on the total capital employed during the past six years:—1913, 5·7; 1914, 4·9; 1915, 8; 1916, 11·6; 1917, 11·1; 1918, 7·7; and 1919, 10·1. The average for the last five years is 9·7 per cent. The directors have sold the works in Kingersheim, Alsace, to a large firm with preponderating interests in the bleaching and dyeing works in France.

CEREBOS, LTD.

At the annual meeting held at Newcastle-on-Tyne on February 24, the chairman, Mr. W. H. Collins, reported that in order to economise on transport charges, the company had purchased the business of the Middlewich Salt Co., Ltd.; it had also acquired a second factory in France, and was about to erect works in Toronto, Canada. Owing to the great increase in the company's business, it had been found necessary to make additions to plant and machinery, and to enlarge buildings. For these, and further developments, additional capital would be required.

JOHN KNIGHT, LTD.

The annual meeting was held on February 27, Mr. J. W. Hope presiding. The chairman said that it was proposed to pay the profit-sharers additional remuneration at the rate of 15 per cent. on their present wages. After stating that the liquid assets of the company amount to £574,426, or about £5,000 more than the whole capital, he dealt with Lord Leverhulme's offer to take over the company, which would, however, preserve its identity. Lever Brothers, and its subsidiary company, Associated Enterprises, Ltd., already held just over one-third of the issued capital. The proposal is to convert the £1 ordinary shares into preferred ordinary carrying a fixed cumulative preferential dividend of 25 per cent.; to purchase all the £1 deferred shares at £13 10s. each, and to allot 10 votes per share to the deferred shareholders as against one vote per share of the preferred ordinary shareholders, the effect being to give a majority of votes to the holders of deferred shares.

South Staffordshire Mond Gas Co.—The annual report states that fuel supplies during the year were short in quantity and of inferior quality, and that owing to labour unrest and strikes (particularly the moulders' strike) 18 per cent. less gas was sold than in 1918. The gross profit for the year was £15,857 (compared with £18,232 in 1918), and the net profit £7,374.

Electro-Bleach and By-Products, Ltd.—The directors of this company have received an offer from Messrs. Brunner, Mond & Co. to purchase from the shareholders all their preference and ordinary shares by allotment of one Brunner-Mond share and 8s. for every two preference, and one Brunner-Mond share and 3s. for every two ordinary shares. The annual meeting of the Electro-Bleach Co. has been postponed pending a decision, and should the exchange be accepted the directors will recommend final dividends of 7 per cent. on the preference, and 14 per cent. on the ordinary shares. The Brunner-Mond shares exchanged will be entitled to the same dividends as the existing Brunner-Mond ordinary shares as from Jan. 1, 1920.

New Capital Issues.—*British Cotton-Seed Products, Ltd.*, has recently issued 220,000 shares, of which 150,000 shares were offered at par (£1). The company was formed, *inter alia*, to acquire and work under patent rights the Segundo cottonseed and cottonseed hull defibrators.

British Cellulose and Chemical Manufacturing (Parent) Co., Ltd., is issuing 4,250,000 7½ per cent. cumulative participating preference shares of £1 each, of which H.M. Government is taking £1,450,000, the remainder being offered to the public at par. The shares are also entitled to 25 per cent. of the profits distributed in every year. The authorised capital is £7,750,000, divided into £4,250,000 in preference shares and £3,500,000 in ordinary £1 shares, of which £2,300,000 has been issued. The shares allotted to H.M. Government are in liquidation of the advances, amounting to £1,450,000, previously made to the company. It is proposed that the old company be immediately liquidated and the word "Parent" omitted from the title. The company manufactures cellulose acetate, calcium carbide and aspirin, and is about to start producing artificial silk at the rate of 3 tons a day, the output to be increased to 9 tons a day by the end of the year. The works are situated at Spondon, near Derby, and cover 200 of the 340 acres owned by the company. The Government has appointed two directors on the board, and reserves the right to veto the creation of any debentures or other charges which might rank in priority to or *pari passu* with its shares. (See also this J., 1919, 317 R.)

TRADE NOTES.

BRITISH.

British Guiana in 1918.—The total value of the exports for 1918 was £3,524,798, representing a decrease of over 18 per cent. on the previous year's figure. Among the exports were sugar (93,001 tons), coffee (4750 cwt.), copra (2487 cwt.), coconut oil (30,650 galls.), citrate of lime (31 cwt.), lime juice (12,996 galls. raw and 3,671 galls. concentrated), oil of limes (180 galls.), fish glue or isinglass (5283 lb., value £321), gold (24,546 oz.), diamonds (14,196 carats, value £29,575), rubber (23,854 lb.), and balata (1,140,788 lb.).

Some 2000 acres are planted with cacao, of which a large part of the production is utilised locally. The planting of Para rubber has materially decreased, only 3980 acres being under cultivation as compared with 5100 in 1917. Tapping experiments at the Government experimental stations continue to give satisfactory results, both as regards the yield and the cost of collecting the rubber. The gold production has decreased owing to labour difficulties. Twenty-nine licences to explore and one licence to prospect for mineral oil in the north-western and Pomeroon districts have been granted. So far no definite results have been recorded.—(*Col. Rep.—Ann., No.* 1014, *Dec.*, 1919.)

East Africa Protectorate in 1917-18.—The total exports, which, for customs purposes, include those of the Uganda Protectorate, amounted to £1,543,104, a rise of 20 per cent. over the previous year. Cotton represents 46 per cent. of the total (combined) value. Fibre, including sisal etc., valued at £202,328, was shipped to the United Kingdom. Coffee to the value of £124,268 (59,111 cwt.) was exported. Other exports were carbonate of soda (4688 tons, value £111,322), grain and oil seeds (£2034), copra (19,285 cwt., value £18,599), and rubber (1666 cwt., value £14,026). Sisal and flax are being extensively cultivated owing to their present high prices. All mining work has been stopped owing to the shortage of European miners and prospectors. Sugar-cane growing is being taken up over a wide area of the protectorate and promises very well.—(*Col. Rep.—Ann., No.* 1013, *Dec.*, 1919.)

Foreign Trade of the United Kingdom in 1913 and 1919.—The *Board of Trade Journal* for February 26 gives statistical tables dealing with the foreign trade of this country in 1913 and 1919. The inflated values of 1919 are reduced to the pre-war values of 1913, thus providing a basis of comparison. The appended data are taken from these tables:—

Northern Territories of the Gold Coast in 1918.—The dyeing of native cloths and cotton goods and the smelting of iron ore give employment to the natives in various parts of the Protectorate. Salt is produced by evaporation at Daboya, and the industry, which remained normal during 1918, is in the hands of the Addah traders.

Gold-bearing quartz and alluvial deposits have been found in the neighbourhood of Wa and in the Bole district. Extensive micaceous outcrops have been discovered in the south-western portion of the North-Eastern Province. Specimens of surface mica have been sent to the Coast and have been favourably reported upon.—(*Col. Rep.—Ann., No.* 1011, *Nov.*, 1919.)

FOREIGN.

Increased Capitalisation of German Chemical Firms.—The recent increases in the capitalisation of the large German chemical undertakings afford evidence of their determination to regain their former ascendancy in the world's markets. These increases follow on others which were undertaken in 1917 (this J., 1918, 269 R), and they bring the total capitalisation up to about £53,676,000 (at normal exchange). The following table gives particulars of the amounts of new and old stock issued by the companies mentioned:—

Company.	Old stock.	New stock, ordinary.	New stock, preferred.	Total.
	Marks.	Marks.	Marks.	Marks.
Badische ..	90,000,000	90,000,000	72,000,000	252,000,000
F. Bayer & Co.	90,000,000	90,000,000	72,000,000	252,000,000
Höchst ..	90,000,000	90,000,000	72,000,000	252,000,000
Cassella & Co...	45,000,000	45,000,000	36,000,000	126,000,000
A.-G. Anilin Fabrik ..	33,000,000	33,000,000	26,000,000	92,000,000
Griesheim ..	25,000,000	25,000,000	20,000,000	70,000,000
Weiler-ter-Meer	10,400,000	10,400,000	8,320,000	29,120,000
Total ..	383,400,000	383,400,000	306,720,000	1073,520,000

—(*U.S. Com. Rep., Dec.* 31, 1919.)

Vegetable Oil Trade of Kobe (Japan).—The quantities and values of colza, coconut, and groundnut oils shipped from the port of Kobe increased very greatly in 1918, but trade in soya-bean oil was much hindered by lack of shipping for transporting the beans from Manchuria. Practically all the groundnut oil shipped at Kobe comes from North China. The following table gives the amounts of oils exported from Kobe during 1917-1918:—

	1917.	1918.
Rapeseed oil ...	17,585,000 lb.	25,268,129 lb.
Coconut oil ...	21,809,996 ,,	36,510,831 ,,
Soya-bean oil ...	5,221,931 ,,	4,975,932 ,,

—(*U.S. Com. Rep. Suppl., Dec.* 22, 1919.)

	Imports.				Exports of foreign and colonial produce.				Exports of United Kingdom produce.			
	Declared values.		Change in average values.	Change in quantities.	Declared values.		Change in average values.	Change in quantities.	Declared values.		Change in average values.	Change in quantities.
	1913.	1919.			1913.	1919.			1913.	1919.		
Raw materials:	£1,000.	£1,000.	Per cent.	Per cent.	£1,000.	£1,000.	Per cent.	Per cent.	£1,000.	£1,000.	Per cent.	Per cent.
Coal, coke, and manufactured fuel	37	6	+200·0	—94·6	3	—	—	—100·0	53,660	92,298	+242·2	—49·7
Iron ore, scrap iron and steel	7,433	11,986	26·9	—28·9	9	3	+200·0	—88·9	411	320	+185·7	—72·7
Other metallic ores ..	10,197	12,365	+ 75·5	—30·9	564	474	+ 14·5	—26·6	130	66	+230·0	—84·6
Oil seeds, nuts, oils, fats, and gums	41,577	131,281	+143·7	+29·6	5,670	11,095	+152·0	—22·4	4,468	14,359	+193·3	+ 9·6
Hides & undressed skins	15,067	29,613	+102·2	— 2·8	8,411	12,276	+118·6	—33·2	1,886	1,627	+119·3	—60·7
Paper-making materials	5,816	16,567	+233·6	—14·6	298	6	+500·0	—99·7	958	911	+297·8	—76·1
Rubber	20,524	24,347	— 19·9	+48·1	14,837	14,021	— 28·6	+32·3	2,993	2,919	+135·4	—58·6
Manufactured articles:												
Chemicals, drugs, dyes and colours	12,906	23,062	+156·5	—30·3	1,641	5,692	+163·8	+31·5	21,974	29,469	+134·3	—42·8
Earthenware and glass	4,546	3,620	+233·9	—76·2	196	45	+164·7	—91·3	5,213	5,182	+143·1	—59·1
Paper	7,674	13,020	+215·9	—46·3	276	99	+175·0	—87·0	3,679	4,234	+248·8	—67·0
Grand totals	768,735	1,631,902	+140·1	—11·6	109,575	164,322	+ 91·7	—21·8	411,368	631,643	+177·1	—45·1

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Imported Potash from Germany and Alsace.

Sir A. Geddes, answering Sir R. Cooper, said that since the armistice the imports of potash from Germany had been 19,280 tons (worth £323,727) for agricultural use, and 4301 tons (worth £182,446) for industrial use, while Alsace had supplied 37,25 tons worth £275,476) for agricultural and 100 tons (worth £2250) for industrial use. The ruling prices of potash in Germany, the material acquired by the British Government in part payment for foodstuffs, and the maximum prices (now £116 5s. per ton) fixed for 88—90 per cent. caustic potash imported through the Board of Trade, were also given.—(Feb. 23.)

Empire Cotton.

Replying to Mr. Chadwick, Lieut.-Col. Amery said that 24 per cent. of the world's production of cotton is contributed by the British Empire. Apart from the small but valuable East Indian crop, the production is almost entirely in tropical Africa. Of late years the Uganda crop has fallen off, but a large increase is expected. Every effort is made to encourage cotton-growing, and special attention has been given to the improvement of Colonial Agricultural Departments. The Colonial Office is in close touch with the Empire Cotton Growing Association. —(Feb. 23.)

Sugar-Beet Industry.

Lieut.-Col. Guinness asked if the Board of Agriculture is aware that the Cantley sugar factory has now been acquired by an English company, and is being equipped with the most up-to-date machinery in readiness to deal with this year's crop; and if he would draw the attention of East Anglian farmers to the importance of this new industry.

Sir A. Boscawen said he would make inquiries. —(Feb. 24.)

Gas Cylinders.

Mr. Kellaway, answering Mr. Alfred T. Davies, said that a consignment of 16,000 gas cylinders was sold to a Mr. Milligan in December last, and the delivery under this contract is now nearing completion. There was no sale to any other buyer.—(Feb. 24.)

Purchases of German Potash.

In reply to Sir R. Cooper, Mr. Bridgeman made the following statement showing the amount of German potash contracted for, together with the different grades and prices per ton :—

Grades.	Quantities contracted for.	Quantities received in the U.K. to date.	Prices credited to German Government f.a.s. Rotterdam
	Tons.	Tons.	£ s. d.
50% muriate of potash ..	20,000	8,288	16 5 1
90-95% muriate of potash ..	5,000	2,300	18 0 8
90% sulphate of potash ..	13,500	5,970	18 15 11
Potash manure salts (minimum content 30% K_2O)	10,000	7,855	8 5 1
Total	48,500	24,413	—

The amount to be delivered at Rotterdam is about two-thirds of the whole. The remainder is to be delivered f.o.b. Hamburg at prices 5s. per ton lower than those given above.—(Mar. 1.)

Sugar Imports.

Mr. Bridgeman informed Lieut.-Col. Archer-Shee that the sugar imported during 1919 was: Refined foreign, 7·9 million cwt.; refined in bond, 16·7; unrefined, 6·1; total, 30·7 million cwt. The figure for 1914 was 33 6 million cwt.—(Mar. 2.)

British Cellulose and Manufacturing Co.

Numerous questions were put to Ministers concerning the conversion of the prior lien charge held by the Government into preference shares in the reconstructed company (this issue, p. 98 R), emphasis being laid on the undesirability of the Government holding share capital in companies engaged in competitive manufacture. The action taken was defended by Mr. Chamberlain and Mr. Hope on the grounds that the arrangement made afforded the best means of protecting the money already invested and of preserving in this country an industry of vital importance in war and of great utility in peace.—(Mar. 1, 2, 3, 4, 8.)

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for Feb. 26 *and March* 4.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of firm or agent.	MATERIALS.	Reference number.
British India ..	Heavy chemicals, pharmaceutical preparations	266
Ceylon	Soap, perfumery, crockery	292
Egypt	Leather, glass, china, earthenware ..	293
"	Toilet and laundry soap	294
"	Glass, china, potash, polishes, soap (tender for)	—
South Africa ..	China, glassware	291
Balkan States ..	Soap, druggists' sundries, glass, crockery	295
Belgium ..	Soap, candles, vegetable oils ..	270
Greece	Textiles, leather, skins	299
Italy	Dyes, metals	275
Japan	Chemicals, dyes, ammonium sulphate, pulp, paper	279
"	Chemicals, dyes, metals, manures ..	280
Latin America ..	Chemicals, paints, colours, alkalis, disinfectants	282
Mexico	Heavy chemicals, potash, soda, intermediates and coal-tar products	285
Netherlands East Indies.	Soap, perfumery, dyes, paint, varnish, chemicals, aluminium, ceramics, milk powder, china, porcelain, enamel (goods in demand) ..	—
Norway ..	Syrup	276
Palestine ..	Leather, leather cloth, iron and steel goods, oils, colours, paints, varnish, chemicals, drugs, enamels ..	281
Persia	Leather, sugar, glass beads, bottles, tumblers (goods in demand) ..	—
Poland	Photographic materials	302
Portugal ..	Chemicals, disinfectants	303
" ..	Artificial silk	304
Spain	Petroleum for Diesel motors (tender for)	—
Argentina ..	Cement, galvanised iron, oils, greases, paints, rubber tubes and tyres ..	312
Brazil	Calcium carbide, caustic soda, cement, oils, paints, varnish, gas oil	313
Chile	Chemicals, drugs, paper	314

An application has been received at the Department of Overseas Trade for the names of manufacturers of water-gas pitch.

MARKET SOUGHT.—A Canadian firm desires to get into touch with U.K. importers of high-grade silica and talc. Inquiries to the Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

TARIFF, CUSTOMS, EXCISE.

Australia.—The export of British and Australian silver coin is prohibited save with the previous consent of the Minister for Trade and Customs.

Argentina.—It is proposed to amend the customs duty on, *inter alia*, fine glassware, porcelain, red lead, lead pipes, plates, ingots and bars, iron pipes, columns and girders, earthenware pipes, cement, cardboard, common glass, iron and steel bars, plates and sheets, and artificial manures.

Belgium.—Certificates of origin and import licences are no longer required for any goods except, *inter alia*, colours with aniline base, copper and its alloys, iron and steel, and photographic materials, and then only in the case of (*a*) non-German goods imported from Spain, Switzerland, Luxemburg, Holland, Denmark, Sweden, Norway, Poland, Czecho-Slovakia, and German Austria, and (*b*) goods of German origin or coming from Germany *viâ* one of the above-named countries.

Export licences are again required for gold, silver, platinum, and earthenware tiles.

Brazil.—The regulations respecting consular invoices are set out in the issue for March 4.

The Budget Law for 1920 increases the customs duties on porcelain, faience, linseed oil, and prepared paints, and doubles the present statistical tax.

Egypt.—The restrictions on the import of gold have been cancelled as from January 29.

France.—The French Customs *régime* is now applicable to the Saar basin.

Germany.—The export of paper, cardboard, and manufactures thereof is prohibited except under licence as from February 19.

Hungary.—In cases where the Customs duties are paid in bank-note currency a supplementary duty of 500 per cent. is levied.

Jugo-Slavia.—It is proposed further to restrict the importation of "articles of luxury," including perfumery and expensive soaps.

Mexico.—The export tax on copper has been altered. British firms may consult the tariff at the offices of the Department.

New Zealand.—The restrictions on trade with Czecho-Slovakia, Poland, and the Serbo-Croat-Slovene State have been removed.

The prohibition of the import of klepalo (cream of tartar substitute), sanatogen, and of gas mantles is revoked as from November 24, 1919.

Portugal.—Among the articles the import of which is prohibited are alcoholic beverages, vinegar, confectionery (except liquid glucose), ceramic products (with some exceptions), manufactured gold, silver and lead, and writing inks.

Among the articles that may only be imported in amounts to be fixed by the Minister of Finance are tin, malt, yeast, chemicals, and substances for use in medicine or perfumery.

United States.—It is proposed to impose Customs duties on graphite and all products containing graphite advanced by manufacture beyond the state of crude graphite.

RAT POISONS.—With regard to the propaganda conducted by the Ministry of Agriculture for the destruction of rats, it is announced that the Treasury has sanctioned the establishment of a research laboratory, and that a chemist is to be appointed to work in conjunction with the Ministry's technical adviser. The work will include the discovery of new poisons that are harmless to domestic animals, as well as the improvement of existing poisons.—(*Official.*)

REVIEWS.

A TREATISE ON BRITISH MINERAL OIL. *Foreword by* SIR BOVERTON REDWOOD, BART. *Editor:* J. ARTHUR GREENE. *Pp.* xii.+233. (*London: Charles Griffin and Co., Ltd.* 1919.) *Price* 21*s. net.*

THE editor of this book was associated in the closing years of the war with several of the contributors to its pages (and others) in a vigorous attempt to force the Government to extend the home production of oil from shale, cannel, waste coal, etc. He and most of his colleagues probably under-estimated both the difficulties attendant on the starting of new schemes at that juncture and the work actually being carried out at the time by the Petroleum Executive in collaboration with the shale-oil and gas industries. Nevertheless, the activities of the committee, of which he was honorary secretary, renewed public interest in the revival of the old coal-oil industry in this country. The possibilities of reviving that industry had, indeed, been canvassed freely, often with more zeal than discretion, in the years immediately preceding the outbreak of war, but the latter held up progress in this direction for the time being.

The revival in this country of the industry of recovering oil-products from waste coal, etc., is assured owing to the ever-increasing demand of the transport agencies for motor spirit and heavy fuel oil, and the concurrent rise in price of supplies drawn from imported petroleum. The principles on which oil-production from coal rests are tolerably well comprehended by oil producers and experts. Unfortunately, however, the confidence of the commercial world in its prospects has been rudely shaken by the lamentable failure of several of the designers of plant for the so-called low temperature distillation of coal to meet essential works' requirements. Among these requirements may be cited: Facilities for the handling of material and for mechanical operation, accessibility of the plant for cleaning and renewals, and ease and reliability of control. In the past also the limitations of any one type of plant have too frequently been ignored; no plant will distil satisfactorily all of the many descriptions of waste coals, cannels, shales, etc., which are available for oil production, simply because their physical characteristics are so widely diverse. Only by close regard to these fundamental considerations can the damage be retrieved which has already been done to a potentially great British industry by some of those who have aspired, without the needful training or qualifications, to be its pioneers.

This book will serve the useful purpose of indicating many of the pitfalls which await the inventors of processes for the "low temperature" distillation of coal. On the whole, its contributors appear to the writer to be over-sanguine of the success of immediate and almost indiscriminate application of these processes, though Dr. A. E. Dunstan, who is responsible for the section on the Products and their Chemical Nature, is reasonably cautious. The first section of the book—on Raw Material—by Mr. E. H. Cunningham-Craig, is also quite authoritative on the geological side, but contains errors in other respects, as, for instance, when he writes: "Freshly cut peat contains roughly 80 to 90 per cent. of water, and though this can be reduced by air drying in the open to 60 or 65 per cent., further drying has to be done artificially." As a fact, hundreds of tons of English peat blocks, which are merely air-dried, are sold containing only 20 to 30 per cent. of water. In other respects the information given in this book about peat and its utilisation is very unsatisfactory. As regards cannels and oil shales, the first section of the book forms a useful supplement to the very valuable memoir, prepared by Dr. A. Strahan, the Director, which was published by the Geological Survey in 1918, dealing with the lignites, oil-shales, cannel coals, etc., of England and Wales.

Mr. Andrew Campbell is responsible for a short section on refining, a subject on which, in relation to shale oil, etc.—he has exceptional knowledge; but in so far as the section refers to the refining of crude oil from cannel, etc., the information given appears to depend almost wholly on results obtained with a five-gallon experimental still. The difficult problem of the refining of crude oils from cannel and "low temperature" coal distillation plants is not really seriously tackled. Perhaps this is because the pioneer producers of these oils (in recent years) have generally disregarded the problems of the refiner, and have chosen their methods of production without regard to his limitations. With the development of the work of the Fuel Research Board and of many private investigators, who are proceeding on more practical lines than their predecessors, it may be anticipated that very shortly the refiner may have a better opportunity of working up products from the crude oils derived from waste coals and cannels. W. J. A. Butterfield.

Industrial Gases. *By* H. C. Greenwood. *Pp.* xvii+371. *(London: Baillière, Tindall and Cox. 1919.) Price* 12*s.* 6*d. net.*

The untimely death of Harold Greenwood is a serious loss to our chemical industry. Always modest and unassuming, he had reached that stage of life when he was beginning to create out of the knowledge which he had absorbed and assimilated. Much of this knowledge will now be lost, but fortunately that part of it relating to the industrial gases has been preserved. This book was almost ready for press when Greenwood died, and it now appears with a foreword written by Dr. J. A. Harker, who was his chief during the researches on the synthesis of ammonia carried out for the Ministry of Munitions, some of which have just been made public in the report of the Nitrogen Products Committee.

The industrial use of gases is no longer restricted to the gas industry. To-day hydrogen, oxygen and carbon-dioxide are of the greatest importance technically, and the application of other gases including even the rarest, such as helium, is continually increasing. The processes of gas manufacture are still in course of vigorous development, and the author has found it preferable to avoid any very detailed treatment of the various processses involved, and to deal in the main with general principles, special attention being paid to the question of gaseous equilibria. In consequence a fair amount of mathematics is introduced, but the treatment is so clear that the reader should have no difficulty in following it. A valuable feature is the frequent use of tables of reference data in the form required for immediate use in technical practice.

The book is divided into three parts, dealing with the gases of the atmosphere, sundry other gases, and gaseous fuels. These are preceded by an introduction in which the fundamental physical and physico-chemical principles forming the basis of technical gas reactions are outlined. This section is most ably written, and for a long time to come should prove to be the standard work on the subject.

The section on air involves the consideration of the various methods for its liquefaction, an achievement which not so many years ago was but a scientific curiosity, whereas in the near future a liquid air plant may become a commonplace in the chemical works. Oxygen gas is in the main absorbed by the welding and metal-cutting industries —about 90 per cent. of the present production, according to the author. It is safe to predict that it will find a more extended application in chemical industry when catalytic oxidation has been further developed. Such processes as the oxidation of aldehyde to acetic acid in presence of manganese are far easier to work with oxygen than with air. Nitrogen, so inert in itself and so active in combination, is the mystery gas of the future and the most fashionable gas to-day. Accordingly we may expect much progress to be made in the knowledge of its behaviour and technical application. This is clearly indicated in the book.

When the Swedish savant Cleve discovered the mineral named after him from which Ramsay in 1894 obtained helium (Lockyer's helium it should be called in justice to the editor of *Nature*, who discovered its "line" in the solar spectrum), it was little thought that America, amongst its many wonders, would prove to possess a natural gas containing up to 1 per cent. of helium (Cottrell, this J., 1919, 121 T), and that it would be proposed to isolate enough of this gas to inflate a Zeppelin! Chemistry has few more fascinating romances.

Of the miscellaneous gases hydrogen is the most attractive and occupies by far the largest section of the book. Its uses are numerous and varied, the most important being aeronautical, fat hydrogenation, and synthetic ammonia. A variety of rival processes for its manufacture has been suggested, many are in practical operation, and the technical and patent literature on the subject is very large. Greenwood had made a special study of this subject and writes therefore with a critical knowledge such as few others outside the industry possess. Hydrogen is made in quantity to-day at a price considerably less than is charged for town's gas, and so much is already known of its behaviour that the way is clear for its further immediate application in many directions. The other gases considered are carbon monoxide, carbon dioxide, and the oxides of sulphur and nitrogen.

The subject of gaseous fuels usually suffices for a book to itself, but the author devotes some 60 pages to it, in which a very clear and concise summary is presented. Throughout the work there is every evidence of thoroughness, and Greenwood's book will provide stimulus to many to come after him, so that his life's work will not have been in vain.

E. F. Armstrong.

Memorandum on Solid Lubricants. *By* T. C. Thomsen *and* L. Archbutt. *Department of Scientific and Industrial Research. Pp.* 28. *(London: H.M. Stationery Office.* 1920.)

Any addition to our scanty and scattered literature on lubricants is welcome, even though it be a co-ordination of results which have long been known to some of us. The subject of solid lubricants is presented very clearly in this memorandum, but, unfortunately, no serious attempt has been made to express a decided opinion upon their value. It must, however, be borne in mind that the memorandum has been compiled to satisfy a demand and not to stimulate the use of such lubricants.

Among the solid lubricants graphite, talc, mica, sulphur, and white lead are mentioned, but subsequently it is stated that some of these are often used to cure hot bearings; they act less as lubricants than as mild abrasives. With properly lubricated bearings the chief advantage of using a solid lubricant is apparently the effect on the friction at the moment of starting. Flaked graphite is stated to build up a surface on very rough bearings, but it may be detrimental where small clearances exist. Colloidal graphite would appear to be a useful solid lubricant were it not for the fact that it is very susceptible to the flocculating action of electrolytes; in fact, less than 0·1 per cent. of free fatty acids is sufficient to precipitate it. Nevertheless, it has its own sphere of usefulness. E. A. Evans.

THE PRESENT POSITION OF THE TUNGSTEN INDUSTRY.

J. L. F. VOGEL.

It is difficult to review the present position of the tungsten industry without somewhat detailed reference to its history, both under war conditions and in the period immediately preceding the war.

Uses for Tungsten.—By far the greater part of the tungsten consumed before and during the war was by high-speed steel makers, whose object is to obtain an alloy steel, which is not only strong and hard, but which also retains these properties at high temperatures. The aggregate tonnage consumed for lamp filaments, contact points, X-ray targets and as wire is quite insignificant, and although it has materially increased since 1914, it still has little bearing on consumption. As regards the alloy steel containing tungsten, despite the competition of molybdenum steel and such alloys as stellite, there is little, if any, evidence of the replacement of tungsten alloy steel to any extent by other alloys for general use as high-speed steel. Tungsten steel has been adopted for purposes other than cutting, as, for instance, exhaust valves for internal combustion motors, and there is a considerable consumption of steel containing a low percentage of tungsten for magnets and hacksaws. Speaking generally, however, it may be said that the uses of tungsten have only expanded to a limited extent, and that the consumption is still essentially dependent upon the demand for high-speed steel.

Raw Material.—The production of tungsten naturally depends upon the supplies of ore, *i.e.*, upon the minerals containing tungsten trioxide (WO_3) combined with the oxides of iron and/or manganese or of calcium, and a review of the ore situation is essential to a correct diagnosis of the position of the industry to-day.

Tungsten ores in pre-war days were derived mainly from the United States, South America, Portugal, Burma and Australia, and the supply and demand had gradually risen from a low figure to some 10,000 tons of concentrates per annum, equivalent to, say, 4000 tons of metallic tungsten. Under war conditions, demand almost immediately overtook and passed supply when plants were ready to produce tungsten powder and ferro-tungsten. Strenuous exertions were taken to augment production, and these met with such success that by 1918 the output of concentrates exceeded the demand. The increased production was specially noticeable in the United States and Burma, while China came into the market with a fresh and entirely unexpected production. The output for 1918 was roughly 25,000 tons, or $2\frac{1}{2}$ times the pre-war consumption.

High-speed Steel.—As it has been shown that the ultimate consumption of tungsten is mainly confined to the manufacturers of high-speed steel some consideration must be given to this product.

Before the war competition between different high-speed steel makers had gradually led to increasing percentages of tungsten being employed whereby better quality could be imparted to the steel. Under war conditions high-speed steel was standardised with 14 and 18 per cent. tungsten contents. On the other hand, high-speed steel is not consumed at all completely in use, and every engineering works accumulates rapidly a stock of scrap in the form of broken tools, or tools which have lost just sufficient of their size by grinding to render them useless for accurate work. During the war period every effort was made to collect scrap and return it to the steel makers for re-melting, but the clean-up after the war disclosed a very great deal more scrap than was ever thought to exist. There were, further, large stocks of many special sections and sizes used in the manufacture of munitions which were no longer saleable.

The conditions ruling at the date of the Armistice may be summarised as follows:—

1. Supplies of ore concentrates were in excess of the current demand and commitments under firm contracts for very considerable additional tonnage were in force.

2. There were large stocks of manufactured and scrap high-speed steel.

3. The demand for high-speed steel by engineers at once dropped and sales were reduced to a minimum.

4. Prices for wolfram concentrates, tungsten powder, ferro-tungsten and high-speed steel at once became nominal.

The Manufacture of Tungsten and Ferro-Tungsten.—From a technical point of view the war had effected radical changes. Up to 1914 the bulk of the wolfram was smelted into tungsten powder in Germany, and at the outbreak of hostilities ore supplies were far in excess of the smelting capacity of the Allied countries. By the middle of 1915 this defect had been made good. In England the question of manufacture of tungsten powder or ferro-tungsten was the subject of close investigation. Many of the makers of the best brands of high-speed steel were satisfied that the quality of their products could only be maintained by employing tungsten powder at least as good as that previously imported from Germany. On the other hand, improved methods of manufacture of ferro-tungsten offered advantages in many respects. The problem was solved eventually in the only rational way—by the erection of factories for making both products. Four works were established initially for powder and five for the ferro-alloy manufacture, and the bulk of the tungsten made during the war came from these. Once the factories were running—that is, in the spring and summer of 1915—the ore situation became acute, and the Government commandeered ore supplies and distributed them. The quantity of ore available, however, sufficed only to maintain outputs of 50—60 per cent. of the maximum in each factory.

The processes employed in the different works were not made public, but collated information obtained by the Ministry of Munitions showed that a very high standard of efficiency was attained throughout. The quality of the product was equally high, and this was specially noticeable in view of the great variety of tungsten ores employed and the low grade of a considerable proportion of these. Pre-war tungsten powder from Germany averaged some 97·0—97·5 per cent., while the standard British metal assayed 98·0—99·0 per cent. Ferro-tungsten was confined to a very stiff specification in respect of impurities and this was met by the makers generally, although the best ores had to be set aside for their use.

It may be generally stated that an industry which had developed for twenty years in Germany was more than equalled in efficiency and quality of product in two years by British firms, working under all the difficulties of war conditions. During the war ferro-tungsten plants were gradually put down by other Allied countries, which sufficed to satisfy domestic consumption in Japan, France, Italy and the United States. The British plants, however, were designed primarily to supply the needs of all the Allies, so at the date of the armistice the manufacturing capacity of Great Britain was in excess almost of the world's normal demand and far in excess of the home requirements.

Ore Production since the Armistice.—The cost of producing ore rose gradually, as it was influenced by the price of silver, which is the basis of exchange in most of the ore-producing countries. This rise became excessive when silver became a free market and hence there followed a period during which costs of mining and transporting ore concentrates to the market grew higher and higher, while accumulated surplus stocks of ore and scrap high-speed steel became available in sufficient quantities to meet demands for an extended period. These stocks were held largely in the United Kingdom and in the United States; as it was found desirable to liquidate them to a considerable extent, prices naturally fell and very soon dropped below the increasing costs of production. Many mines, in consequence, closed down after completing their existing contracts at war-time prices. The steady fall in ore prices and the absorption of scrap eventually reduced the cost of production of high-speed steel to a figure that made the re-stocking of stores of this material economically possible. Further, the demands of the engineering trade for sizes of bar suitable for reconstruction work, motor car manufacturing, etc., began to be felt in the autumn of 1919, as well as a demand from the enemy countries, whose stocks were entirely depleted, though this trade was hampered by the heavy fall in exchange.

The future of the industry can now be discussed on the basis of this information, but, like all estimates of the future of industries, it is deeply obscured by unknown factors.

Consumption.—Once depleted stocks of suitable sizes and sections of high-speed steel have been manufactured and distributed it is probable that the normal consumption will settle down to something between the war and pre-war rates; in terms of ore concentrates consumed these were, say, 20,000 and 10,000 tons, respectively.

In view of the almost complete scrapping of old machine tools, it is reasonable to assume a post-war normal consumption of some 15,000 to 16,000 tons of ore concentrates with a gradually rising tendency. How soon this normal consumption will begin to operate, it is difficult to estimate, but probably from 1921 onwards, demand and supply will run more or less together.

Ore Supplies.—On the above estimate of consumption, the ore supplies already in existence are likely to govern the market for a considerable period, when taking into account the wolfram which will be mined in any case in conjunction with tin, the demand and price for which will ensure active production. Once stocks are absorbed or reduced to a low figure, the cost of ore concentrates must be governed by costs of mining fresh supplies, and these, owing to the movements of exchange, are at present greatly in excess of the current market price of stocks. Assuming, as is reasonable, that silver and gold are unlikely to fall to pre-war values within say two years, it is probable that the price of freshly-produced ore concentrates will rise to an extent which will correspond with exchange. Taking actual figures, the pre-war and current prices for ore concentrates are approximately 30s. per unit, and it is improbable that at the present exchange rates, production to satisfy the full demand will be possible under 45s. to 50s., but these figures will not come in force until stocks have disappeared.

Manufacture of Tungsten and Ferro-Tungsten.—As has been shown, even under the stress of war conditions the British makers of tungsten powder and ferro-tungsten entered on their task determined to place these industries on a permanent footing. Quality of product was recognised as an essential, and the standard production of this country has proved to be superior to that previously obtainable anywhere. Scientific research has gone hand in hand with manufacture, and British manufacturers might be able to compete with their former rivals, but, of course, the fabulous decrease in money values of continental currency gives advantages in costs of manufacture which are not easily countered.

It has been accepted as a matter of policy that the industry is essential as a safeguard and it is included in the "key" industries which may be protected if necessity arises. Whether such necessity will arise is difficult to forecast, but present indications favour the view that by foresight and precaution in erecting the factories, providing for ore supplies and establishing a high grade of product, the industry can look after itself against fair competition, but not against dumping.

It must be remembered, however, that fuel and labour both directly and indirectly govern costs of manufacture and that if the latter exceed a certain limit foreign competition cannot be met.

THE IMPORTS AND EXPORTS REGULATION BILL.

The Bill to regulate imports and exports (this J., 1919, 459 R), which was introduced into the House of Commons during the past Session and temporarily withdrawn, has been considered and reported upon by a committee of the Association of British Chemical Manufacturers. The report of the committee has been adopted by the Council of the Association and forwarded to the Board of Trade. The following are the main provisions:—

The committee recognises that there are three classes of industry which have to be considered at the present moment, when the Government has to safeguard the country against the lack of material necessary for war purposes:—

(1) Industries which during the war spent their own capital, at the urgent request of the Government, to make, or increase their make of, war material, and now for various reasons find their capital unremunerative.

(2) Those industries, commonly called "key industries," necessary for the prosecution of a future war, which are non-existent or not sufficiently strong to stand by themselves without some form of protection.

(3) Industries which do not exist or do not cover home requirements, which are unnecessary for war purposes, and therefore cannot be called "key industries," in cases where ample cheap supplies can be imported.

The committee has confined its attention to the industries under the second heading, and has considered the following methods by which the Government might possibly deal with the present situation:—

Free Imports.—In view of the strong political opposition which has developed against the Bill, the committee recognises that it may be deemed advisable for the Government to abandon all attempts to deal with dumping and the protection of key industries. This would have the advantage of freeing the chemical industry in so far as it is covered by the Second Schedule of the Bill, from all Government interference in manufacturers' businesses, and in particular from the inquiries which would inevitably be made into the ownership, management, control, costs, prices, and profits of any person engaged in the manufacture or sale of the articles in the schedule.

It is understood that, so far as the question of dumping is concerned, this is not going to be dealt with in the Bill about to be submitted; but there is an immediate need for dealing with the principle of fostering key industries.

Licensing and Grants-in-Aid.—Although the method of licensing as recently carried out results in delays and is apt to be irritating to the importer and user, it does not entail some of the disadvantages which are common to other forms of protection. After giving full consideration to the views of the various Groups of the Association, the committee recommends that the Government should be asked to adopt this system combined with loans and grants-in-aid, with this modification—namely, that it should be understood that licences to import chemicals should be freely granted as of right, unless and until the manufacturer of such chemical has shown cause why the particular chemical should not be admitted in unrestricted quantities.

The principle of grants-in-aid has been recognised by the Government, not only during the war, but is to continue after the war in the case of the dye industry.

Tariff.—The arguments for and against protection by means of a tariff are too well known to need recapitulation. The committee feels that while this method has the advantage of simplicity, in the present state of public opinion it would be impossible to adopt it.

Licensing plus a Tariff Fee.—The committee has given very careful consideration to the possibility of instituting a system of licensing by which an importer would be assured of obtaining a licence, thereby eliminating the uncertainty of the present system of licensing, but by which he would be charged a substantial fee, which could vary with each article and which would be based on the difference in price between the foreign-made article and that of British manufacture.

This method has some attractive features, of which the removal of the uncertainty whether a licence would be granted or not is the chief. In effect it is an easily varied tariff under another name. Its disadvantages are that it would be opposed politically as a tariff, and that the House of Commons would inevitably decline to place what amounts to the power of taxation in the hands of any other body than itself. The committee does not therefore recommend it.

State Purchase and Sale Bureau.—The committee has given consideration to the suggestion of setting up a State Purchase and Sale Bureau as a method of dealing with the present difficulties. In essence the proposal is that both the purchase and sale of articles the manufacture of which is to be regarded as a "key" industry should be made through a central bureau, in which the Government should be interested, but in which the preponderating influence should be that of commercial men. The difficulty in adopting this method is that it would entail the setting up of a special and rather expensive organisation which would depend for its success upon obtaining the services of a number of experts, who would have to be independent of any interested firm. It is not thought that such experts are at present available, and the committee does not therefore recommend this course.

The committee also recommends a revision of the list of goods, specified in Schedule II. of the Bill, the importation of which may be prohibited (see this J., 1919, 314 R). The suggested alterations refer more to the mode of classification of the goods than to their nature. The addition of "wood charcoal and hardwood tar (excepting fine decolorising carbon)" is recommended, the heading "analytical reagents" is extended to cover research chemicals; further, in lieu of, or in addition to, certain specified organic chemicals, the generic terms synthetic acids, alcohols, aldehydes, esters, ethers, and ketones are substituted. It is also suggested to alter "cerium fluoride and fluorides of other rare earth metals" to "compounds of cerium and other rare earth metals."

CANDLENUT OILS IN THE PAINT AND VARNISH INDUSTRY.

Of the many new raw materials periodically brought to the notice of the paint and varnish industry, and of which the advent on the market in commercial quantities seems to hold out promise, the lumbang oils *Aleurites moluccana* and *A. trisperma* would appear to be of considerable interest as alternatives to linseed oil. Attention has been drawn to the value of the lumbang oils in a recent article in *The Times* (Trade Supplement, Dec. 27, 1919), whilst H. A. Gardner (Circ. No. 75, Paint Manufacturers' Assoc., U.S.A., Oct., 1919; this J., 1919, 952 A) has published for the first time the constants of "soft lumbang" oil, *A. trisperma*. A third variety of candlenut oil, which is apparently to be the generic name for the lumbang oils, is obtained from the nuts of a tree (*A. triloba*) growing in Hong Kong, and is known locally in India as "Kekuna oil." This variety has been described (this J., 1901, 642), but its constants appear to demand its classification among the semi-drying oils, and it would therefore be of little value to the paint manufacturer. The commonest and most abundant of the drying lumbang oils is that from lumbang bato (*A. moluccana*), which occurs both as a native and semi-cultivated tree from India to Polynesia. Lumbang banucalag (*A. trisperma*) is confined to the Philippines, and is less common than lumbang bato.

The results of a series of practical tests by the Bureau of Science, Manila, show that the behaviour of the lumbang oils on drying is comparable with that of linseed oil. Gardner (*loc. cit.*) also shows what he claims to be many points of resemblance between soft lumbang oil and linseed oil, but states that when spread on glass the film yielded has the characteristic opaque, crystalline appearance of dried tung oil, which is, however, inhibited by addition of 10 per cent. of lead-manganese drier, when a perfectly clear film is obtained in 14 hours. This latter point Gardner adduces as a distinction from tung oil, but he is inaccurate in this respect, as the formation of a matt crystalline film in tung oil can be similarly inhibited by the addition of suitable driers or by controlling the nature of the surrounding atmosphere and incident light during exposure.

From their behaviour in practice and the nature of the published constants, it would appear that both common candlenut oil and soft lumbang oil are to be classed among the foremost members of the drying oils, whilst in the absence of more information concerning the characteristic glycerides of these oils it is highly probable that they are to be placed in the sub-class of China wood or tung oil, which also includes Japanese wood oil and the oiticica oil described recently by Bolton and Revis (Analyst, 1918, 43, 251—4; this J., 1918, 37, 15, 430 A). A determination of the bromine thermal value and a correlation of this value with the iodine value would be a useful criterion of the possible inclusion of the lumbang oils into the subgroup occupied by tung oil, since the latter shows a great divergence from other drying oils in the value of the factor necessary to relate the bromine thermal values with their iodine values.

Since the main use for tung oil in the varnish industry is in conjunction with linseed oil, the function of which is to mitigate the otherwise uncontrollable gelatinisation of the pure oil during heat treatment, the use of pure soft lumbang oil as a varnish oil would seem to be indicated; a distinct increase in its viscosity occurs after heating to 280° C. for 15 minutes, a change which has no counterpart in the case of linseed oil under the same conditions.

It remains to be seen whether the stimulated production of lumbang oils referred to will have any result in the placing of these oils on the English market, especially in view of the fact that the United States is a great consumer of oils which show any promise of serving as linseed oil substitutes. The output of menhaden oil in the United States, which is practically all absorbed in that country as a drying oil in certain industries, may be quoted as a comparable case.

PETROLEUM ECONOMICS.

The following extracts are taken from a paper on "The Economics of the Petroleum Industry," read by Mr. R. S. Dickie at the Imperial College of Science and Technology on March 4, 1920.

In certain respects the winning of petroleum from the earth and its conversion into manufactured products differs from any other undertaking. A company which produces and refines petroleum has always to face an uncertain source of supply which may one month exceed the storage and refining facilities and a few months later may make it difficult to keep its refinery employed. It is, perhaps, owing to this uncertainty that oil companies have combined the operations of the production of the crude with its refining and distribution, thereby differing from most industries in which the winning of the raw material, its manufacture, and the distribution of the finished product are almost invariably in different hands.

The British petroleum industry may be said to date from 1847, when James Young of Kelly commenced distilling petroleum from the coal measures of Alfreton in Derbyshire. As the supply of oil soon gave out, Young tried to imitate artificially what he believed to be the natural process. He argued that the oil was produced by subterranean distillation of bituminous minerals, and by experiment discovered that cannels and shales when subjected to distillation yielded a product similar to natural petroleum. His attention was then directed to the Boghead coal of Scotland, and in 1850 he there erected the first works of what was later to become the Scottish mineral oil industry. By 1871 there were 51 works in operation, and the price of kerosene, which had been 2s. 6d. per gall. during the currency of Young's patent, had dropped to 1s. 6d. There were at one time and another 116 works engaged in distilling Scotch shale. The industry had probably reached its zenith in the 'seventies, after which time the development of the American and Russian oilfields began to affect prices. Each fall in price was countered by the adoption of cheaper methods of handling and distilling the shale by improved plant and by the working up of neglected by-products. Evidence of this appears from the cost of the raw material being reduced from 5s. 1d. per ton in the 'sixties to 2s. 7d. in 1882 and 2s. in 1897, while the expense of distilling and refining fell from 5s. 7d. per ton to 3s. 7d. in 1882 and just under 2s. in 1897. During the same period the output of shale rose from one million tons per annum in 1880 to 3 million tons in an attempt to reduce the incidence of fixed costs by increasing the aggregate upon which the same would be chargeable. Evidence of the rigour of the fight appears from the number of companies which went into liquidation. In 1880 the number of companies had been reduced to 19, in 1895 to 12, and when the curtain was rung down last autumn only four companies remained to be acquired by the Anglo-Persian Oil Co.

Having thus briefly considered the genesis of the British petroleum industry we may now see what it has grown to. In 1919 there were 360 British companies with paid-up capitals amounting to 170 millions sterling. These figures refer only to the nominal capitals, but if we take the market valuations of all the companies it would amount to much larger figures. The market valuation of four of the largest companies amounts to over 300 millions. Lest these figures should give too rosy a view of the prosperity of the industry, it should be noted that within the last ten years nearly 500 companies have gone into liquidation.

The areas in which British companies are operating include the following:—Algeria, United States, Turkey, Bulgaria, the Dutch Indies, Ecuador, Egypt, Russia, Mexico, Persia, Rumania, Assam, the Punjab, Burma, Trinidad, Bolivia, Canada, Austria, Borneo, British Guinea, New Zealand, South Africa, Syria, Colombia, Australia, Cuba, Cyprus and Venezuela.

It is the experience of a large and successful corporation that on an average only one out of six areas which have surface indications and which have been favourably reported on by their geological advisers proves a successful commercial proposition. As it is generally at this stage in the development of a property that the public becomes interested, it is desirable that we should recognise the distinction between an area believed to be oil-bearing and one which through sound preliminary work has advanced to a commercial proposition. In the latter case it will have been ascertained that the depth of the oil sands is not too great for profitable drilling, that the yield per well is satisfactory, that the oil is of good quality, free from excessive sulphur compounds, that it is not emulsified, and that transportation problems are not too difficult. As a rule the testing and development stages of an oil area proceed together, and though it may be possible as a temporary measure for the output of the test wells to be disposed of in its crude state to some third party, it is important that a comprehensive policy for its refining and distribution should be proceeded with at the earliest moment if the company owning the property is to make the most of its resources.

It is a very striking economic fact that it has been the refining and distribution of oil products that has been the most remunerative, and not the winning of the crude oil. The Standard Oil Company was always more interested in the manufacture and distribution of the products of petroleum than in the production of the crude.

The cost of sinking wells varies within very wide limits. Owing to the advance in the prices of all structural and drilling plant it is impossible to give absolute figures which would have any value, but relative pre-war figures have a degree of interest. From 3s. per foot for the easily drilled wells of Ontario to 50s. per foot for the Coalinga field of California gives a range which probably includes the extreme limits. It is common knowledge that the productivity of an oil well declines steadily from the time the oil is first struck. What is not so generally known is that for every producing sand there is a more or less definite period at which the decline becomes more gradual which is known as the time of "settling." The determination of this period is of importance as it enables production to be averaged more successfully than is possible when dependent on the varying yields of wells in their initial stages.

Crude oils are generally classified as "asphaltic," "paraffin," or "mixed." The best instances of asphaltic crudes are the Mexican and Californian petroleums. Pennsylvania probably furnishes the purest "paraffin base" oil, and examples of the mixed are found in the Mid-Continent fields. The processes which the refiner makes use of in the separation of his products are:—distillation, refrigeration, filtration, "sweating," and chemical treatment. The distillation may be "destructive" when heat alone is applied to the still and when the distillation products are considerably altered from the forms in which they occur in the crude, or by the injection of steam into the still itself the distillation may proceed at reduced pressure, in which case the intention is to separate the products without altering their character. Distillation under vacuum was once a common practice, but is now discarded in up-to-date refineries, as the same results can be obtained by the use of outside firing and internal steam at less cost. Refrigeration is made use of in the treatment of "paraffin base" oils to effect the separation of the paraffin wax. The sweating process consists in subjecting the crude wax which still contains a proportion of oil to the influence of a gradually increased temperature—the wax in the form of a cake or block being meantime supported on a perforated surface or on an inclined plane. As the temperature rises the oil and the lower melting point waxes become liquid and drip through the perforations or down the sloping surface leaving the pure wax behind. Chemical treatment generally consists in washing the distillates with a small percentage of sulphuric acid, separating the so-called "acid tar" which sinks to the bottom of the vessel and then adding a solution of caustic soda. The effect from the refiner's point of view is to improve the colour of lubricating oils and to improve both the colour and the burning qualities of illuminating oils. The exact chemical action which takes place is still obscure. The acid combines with the unsaturated hydrocarbons, with the oxygenated bodies, and with some of the sulphur compounds, but it is probable that its action is more complex than these combinations alone would imply. Decolorisation by filtration through animal charcoal, fullers' earth or bauxite completes the refining operations in general use, but there are a number of patented processes which have come to the front in the last few years which are already having a marked effect on the economic situation, and which may be expected to be of even greater importance when their advantages are more generally known.

First among these come the various "cracking" processes. "Cracking" consists essentially in the subjection of oils of high molecular weight to relatively high temperatures and pressures which cause their decomposition into hydrocarbons of lower molecular weight and lower boiling-points. This reaction has been known to refiners for many years, and use has been constantly made of it when it was desired to obtain a high yield of kerosene. Its application to the manufacture of petrol is more recent. Already the literature of the subject is voluminous, and the number of patented processes shows the practical interest in the subject. Many of these processes are beyond the experimental stage, and some have been turning out millions of gallons of petrol within the last two years.

Another process which deserves attention is that of Edeleanu, who substitutes the solvent action of liquid sulphur dioxide for the usual acid treatment. The separation of the unsaturated hydrocarbons is very complete, and they are obtained in a form which makes their conversion into useful by-products more readily possible than from the sulphuric acid sludge.

The cost of chemical treatment varies within extremely wide limits. It is high in those crudes which contain excessive unsaturated hydrocarbons and in making those products in which the market demands a pale colour. It is always a considerable and in some cases an avoidable expense. There seems no special reason, for instance, why lubricating oils should, except for some special purpose, be pale in colour, and the consumer would therefore seem to be paying for an operation which some authorities hold is not only unnecessary but perhaps detrimental to the product.

The standardisation and distribution of products still leaves much to be desired. We know more about the negative characteristics which are undesirable in commercial oil products than about those positive qualities upon which their usefulness depends. In lubrication, for instance, if we knew more about the physical and chemical properties of the higher hydrocarbons we might build up a lubricant for a specific purpose which might be more efficient and economical than any arbitrary mixture. Similarly with motor fuel, we might blend proportions of benzol, selected hydrocarbons with petroleum, and even alcohol to make the ideal fuel, and with a standard quality to reckon on the motor manufacturers would doubtless respond with more perfect carburation and cheaper running costs. As has been said already, the distribution of products to be economical must be in bulk. Containers always mean avoidable expense, and the price of the petrol has to be sufficient to recover the original cost of the container based upon its probable life. Throughout America the supply of motor spirit is invariably in bulk, and in some cases it is possible to go to an automatic machine, place the end of a flexible pipe which is attached to it in the tank of the car, and on dropping the prescribed coins in their appropriate slots obtain a supply of petrol which is visibly measured in a glass vessel. It is satisfactory to note that this method is now being introduced into this country.

As indicating the extreme range of economic production of petroleum, the following two facts may be quoted: The greatest producing well the world has ever known, the Potrero del Llano No. 4, of the Mexican Eagle Oil Co., was completed on December 26, 1910, at 1912 ft. It ran wild for 90 days, flowing during that period at the rate of 100,000 barrels per day. In the eight years of its life before it turned to salt water it was credited with a production of 100 million barrels.

By the perfection of multiple pumping it is possible to work at a profit certain wells in Pennsylvania yielding only half a barrel of crude oil per day.

NEWS FROM THE SECTIONS.

GLASGOW.

A meeting was held in the Royal Technical College, Glasgow, on February 24, with Mr. Quintin Moore in the chair. Mr. J. G. Roberts, of Messrs. Shanks and Co., Barrhead, read a paper on "The Manufacture of Porcelain."

After a brief sketch of the history and development of pottery and porcelain, the materials used and the process of manufacture were described. The composition and characteristics of the various types of porcelain were contrasted, and lantern slides of micro-sections of laboratory porcelain, lent by Dr. W. T. Gordon, of King's College, London, were exhibited. These slides showed marked differences in the extent and character of the sillimanite crystals, and the lecturer said that the problem of the laboratory porcelain maker consisted in obtaining the right amount of the right kind of crystallisation in the sillimanite.

At an informal meeting of the Section held in the City Business Club Room, Glasgow, on February 11, Mr. J. G. Roberts gave a demonstration of the casting of pottery ware in plaster of Paris moulds. A small bowl was made, and Mr. Roberts explained the method of manufacture, the principle involved, and the ways in which the mould and the "slip" poured into it could be adapted to the making of different articles. Both plastic and non-plastic material could be used for the "slip." The scope of the process was indicated by drawings of chemical ware of remarkable size manufactured by Messrs. Shanks

Mr. W. A. Walmsley, who came to Glasgow last year to take charge of the Chemical By-product Department of the Corporation Gas Works, gave a "Sketch of the Manufacture of Sulphuric Acid by the Chamber Process with particular reference to Spent Oxide." The author dealt with the sulphur-bearing raw materials used in the manufacture of sulphuric acid, the origin of the spent oxide, burners and the burner house, types of furnaces, methods of feeding, with a comparison of mechanical and hand-firing, damper arrangements and their use in stabilising the condition of the plant, Glover towers, and all the methods of control which lead to the efficient handling of the plant used in the manufacture of sulphuric acid.

NEWCASTLE.

"A Comparative Method of Determining the Heat of Carbonisation of Coal" was the subject of the paper read by Mr. G. Weyman at the meeting held on March 3, Prof. B. Phillips Bedson presiding.

Observations on the carbonisation of coal in continuous vertical retorts have shown that under the same conditions certain coals can be carbonised very much more rapidly than others, and that this variation may make a difference of 25 to 30 per cent. in the capacity of a carbonising plant. The coals which give a slow rate of carbonisation are those of the highly-coking bituminous type. The fact that this system affords an improved means of distinguishing coals is really a point in its favour, although it has been detrimental to its introduction.

The method of comparing the carbonising properties of coals devised by the author consists essentially in plunging a known weight of coal into a calorimeter at known temperature, the source of heat being a known weight of molten copper. The yield of gas is taken as the criterion of the amount of carbonisation which takes place. Results were given illustrating the effects of varying the amount of coal and copper taken, and the method was claimed to be consistent. Investigation of six different coals showed that the heat quantities required to effect carbonisation varied very considerably, and the results obtained were compared with the behaviour of the coals in practice. The difference in the carbonising properties of the different coals is considered to be due mainly to secondary decomposition of the tarry matter first formed, which is larger in amount and more dense in the case of the bituminous coals.

The second paper was by Capt. F. S. Sinnatt on "A New Characteristic for Coal—The Agglutinating Curve," which was recently read before the Manchester Section (this J., 1920, 71 R).

On March 6, the Section visited the works of The International Paint and Composition Co., Ltd., on the kind invitation of the directors; and on March 18 the President and General Secretary were entertained at dinner by the Committee of the Section.

MANCHESTER.

At the Grand Hotel, Manchester, on March 5, Mr. J. Allan presiding, a paper on "Some Causes of Ropiness in Bread" was read by Mr. James Grant.

The author gave an account of the troubles of the housewife who baked her own bread in the days when stone-milled flour was in use. Ropiness in the mid-Victorian period was of common occurrence and known as "string mould," owing to the appearance of the bread when broken and pulled asunder. German and French bacteriologists found that string mould was intimately associated with potato disease, which, in turn, was caused by the presence of *Bacillus mesentericus fuscus* in the soil. Some fifteen years ago the author investigated numerous cases of bread disease, and found that the *proteus* group of bacteria was sometimes the cause of the trouble. Dr. D. J. Lloyd, of Cambridge, has recently discovered that at least four groups of the *B. mesentericus* are concerned in ropiness. Lately the lecturer had an opportunity of studying the question from the aspect of the influence of the nature of crops on the development of ropiness in wheaten bread. The results showed clearly that wheat destined to be used for bread making should not be grown on land previously under potatoes (*cf.* this J., 1906, 350. 1917, 697).

In a paper on "The Neutral Hydrolysis of Guncotton, with a note on the Alkaline Hydrolysis of Guncotton," Prof. E. Knecht and Capt. B. R. Bostock described the effects of heating guncotton with water and with caustic soda. Heated with water under pressure, guncotton goes completely into solution at 190° C., the bulk of the nitrogen being given off as nitrous oxide, but ammonia and hydrocyanic acid are also formed. When guncotton is dissolved in warm caustic soda, 65 per cent. of the nitric acid is reduced to nitrous acid. This figure is about 17 per cent. lower than that found by Tor Carlson, but probably the discrepancy can be accounted for by the different experimental conditions.

EDINBURGH AND EAST OF SCOTLAND.

On March 9, Mr. C. Norman Kemp gave a paper on the production and uses of X-rays and some account of their recent applications to the examination of materials.

After a rapid historical survey, the lecturer described modern apparatus and recent improvements in methods and technique. The various commercial uses to which X-rays are being put were enumerated, and the examination of a great variety of materials, including metals, alloys, electric cables, castings, wooden aeroplane parts, reinforced concrete, were described in greater detail; also some applications to chemical analysis. The lecturer specially emphasised the fact that all materials, according to their density, are more or less transparent to X-rays, and illustrated this with an X-ray photograph of an oil painting which showed the main outlines of the subject as revealed by the varying densities of the pigments employed. In conclusion the methods employed in research and the lines of probable future development were indicated.

Mrs. Norman Kemp also gave a short paper on some points of chemical interest in connexion with the application of X-rays to medicine and surgery. Absorption and deposition of mineral matter as exemplified in bone in health and injury were noted. In the examination of the digestive system the relative values of bismuth and barium salts and other compounds relatively opaque to the rays were mentioned, and some account of the various salts used in injection media for radiographic purposes was given. The increasing use of X-rays in the examination of the teeth was also referred to.

At the annual meeting, held on the same occasion, the following new members of the local committee were elected:—Messrs. C. N. Kemp, Robert Bruce, J. F. Tocher, A. Tait, and W. T. H. Williamson, in place of Messrs. J. Hendrick, B. D. W. Luff, A. Middlemas, B. D. Porritt and J. Walker, who now retire. The report of the hon. secretary records the holding of seven meetings and the reading of eleven papers and notes. The average attendance was 40. Starting the session with 136 members, the Section has lost 2 and gained 25 members, bringing the total now to 159. Allusion is made to the recent visit of the President, and to the importance of recruiting new members.

CANADA.

Ottawa Branch.

"Chemical Patents" was the subject of a very interesting address given before the Ottawa Branch at its February meeting by Mr. A. E. MacRae, Examiner in the Chemical and Metallurgical Division of the Patent Office at Ottawa. Mr. MacRae traced the development of chemical patents, and showed that of the first eighteen patents granted in England twelve were for chemical products He described some of the features of the Canadian Patent Office, and emphasised the point that if better facilities were provided much more could be accomplished. In this connexion the speaker suggested that the fees collected by the Patent Office should not be regarded as a source of revenue for the country, but that they should be diverted to defray expenditures made for the improvement of the service. The patentee, said Mr. MacRae, should be regarded as a creator of national wealth.

In the ensuing discussion many interesting points were raised, chief among which was the question of whether patents should be granted for chemical products or only for the process by which any newly discovered chemical product is made, the majority of those present inclining to the latter view.

It was intimated at the meeting that Bill 76, which is intended to permit the manufacture and sale of alcohol for industrial purposes duty free, would be introduced again in the coming session of Parliament, and a committee, consisting of Dr. A. E. Macintyre and Messrs. E. A. Thomson and S. J. Cook, was appointed to take whatever steps might be desirable on the part of the Ottawa Branch towards facilitating the progress of this very important measure.

At a "lecture'" meeting held on February 5, a kinematograph film depicting the operations of a modern by-product coke plant, lent by the Koppers Co. of Pittsburgh, was exhibited. The interest of the film was much enhanced by a preliminary exposition of the plant by Mr. E. Stansfield, chief engineering chemist of the Fuel Testing Division of the Mines Branch. Following this exhibition Mr. F. J. Kennedy, of Montreal, gave an illustrated account of modern methods of town gas manufacture.

MEETINGS OF OTHER SOCIETIES.

THE PHYSICAL SOCIETY.

At the meeting held on March 12 last a paper was read by Mr. J. S. G. Thomas on "A directional hot-wire anemometer of high sensitivity, particularly suitable for the investigation of low rates of flow of gases."

The directional type of anemometer comprises two fine platinum wires of about 0·1 mm. diam. inserted transversely, in close juxtaposition, in the main in which the flow of gas occurs. The wires constitute two arms of a Wheatstone bridge in which a constant current of about 1 ampère is maintained. With passage of the stream of gas over the heated wires in one direction the "downstream" wire is subjected to less cooling action than the "upstream" wire, and the indicator is deflected in one direction. With reversal of the direction of flow of the gas current the *rôles* of "upstream" and "downstream" wires are interchanged with a reversal of the direction of deflection of the indicator. The device affords a clear indication of the direction of flow, and is designed more particularly for use in mains in which certain operations, such as the injection of oil, are carried out or suspended according to the direction of flow of gas in the main. The author finds that such directional anemometers are of extreme sensitiveness at low velocities—up to 5 cm. per sec. or so—possessing in this region of low velocities a sensitiveness about 9 times as great as the Morris type of hot-wire instrument (this J., 1918, 165 T). This is due to the fact that the "downstream" wire, when immersed in a stream of such low velocity, far from being cooled by the stream, is heated by the hot current of gas transported by the stream from the "upstream" wire. Moreover, the "upstream" wire experiences an increased cooling effect due to the free convection current set up by the second heated wire in its vicinity.

THE INSTITUTE OF METALS.

The Spring Meeting of the Institute of Metals was held in London on March 11 and 12. Eng. Vice-Admiral Sir George Goodwin presided, and in his presidential address reviewed the progress of the Navy with special reference to its metallurgical aspects, indicating the nature of the problems which have still to be solved. He described difficulties which have arisen in connexion with turbine blading, condenser tubes, propellers and many other applications of non-ferrous metals, and his address was an appeal for greater co-operation between engineers and metallurgists, and for the education of each in the fundamental principles of the science of the other.

Two papers on corrosion were presented at this meeting, the first being the Fifth Report of the Corrosion Committee of the Institute. This deals with the corrosion of condenser tubes (mainly 70:30 brass) and is a study of the practical problems of corrosion in condensers under service conditions, employing either fresh or sea-water. It is divided into four sections. The first deals with the "diagnosis of condenser tube corrosion"; the second deals with the structure of condenser tubes, with particular reference to the surface layer; in the third section, the five main types of condenser tube corrosion are considered separately in detail, while the fourth section contains an account of preliminary work on the electrolytic protection of condenser tubes. An interesting feature of the report is the study of the so-called "dezincification" of condenser tubes. It is shown that this is not really selective removal of the zinc by direct solution in the corroding medium, but that the brass is dissolved completely and the copper subsequently re-deposited.

A paper by Dr. R. Seligman and Mr. P. Williams, on the action of hard industrial waters on aluminium, described the different forms of corrosion to which this metal is liable, and differentiates between general superficial attack, or "etching," and localised deep attack, or "pitting." They conclude that pitting, which is the harmful form of attack, is facilitated by the action of hydrogen peroxide produced during corrosion, which is only retained in contact with the metal where mechanical imperfections exist. They also discuss methods for prevention of corrosion.

Mr. N. J. Maclean described methods of casting "high-tensile brass." The object was to obtain sand castings having a strength of 20 tons per sq. in., a result which was achieved by careful control of pouring temperature and zinc content, and by the use of a special hardener containing copper, nickel and iron. Messrs. H. Moore and S. Beckinsale described experiments to determine the temperature range within which the internal stresses in cold-worked 70:30 brass may be removed without serious reduction in the hardness. A paper by Dr. W. Rosenhain, Mr. J. L. Haughton and Miss K. Bingham described the constitution and mechanical properties of alloys of zinc containing from 0—10 per cent. copper and 0—15 per cent. aluminium. The constitution was described by the aid of a "ternary model." The rolling properties of these alloys were carefully studied and also the mechanical properties of the rolled metal. This latter presents a number of anomalies, in that, over a wide range of composition, the metal is very ductile if deformed slowly, but very brittle if deformed rapidly. After storing, or after annealing at 100° C. for some hours, the metal is brittle under all conditions. An explanation of these properties was given using the "amorphous metal hypothesis." An interesting paper by A. C. Vivian described a series of tin-phosphorus alloys; two compounds Sn_4P_3 and Sn_3P_4, and three eutectics were identified. Alloys containing more than 8 per cent. of phosphorus were unstable, when molten, at atmospheric pressure, and had to be made under pressure. The author gives a temperature-concentration diagram of the alloys, but in the absence of any consideration of the quantitative effect of pressure on the alloys this is of very doubtful value.

Three papers on copper were presented. Two of these, by Messrs. W. E. Alkins and by F. Johnson, dealt with the phenomenon, recently discovered, that at a certain stage in the cold-rolling or drawing of copper, a range occurs, at about 50 per cent. reduction in thickness, over which an increase in the amount of reduction is accompanied by a very small increase in hardness. This "critical point" has also now been detected by measurements of tensile strength, elongation, specific gravity, and lateral spread during rolling. No adequate explanation of the phenomenon has yet been given; Johnson suggests that "the crystal grains are forced by the rolling into a homotropic arrangement in which slip can occur more smoothly and readily under tensional forces over the critical range than at other stages of deformation."

Mr. J. L. Haughton read a paper on the study of thermal electro-motive force as an aid to the investigation of the constitution of alloy systems. This method of study is a useful adjunct to the methods of thermal and microscopic analysis, but the author's results suggest that considerable care is required in arriving at a correct interpretation of the results obtained. It is shown that the manner of the arrangement of the constituents of an alloy can have an influence on the thermal electro-motive force developed under any given conditions. For example, in the case of composite copper and nickel rods, the e.m.f. against iron is nearly 50 per cent. greater when the rod is built up of small discs of the two metals in series with one another, than when it takes the form of a bundle of parallel strips.

Other papers presented at the meeting were:— "Notes on the Effect of Hydrogen on Copper," by W. C. Hothersall and E. L. Rhead; "Idiomorphic Crystals of Electro-deposited Copper," by W. E. Hughes; "A Model for Representing the Constitution of Ternary Alloys," by W. Rosenhain; and "The Etching of Zinc," by H. H. Hayes.

NATIONAL UNION OF SCIENTIFIC WORKERS.

The half-yearly meeting of the Council was held at University College, London, on March 6. Mr. G. S. Baker, chairman, reported that the rapid growth of the Union had necessitated the appointment of a full-time secretary, and that Major A. G. Church had been appointed to fill that office. Since November last two branches had been formed and several were in process of formation. The report of the Research Committee outlined the function of this body and that of the Research Council shortly to be constituted; they will consider how industry and public administration can be kept in close touch with the development of scientific knowledge, and ensure that the views and conditions of employment of scientific workers shall receive consideration from all bodies bringing forward any schemes for research in science or for the administration of research.

In presenting the report of the committee on patent rights, Mr. A. A. Griffith emphasised the need for safeguarding the reputation of scientific workers in regard to rights of publication and authorship, "the only satisfactory way of remunerating salaried inventors is to pay them adequate salaries; a salaried inventor receiving an adequate salary should have no claim whatever to any extra payment because his work proves unexpectedly remunerative." The Council passed a resolution "protesting strongly against the differential treatment of men and women as regards the method of recruitment to the Civil Service and the salary scales offered therein as recommended by the Reorganisation Sub-committee of the Civil Service National Whitley Council."

THE CHEMICAL SOCIETY.

Four papers were presented at the meeting held on March 18. Dr. H. E. Fierz gave an account of recent work on the electrolytic reduction of nitronaphthalene sulphonic acids; the naphthylamine sulphonic acids of Erdmann, Laurent and Koch were produced electrolytically, but Cleve's acid was not obtained, the reduction ceasing at the hydroxylamine stage.

A paper on the use of 1:2 dichlorvinylethyl ether for the production of chloracetates and acid chlorides by Prof. H. Crompton and Miss P. L. Vanderstichele was presented by the latter. The reactions of this ether with alcohols, phenols and acids are of two kinds:—

$$CHCl\!:\!CCl(OEt)+ROH \begin{cases} \rightarrow CH_2Cl.CO_2R+EtCl & (1) \\ \rightarrow CH_2Cl.CO_2Et+RCl & (2) \end{cases}$$

Both of these changes occur with the alcohols, but (1) predominates in all cases, except that of methyl alcohol. The phenols examined reacted entirely in accordance with (1), and the organic acids almost entirely in accordance with (2). These reactions occur usually with readiness, sometimes even with violence, when the two substances are heated together, and in many cases are almost quantitative.

Mr. W. E. Garner followed with an account of an electronic theory of isomerism based on the hypotheses of Böhr and Ramsay that the valency electrons rotate around the lines joining the centres of the atoms in chemical combination, thereby developing a north-seeking pole on one atom and a south-seeking pole on the other. It follows therefore that in any compound there are equal numbers of north and south valencies. The author assumes that in organic compounds the carbon atom possesses two north and two south valencies, oxygen one north and one south, and the hydrogen atom may have either a north or a south valency; also that the carbon atoms are arranged in an alternating manner throughout the crystal, and that this arrangement persists in the liquid condition. These assumptions indicate a new type of isomerism due to the distribution of the north and south valencies about one arrangement of the atoms in space, and it is suggested that the isomerism shown by cinnamic, malic and glutaconic acids, and by α, β and γ sugars is of this type. On this theory an electromagnetic field forms the "atmosphere" of all molecules. It is thus conceivable that the phenomena of racemisation, Walden inversion, asymmetric synthesis and mutarotation are due to electronic changes rather than to a movement of the groups. An explanation was also given of the alternation in melting points of the homologous series.

The last paper was on the composition of salvarsan by Prof. F. L. Pyman and Mr. R. G. Fargher. The latter dealt in the first instance with the question of the nature and amount of combined solvent present in the commercial product, and showed that the retained solvent consists almost entirely of water, the percentage of methyl alcohol found varying from nil to 1·4. In connexion with the presence of sulphur in the British and German products, the amount of which was usually 1—2 per cent., the authors have found that at least a portion of it is present in acidic form, most probably as a sulphaminic acid, and evidence was given showing that a portion of the remainder was attached to arsenic. The last section of the paper dealt with the preparation of pure diamino-dihydroxy-arsenobenzene dihydrochloride, the most satisfactory process being the reduction of 3-amino-4-hydroxyphenylarsenic acid with phosphorous acid. It is interesting to record that a specimen of this pure material tested by the Medical Research Committee proved to be more than normally toxic.

NEWS AND NOTES

AUSTRALIA.

New South Wales Government Paper Plant.—The New South Wales Government intends to undertake almost immediately experiments in the manufacture of paper from local timbers. A committee, consisting of Mr. W. A. Gullick (Government Printer), Messrs. R. T. Baker and H. G. Smith (of the Sydney Technical College), and two other Government officers, is now arranging for the introduction of a plant into New South Wales. This action has been taken in consequence of the satisfactory reports received from Canada of laboratory tests on the suitability of selected Australian timbers.—(*Science and Industry, Dec.*, 1919.)

Australian Sandalwood Oil.—It has been found that a marked chemical difference exists between the oil derived from Western Australian sandalwood and that obtained from Indian sandalwood. Recent research shows that the oil from the West Australian tree does not contain santalol, but a nearly related chemical compound. Medical practitioners who have used the Australian oil consider that it is quite equal to the true sandalwood oil without possessing the deleterious effects of the latter. The Western Australian Committee of the Institute of Science and Industry has referred the matter to the Institute with a view to having complete tests made as to the chemical and therapeutic properties of the oil, in order that action might be taken to have the Australian product inserted in the British Pharmacopœia.—(*Science and Industry, Dec.*, 1919.)

The Castor Oil Plant in New South Wales.—An interesting account of experiments and experiences in the cultivation and testing of seeds of the castor oil plant was given by Messrs. E. Chiel and A. R. Penfold at a recent meeting in Sydney of the industrial section of the Royal Society. Two distinct forms of the plant are found naturalised in New South Wales, and, in addition, there are at least four varieties under cultivation. The oil from the seeds grown in New South Wales was found to average 50 per cent. by weight of the seeds, and the analytical figures showed it to be useful for all such purposes as lubrication, leather dressing, dyeing and medicine. In view of the importance of these facts and of the high price obtainable for the oil it was suggested that experiments should be conducted on a much larger scale.—(*Hardware and Machinery, Jan.*, 1920.)

Mineral Output of Tasmania in 1918.—The report of the Secretary Mines, Tasmania, gives the following figures for the mineral output in 1918, those for 1917 being placed in brackets:—Gold, 10,529 oz. (14,496), silver-lead ore, 7241 tons (9576); blister copper, 5559 tons (5845); copper ore, 444 tons (771); tin ore, 2256 tons (2637); wolfram, 155 tons (172); osmiridium, 1607 oz. (332); zinc, 3822 tons (48); scheelite, 216 tons (69); coal, 60,163 tons (63,412).—(*U.S. Com. Rep., Jan.* 26, 1920.)

New Copper-Bearing Areas of Northern Territory.—The Director of Mines has reported that extensive areas of copper formations occur about three miles south of the Queensland border and about sixty miles south of the shores of the Gulf of Carpentaria. Work carried out has shown that copper can be obtained 54 ft. from the surface, mining being easy as the rock is soft. Most of the copper occurs in irregular deposits. One area has already produced about 100 tons of 35 per cent. shipping ore, and probably 2000 tons of ore with 7—10 per cent. of copper. The economic exploitation of these deposits will depend on the erection of a treatment plant near the mines.—(*Bd. of Trade J., Mar.* 11, 1920.)

NEW ZEALAND.

Condensed, Evaporated and Powdered Milk.—Fair quantities of powdered and condensed milk are manufactured in New Zealand, *e.g.*, in 1917—18, 2950 long tons, and in 1918—19, 3225 long tons, of dried milk were produced. Several new milk factories are being erected, and one plant is expected to turn out 5000 lb. of dried milk daily. There is only one large factory in New Zealand manufacturing sweetened and unsweetened condensed milk; in 1918 its output was 6,205,400 lb. As New Zealand is an important dairy country, many more condensed milk factories will probably be erected to utilise the skimmed and surplus milk, and this industry will expand as soon as the price of machinery is reduced.—(*U.S. Com. Rep., Nov.* 26, 1919.)

BRITISH INDIA.

Chemical Industry in Bengal.—As a commercial centre Calcutta possesses many advantages. It lies in the very fertile country of Bengal which has an extensive system of natural waterways as well as some canals and a number of railways. Two of the railways connect Calcutta with the principal coalfield of India, which lies partly in Bengal and partly in the neighbouring province of Orissa. The great jute industry is concentrated around Calcutta and finds its outlet from that port, as also does the tea industry of Assam. Although there is a large class of well-educated and intelligent Bengalis, many of the industries before the war were on a small scale and mostly in the hands of British firms, the trade consisting almost entirely in the export of raw materials and the import of manufactured goods. This applied especially to the chemical industries, which were handicapped by the absence of sulphur ores, sulphuric acid being made from imported sulphur. The opening up of the zinc-lead mines in Burma will alter this, and soda is now being imported from East Africa by the Magadi Soda Co., which converts part of it into caustic soda at a factory near Calcutta.

The most important chemical works are those of Waldie and Co., but there are also many small factories, mainly for the manufacture of drugs, for which there is a very large demand. Some of these have been started recently by Indians. One of the most remarkable of the chemical enterprises is the Bengal Chemical and Pharmaceutical Works, Ltd., which was started some 19 years ago by Prof. (now Sir) P. C. Ray. Although the output was very small until recently, this firm showed great enterprise in taking up new branches of manufacture, such as making chemical balances and other accurate scientific instruments, and gas-making installations for laboratories. At present about a thousand workers are employed and some twenty chemists, all Indians and graduates of Calcutta University. A larger factory is being erected on the river-bank.

Although shares in existing companies are in many instances practically unsaleable, the flotation of new companies continues on a large scale. In October last, 92 companies were registered, with an aggregate authorised capital equivalent, at the current rate of exchange, to about £60,000,000. During this month there were floated two tanning companies, a paint works, a cement company, thirteen companies for cotton and jute mills, presses, etc., eight coal-mining undertakings, and two other mining companies.

Mineral Production in 1918.—Although there was an increase of £2,500,000, or 18 per cent., in the value of the total mineral production over that for 1917, these figures must necessarily be viewed in the light of the higher costs of production, otherwise it is not possible to obtain a true indication of the state of the industry. The number of mineral concessions granted during the year amounted to 719, as against 574 in the preceding year, and most of this increase was due to prospecting activity in Lower Burma.

The output of chromite increased by more than 100 per cent.; this was partly owing to increased production in Baluchistan, but chiefly to the rapid development of a new mine in Mysore. Baluchistan produced 22,944 tons, Behar and Orissa 1,085 tons, and Mysore 33,740 tons. In 1917 Mysore produced only 8,316 tons.

There was an increase in the coal production of over 2½ million tons. With the exception of Assam and Hyderabad, all the Indian provinces shared in this increase. The pit mouth value increased everywhere except in the North-West Frontier Province. Exports of coal fell to 74,335 tons, compared with 407,078 tons in 1917, while imports increased from 43,788 tons in 1917 to 53,202 tons. These figures do not include coke and patent fuel, of which the quantities dealt with were small.

The output of copper ore in Singhbhum fell from 20,108 tons in 1917 to only 3,619 tons. Smelting operations were begun at the Rakha Mines, where 13·16 tons of blister copper was produced.

There was a decrease of 38,175 oz. in the output of gold. All provinces shared in the decrease, which was greatest in the Mysore fields. The total output was 536,118·32 oz.

The output of iron ore rose considerably. The Tata Iron and Steel Co. produced 198,064 tons of pig-iron and 130,043 tons of steel, including rails, while the Bengal Iron and Steel Co. produced 49,348 tons of pig-iron, 12,114 tons of ferro-manganese, and 21,776 tons of cast-iron castings. In the Central Provinces the number of furnaces in operation declined from 312 to 232.

Although there was a decrease in the amount of ore and slag produced at the Bawdwin Mines, the amount of metal extracted was greater than in the previous year 1917, the total output being 19,074 tons, as against 16,962 tons. The quantity of silver extracted rose from 1,580,557 to 1,970,614 oz.

The output of manganese ore fell from about 591,000 tons to 518,000 tons. As usual, 80 per cent. of the production came from the Central Provinces. About 315,000 tons was exported, and considerable stocks were held in the country at the end of the year.

There was an increase of about 4 million gallons in the output of petroleum, the total production being 286,585,011 galls. The chief increases were in Burma; over 26 million galls. from the Yenangyaung field, 1¾ million from Minbu, and 2½ million from the Badarpur field in Assam. For the first time the Chindwin field showed an output, amounting to nearly 500,000 galls. The output from the Singh field fell by about 24½ million galls. Imports of kerosene oil decreased by over 30 per cent., and amounted to only 21,768,176 galls.; and exports of paraffin wax rose from 438,888 cwt. to 508,964 cwt.

In addition to the output of silver at Bawdwin, a small quantity (1,169 oz.) was produced from the Anantapur gold mine in Madras. The total Indian production of silver was 1,971,783 oz.

There was a small increase in the output of tin ore, which rose from 13,321 cwt. in 1917 to 15,607 cwt. in 1918. The whole of the ore came from Lower Burma, and nearly half of it from the Southern Shan States. Mergui produced 2,000 cwt. of block tin. The imports of tin fell from 28,180 cwt. in 1917 to 24,596 cwt. in 1918. Practically the whole of the tin imported came from the Straits Settlements.

There was a slight decrease in the output of wolfram, which fell from 4,542 tons to 4,431 tons; as usual, most of this ore came from Tavoy.—(*Geol. Surv. India. Vol.* 50. *Pt.* 3.)

CANADA.

Quebec Asbestos Fields.—The province of Quebec is the world's chief source of asbestos, as it provides 85 per cent. of the total output. The workable deposits extend over a length of 23 miles, with a width varying from 100 to 6,000 ft. The production in 1917 (see J., 1919, 25 R) was 153,781 tons, valued at £1,446,815.—(*Official.*)

Zinc Output.—It has been stated that the zinc output of Canada could be increased to supply one-tenth of the world's demands, estimated at over one million tons a year (see J., 1919, 164 R). A 10,000-ton concentrator is being erected at Kimberley, British Columbia, to handle the production from the Sullivan mine; this unit will probably be extended to give an output of 20,000 tons a day, and, when finished, will be the largest zinc concentrating plant on the continent.—(*Official.*)

The Coal Industry in Alberta.—The Hon. Charles Stewart, Premier of Alberta, in an address to the members of the Calgary Board of Trade, announced the immediate formation of a commission to develop and protect the coal-mining industry of Alberta. This commission will strive to form a real understanding between miners and operators, increase markets and develop the industry in general. It will be representative of the Government, miners, and operators, and will have sufficient authority to making its rulings effective.—(*Canad. Mining J., Jan.* 23, 1920.)

FRANCE.

Alcohol Production.—The following comparison of production, imports and exports, of alcohol in France for the years 1919 and 1918, is published by the Finance Minister:—

	1919.	1918.
Total production (hectolitres)	821,216	831,758
Imports (,,)	693,493	677,136
Exports (,,)	198,234	102,598

—(*Journal Officiel, Jan.* 24, 1920.)

JAPAN.

The Glass-Making Industry.—During 1918, 240 new glass factories, employing 3,236 hands, were started in Japan. The Japanese output of glass has increased from a value of about 7 million yen (yen =2s. 0½d.) in 1914 to 27,360,000 yen in 1917, and 41,924,000 yen in 1918.—(*Oil, Paint and Drug Rep., Feb.* 9, 1920.)

The Caffeine Combine.—The caffeine manufacturers of Japan have combined to form a company known as the Nippon Caffeine Co., Ltd., with a capital of 1 million yen, the intention being to obtain a monopoly of caffeine in the world market by taking advantage of the position of Japan in the tea trade. The yearly output is now under 50,000 lb., but it is expected soon to exceed that figure.—(*Oil, Paint and Drug Rep., Jan.* 12, 1920.)

SOUTH AFRICA.

Mining in Swaziland.—The output of cassiterite tin in 1918–19 was 480 tons, valued at £76,870, as compared with 511 tons, valued at £60,211 in 1917–18. As in the previous year, there was no output of gold.—(*Col. Rep. Ann., No.* 1020, *Feb.* 1920.)

Discovery of Hæmatite.—A hæmatite deposit of great promise has been discovered in the Rustenburg district. The ore contains roughly 90 per cent. of hæmatite, only about 2 per cent. of silica, and a small percentage of phosphorus, low enough for the ore to be classed as a Bessemer ore. It is at present impossible to estimate what quantities of ore may be present, but one outcrop shows bands of hæmatite with a collective thickness of 42 ft., which persist for over two miles.—(*S. African J. Ind., Dec.*, 1919.)

UNITED STATES.

American Chemical Society.—The Spring Meeting will be held at St. Louis from April 12 to 17 inclusive. Among the subjects to be discussed are the confiscation of German-owned American patents, the American patent laws, the development of the Chemical Warfare Service, and the dye industry. The proposal to put an embargo on certain foreign dyes has been held up in Congress on account of the prior claims to consideration of the Peace Treaty.

Research on Oil Shales.—The sum of $10,000 is to be spent in investigating the oil shales in the State of Colorado. The work will be undertaken by the Bureau of Mines in the laboratories of the University of Colorado, and will be directed towards developing commercial processes for retorting the shale and refining the crude oil obtained. The results will be published.

Syrup from Home-grown Sugar-Beets.—From time to time directions have been issued for the preparation of table syrups at home from garden-grown sugar-beets, but results have usually been unsatisfactory. The compound that is responsible for the objectionable flavour has not yet been identified, but the latest experiments indicate that if all green portions are removed from that part of the beet usually above the ground a very satisfactory syrup can be produced, and that the flavour and colour are improved if fully-ripened beets are used. It has been suggested to use the syrup as a diluent for maple and other strongly-flavoured syrups.

Mineral Output of Alaska in 1919.—The value of the mineral output of Alaska for 1919 was less than half that of 1916, largely owing to the fall in the price of copper. Eight copper mines were worked in 1919, producing some 44,800,000 lb., as against 69,225,000 lb. in 1918. The gold output has declined from a value of $16,700,000 in 1916 to $9,000,000 in 1919. As by-products to gold and silver mining, 590,000 oz. of silver and 800 tons of lead were mined during the year.—(*Bd. of Trade J., Feb.* 26, 1920.)

Zinc and Copper Production in 1919.—Some 450,000 tons of zinc were produced in the United States in 1919, as compared with 517,927 tons in 1918. In November, 1919, 100,800 out of a total of 158,000 retorts were in operation, against 82,000 out of 159,000 available on June 30, 1919. In the same year about 275 million lb. of copper was exported, representing 15 per cent. of the production, against a normal figure of 65 per cent. Forty per cent. of this amount went to Japan, which had previously never taken more than 2¼ per cent., while 14 per cent. went to Britain, Germany, Holland, Sweden and Denmark.—(*Board of Trade J., Mar.* 4, 1920.)

The Dye Imports Bill.—The new section which has been introduced into the Bill regulating the imports of dyestuffs into the United States provides that no article on the dutiable list shall be imported unless the Tariff Commission shall determine that such article, or an efficient substitute, is not obtainable in the United States on reasonable terms as to quality, price, and delivery, and that the article is required for use by an actual consumer in the country. The final working of the Bill is still uncertain, as changes are suggested. It is proposed to frame the Bill in such a way as to protect the home producer and to prevent any consumer from obtaining supplies for more than six months, and to hinder the accumulation of more than six months' supply for the country as a whole.—(*Chem. and Met. Eng., Feb.* 11, 1920.)

Petroleum Investigations and Helium Production.—Bulletin 178 C., an advance chapter from Bulletin 178, War Work of the Bureau of Mines, Washington, details the activities of the American authorities in connexion with supplies of petroleum and helium during the latter period of the war. An investigation of the suitability of fuels for fighting aeroplanes led to the conclusion that the best was that composed of 70 per cent. cyclohexane and 30 per cent. benzol (so-called "hecter"), which when used in a high-compression motor, gave an aeroplane an additional thousand feet of "ceiling."

The oilfields of the United States were carefully surveyed and monthly statistics of the refining industry compiled. An investigation was undertaken as to the possibility of increasing the production of oil in California by promiscuous drilling and by drilling at selected stations. A plant for the distillation of oil shales is being erected at Elko, Nevada. The output of oil from the Cushingfield, Oklahoma, was considerably increased by excluding water from the wells by cement. Investigation showed that practically all American distillates and some residuum fuel oils conform to the viscosity specification of the British Admiralty. Various preparations, alleged to increase the efficiency of gasoline were found to be worthless. The Swan process for recovery of waste crank-case oils was favourably reported upon and was adopted by the French Gocernment. Oils from the Humble field, Texas, were found to be suitable for the manufacture of gasolene by cracking processes. The Bureau, amongst its numerous activities, investigated petroleum facilities in France, examined the efficiency of recovery of gasolene from natural gas, supplied information concerning economy in the use of oil fuels, took a census of oil-well casing, was responsible for the inspection of overseas shipments of gasoline, drew up a valuation of oil properties in the Naval Petroleum Reserves, and assisted in prospecting for oil in the British Isles.

The large-scale production of helium is one of the outstanding scientific achievements of the war period. Mixtures of hydrogen and helium in certain proportions, as well as helium alone, can be used with perfect safety in lighter-than-air craft. Towards the end of 1917 it was decided to erect experimental plants, working the systems of Linde, Claude, Norton, and Lacy for the production of helium from natural gas. The Lacy system was dropped later. In the Norton process three expansion engines are used, liquid is throttled, and heat interchanger and fractionating still are of new design. It represents the latest practicable development in liquefying and separating gases. The cost of "Argon" Plant No. 3, operating the Norton process, which was completed October 1, 1918, was $148,398. The estimated production of helium was 30,000 cub. ft. per day. Plant No. 1

(Linde) cost \$245,000, and Plant No. 2 (Air Reduction) \$135,000. Their respective capacities were 5000 and 3000 cub. ft. per day. Altogether 200,000 cub. ft. of helium of 92.5 per cent. purity was produced by Plants 1 and 2. It is anticipated that helium of the highest purity will be produced by Plant No. 3 on a large scale very shortly. Plant 1 is now dismantled. Further experimental work is to be carried out on Plant No. 3, a fund of \$100,000 having been made available for the purpose. Helium, which in pre-war days cost about \$2,000 per cub. ft. to produce, can now be produced on the large scale at an approximate cost of \$0·7 per cub. ft.

GENERAL.

Research and the Non-Ferrous Metals Industry.—A research association for the non-ferrous metal industry has been formed which will be registered as a limited liability company, working without profit, and with a nominal guarantee from members in place of shares. It is incorporated as "The British Non-Ferrous Metals Research Association," and its province includes all the non-ferrous metal industries throughout the country.

All British firms who are engaged in any branch of the non-ferrous metals industry, whether producers, manufacturers, or users, are invited to join the Association, and thus to become eligible for benefits resulting from its scientific investigations. Non-British firms will be excluded from membership. The members of the Association will pay an annual subscription based upon the capital employed in the business, except where a firm's capital is partly employed in other than non-ferrous metal work, in which case the firm's subscription will be specially assessed. The minimum annual subscription is £25 and the maximum annual subscription £200 (for the first year).

It is intended at an early date to obtain suitable quarters in Birmingham for housing an information bureau, and later to establish branches in various other centres. In the near future a programme of research will be drawn up, primary attention being given to the more urgent needs of the industry. At the outset, the Association will not set up its own laboratories, but will utilise existing institutions, such as the National Physical Laboratory and the Universities. If the work of the Association is to be efficiently carried out, and is to be of practical value to the industry, it must be well financed and fully equipped. General support is necessary if the full measure of Government aid is to be obtained, and it is hoped that all firms in the non-ferrous metal industry will become members. The Council of the Association is well representative of the non-ferrous metal industry. The chairman is Mr. Thomas Bolton, of Messrs. Thomas Bolton and Co.; vice-chairman, Mr. Fredk. Tomlinson (The Broughton Copper Co.); and the secretary, Mr. Ernest A. Smith, with temporary offices at 30, Paradise Street, Birmingham.

Chemical Engineering.—Speaking at University College, London, on March 12, on the occasion of the formal inspection of the new laboratories by Prince Arthur of Connaught, Lord Moulton compared the relationship between the chemist and the chemical engineer with that of the mathematician to the mechanical engineer. The passage from the world of idealities to the world of practice was a difficult one involving the exercise of peculiar knowledge, experience and talents. Successful change of scale was the secret of chemical engineering. It was very difficult to roast a whole ox satisfactorily, but easy enough to cook a single joint. The war had given a stimulus to chemical engineering in this country where it had been previously neglected; it was not knowledge of chemistry that we lacked, but practical experience of its application. Lord Moulton also emphasised the necessity of familiarising students at College with large scale chemical operations, and in this connexion referred to the grant of £25,000 by the Ramsay Memorial Committee for the erection of chemical engineering laboratories at University College. Prof. F. G. Donnan, who also spoke, stated that in addition to the sum mentioned another £50,000 was required for the completion of the building and its equipment.

The Dye Industry.—In the issue of *The Glasgow Herald* for February 28, Prof. H. E. Armstrong deplores the lack of progress in dye manufacture since the conclusion of hostilities, which he ascribes mainly to the impossibility of obtaining plant owing to dissensions in the engineering trades. Hence the demands of the textile trades are likely to remain unsatisfied for some time to come. Statements to the effect that the bulk of the supplies—some 80 per cent.—is being produced at home are misleading; even including the dyes imported from Switzerland made from home intermediates, probably not one-half of the demand has been met in point of quantity, and only a small percentage in point of colour, shade and fastness. The failure of the Government to introduce protection, the Sankey judgment, and the complete breakdown of the Board of Trade's scheme to regulate imports have led to a state of chaos. Meanwhile, America is advancing. It is obvious that some form of protection is necessary, but manufacturers must not be granted any "soft options"; the views of users and producers, still more those of agents, will always be difficult to reconcile. The industry can never prosper under present management, and the past impotency of the users in face of the producers is lamentable. Equally deplorable is the lack of any organisation either in the dyestuff or the fine chemical branches, in both of which—the latter especially—aloofness rather than co-operation is the order of the day. The future of the industry lies in the provision of the right type of men as leaders —such men as we have had in the heavy chemical trade, but never in the organic, where the Germans have beaten us out and out. The recent withdrawal of the professoriate from academic to industrial service must entail most serious consequences, for the manufacture of organic chemists is of far greater importance than that of dyestuffs. It is regrettable that so much of the work now being done merely involves the interpretation of German patents and not original investigation. Instead of spending time in copying, we should be seeking to move forward. This is not being done sufficiently, and the prospects of the industry are therefore gloomy.

German Remarks on the Claude Synthetic Ammonia Process.—Editorial remarks on the Claude process (this J., 1920, 40 R) in "Die Chemische Industrie" for March 3, point out that the successful experiments recorded were obviously only laboratory tests. The extraordinary difficulties attending the synthesis of ammonia at 150 to 200 atmospheres pressure, particularly in regard to the question of plant, were only overcome in Germany after long years of work, and it would appear at least doubtful if the utilisation of 1,000 atmospheres' pressure, which must increase the difficulties to an enormous extent and also introduce new complications, will be carried through on a technical scale. The use of very high pressures is covered by the patents taken out by Haber and the Badische Company, and the advantages of using small reaction vessels were well known to them.

Discovery of Silver Ore in Spain.—New and valuable silver ore deposits have been discovered in the province of Almeria, of which the most important is that found in Sierra Alhamilla (32 km. from Almeria). The argentiferous mineral is antimony sulphide, and it occurs at a depth of 65 m. The silver content runs 108 kg. to the ton, and the deposit covers over 2 sq. km.—(*Z. angew. Chem., Jan.* 30, 1920.)

The Manganese Industry of Georgia.—The Georgian manganese deposits are situated in the Caucasus, near Tchiaturi, in the valley of the River Kvirila, where they cover an area of some 400 square miles. About 200 million tons is said to be available for exploitation. The total output from 1904 to 1913 was 5,363.706 tons of ore, compared with 954,645 tons in 1913. In 1906 the number of mines worked was 443. The ore, which is remarkably free from undesirable constituents, contains from 49·31—51·50 per cent. of metallic manganese, from 6·80—10·55 per cent. of moisture and from 8·29—10·42 per cent. of silica.—(*Russo-Brit. Chamb. Com. J., Feb.*, 1920.)

Finnish Industries.—During 1918 Finland exported 29,415 and 23.990 short tons of wet and dry pulp, the total value of paper pulp and paper exported being £2,436,777, a decrease of over £7,000,000 compared with 1916. Wood alcohol, turpentine, rosin and ammonium sulphate are recovered as by-products from the chemical-pulp mills. Large stocks of timber and pulp are now in hand, and the industry has a promising future. Copper pyrites, iron pyrites, magnetite, galena, and molybdenite ores occur in Finland. The iron ore mined (see J., 1919, 27 R) is not of the best quality, but about 350,000 tons of pig-iron was produced in 1915. Large deposits of iron ore are said to occur in Lapland. At Outokumpu there are copper deposits containing about 6 to 8 million tons of ore in sight, with 4 per cent. of copper and 27 per cent. of sulphur. In spite of the necessity to import all its raw materials, the Finnish glass industry has developed rapidly; the value of the output in 1912 and 1913 was about £200,000.—(*U.S. Com. Rep. Suppl., Dec.* 20, 1919.)

Petroleum Production in Mexico.—In 1918 the Mexican output of petroleum was 63,828,836 barrels ;the output for 1919 was estimated at 80 million barrels, an increase of 20 per cent. This output is said to be only 10 per cent. of the potential production, 1,800,000 barrels per day. In the petroleum district tanks are available with a storage capacity of 48 million barrels. The total capacity of the existing petroleum refining plants in Mexico is 90,000 barrels daily. (*U.S. Com. Rep., Jan.* 21, 1920.)

The Sugar Industry in Paraguay.—The growth of sugar cane in Paraguay is confined to the neighbourhood of sugar refineries in northern and eastern Cordillera and a part of the Chaco. About 7,750 hectares was planted up in 1919; the production in 1918 was 387,500,000 kilo., and in 1919 about 400,000,000 kilo. In 1918 there were produced 561,820 kilo. of refined sugar, 180,121 litres of rum, 51,500 litres of industrial alcohol, and 325,900 litres of rectified alcohol. Imports of sugar during 1918 were 2,300,458 kilo., and exports 360 kilo.—(*U.S. Com. Rep., Nov.* 15, 1919.)

Brazilian Iron Ore.—It is estimated that there are some 2,000,000,000 tons of hæmatite in the State of Minas Geraes, in the district between Itabira do Campo and Serro. This ore assays 69·2 per cent. of iron, 0·018 per cent. of sulphur, and 0·009 per cent. of phosphorus. There are also enormous quantities of "jacutinga" ore, which contains 52 per cent. of iron with a very small proportion of phosphorus and sulphur. As the Brazilian ore necessitates the use of a high-grade coke for smelting purposes, which would have to be imported, it is considered expedient to export the ore to Europe.

The Itabira Iron Ore Co., an important English company, which has in the famous Pico de Cane alone a minimum of 18,000,000 tons of hæmatite of the very best quality, proposes to extend its railway to Itabira, and to establish a fleet of steamers, with automatic discharge, designed especially for the ocean transportation of ore. Such steamers could return from England loaded with coal at low rates. (*U.S. Com. Rep., Jan.* 23, 1920.)

Coconuts in Tropical America.—The coconut palm which grows wild in many tropical countries is utilised in many ways by the natives. The meat of the nut is eaten raw or cooked, and the liquid is a refreshing drink; the sap of the flower buds is drunk, and is highly intoxicating when fermented; the nut husk is used for fuel, and its fibres make rope, matting and brushes; the shell is also used for fuel and for household utensils; whilst the leaves and wood of the palm furnish mats, thatching and timber.

Whole nuts, dried meat or copra, and oil are exported to Europe and the United States. The oil serves for making soap, candles and butter substitutes; and the remaining copra-cake for cattle and chicken food, and as a fertiliser.

The Far East provides the bulk of coconut products, but cultivation also takes place in the following regions of Tropical America: Trinidad, Tobago, Jamaica, Porto Rico, Dominican Republic, Haiti, Panama, Costa Rica, Nicaragua, Honduras, Guatemala, British Honduras, and in the following South America countries: Brazil, Colombia, British Guiana, and Venezuela. There has, however, been little scientific cultivation in most of these regions; for, although ultimately very profitable, coconut cultivation involves large capital outlay and a long wait for returns. The British Government has encouraged cultivation in Trinidad, Tobago, and Jamaica, where the industry has become important, and there are plantations belonging to United States' companies in Central America and the West Indies. Trinidad has 27,000 acres planted with coconuts; two-thirds of the trees is bearing, and 17,355,712 nuts was exported in 1917. In the same year Jamaica, with 35,000 acres under cultivation, exported 27,000,000 nuts. Coconut production in Panama is becoming important, and the nuts are among the finest in the world.

Cohune nuts are exported from Honduras and British Honduras. These are similar to, but smaller than, coconuts, and yield an edible oil of good quality. The best cohune district in British Honduras is 75 to 100 miles from the sea. The annual production is at the rate of 25 tons per 1000 acres, or 50,000 tons per annum; but only about a quarter can be used commercially owing to inaccessibility, and transport and labour difficulties. Cohune nuts grow wild in the swamps of the Nicaraguan coast, and to an altitude of 1500 ft. on the south shore of Guatemala; but this product is little exploited in these regions. Cohune nuts are very common on the Pacific coast of Costa Rica.

In Brazil there is no scientific development of coconut growing, although the nuts compare well in size with those of other countries. Modern methods of cultivation would create a profitable industry. There are a few coconut groves in Colombia; but coconuts are the chief source of wealth of the islands of San Andres and Providencia. British Guiana is climatically suited for raising coconuts, and increased attention is being given to the industry. Coconuts are produced on the Venezuelan coast and the towns of Guanta and Cumana have oil and soap industries. The natives of Margarita Island make coconut oil and butter, and fatten pigs and stock on the residue "poonac." Mexico exports very few coconuts at present, the wild groves on the Atlantic and Pacific coasts having been injured by soldiers and bandits; whilst the disturbed condition of the country has prevented cultivation. There are also groves of "coquitos" (little coconuts), which are gathered in the winter and used in local soap factories. Coquito nuts are abundant in Vera Cruz, but revolutionary conditions interfere with their collection.—(*U.S. Com. Rep., Nov.* 18, 1919.)

The Chinese Indigo Crop.—The new indigo crop is expected to be a record one, as reports from the Hohan and Tungsuhsien districts are very optimistic. A group of merchants has recently formed a syndicate for the erection of a dye factory, and as the Department for Agriculture and Commerce has undertaken to lend active assistance for a term of three years it is hoped that the industry will revive.—(*Kelly's Month. Tr. Rev., Feb.* 1920.)

Sugar Supplies in Holland.—The total quantity of beet sugar produced in October and November amounts to 179,654 tons, as compared with 101,711 tons for the same period in 1918 and 148,055 tons in 1917. The estimated production for 1919 is 190—195,000 tons, equal to 175,000 tons of refined sugar, while the consumption for 1919 is estimated at 179,000 tons.

Sugar imports in 1919 amounted to 33,349 tons of raw cane from January 1 to September 30. Exports during the same period amounted to 14,000 tons of refined cane, 2,831 raw beet, and 2,345 tons of raw cane.—(*Bd. of Trade J., Jan.* 20, 1920.)

The Oil-seed Industry in Egypt.—The chief oleaginous product of Egypt and the Anglo-Egyptian Sudan is cotton seed. The exportation of peanuts and sesame is limited to adjacent territory and is not important. The preparation and grading of these products is not carried on in Egypt; they are either dealt with in sacks or, in the case of cotton seed, shipped in bulk. Ginners in the country maintain their own warehouses. The only crushing of commercial importance is limited to cotton seed, and this is maintained solely for the purpose of supplying local needs. Only a small proportion of the oil produced is exported and, normally, none of the cake is consumed locally. In 1913 some 11,150 metric tons of oil and 63,000 tons of cake were produced. The Egyptian oil mills are equipped with modern machinery and produce an oil of good quality.—(*U.S. Com. Rep., Jan.* 3, 1920.)

PERSONALIA.

Sir Robert Horne has succeeded Sir Auckland Geddes as President of the Board of Trade.

Mr. J. H. West has been appointed lecturer in chemical engineering at the Imperial College of Science and Technology.

Dr. M. Mayer, of the Auer Co. in Berlin, has been appointed to the chair of chemistry in the Karlsruhe Technical High School.

It is announced that Prof. v. Röntgen, now 75 years of age, will definitely retire from the directorship of the Physical Institute in Munich at the end of the current term.

Dr. Edgar F. Smith, who has made notable contributions to electrolytic analysis and the analysis of minerals, has tendered his resignation as provost of the University of Pennsylvania.

Mr. C. T. Heycock has been appointed president of Section B (Chemistry) of the British Association for the Advancement of Science. The Association will meet this year at Cardiff, from August 24 to 28.

Dr. D. S. Pratt, formerly assistant-director of the Mellon Institute in the University of Pittsburgh, died on January 28. His chief work was on phthalic acid derivatives, and he was a recognised authority on the chemistry of tropical products.

The death occurred on February 27 last of Dr. C. A. von Martius, in his eighty-third year. The deceased was one of the founders of the German coal-tar dye industry and a director of the Aktien-Gesellschaft für Anilin-Fabrikation in Berlin.

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

British Dyes.

On a supplementary vote in Committee of Supply, Mr. Bridgeman replied to various questions and criticisms relating to the formation of British Dyestuffs Corporation, Ltd. He denied that this company had any monopoly, and stated that other firms were receiving State assistance on equally fair terms. When Levinstein, Ltd., was taken over by the Corporation the purchase price was settled by an independent accountant. The dye-making industry had to be supported on account of its vital importance in time of war.—(Mar. 8.)

Incandescent Gas Mantles.

In reply to Lieut.-Colonel Sir J. Griffiths, Mr. Bridgeman said that prior to the Sankey judgment the importation of incandescent gas mantles was prohibited. From then up to the end of February the value of imported gas mantles was approximately £26,000, those coming directly from Germany being valued at about £5,000. The value of gas mantles imported into this country from Germany in 1913 was about £250,000.—(Mar. 15.)

Sugar Imports.

Answering Captain Sir B. Stanier, Mr. Bridgeman gave the total quantity of sugar imported into the United Kingdom during 1919 as 31,949,000 cwt., valued at £53,962,000.—(Mar. 24.)

German Potash Supplies.

In reply to Sir R. Cooper, Mr. Bridgeman said that the gross turnover of the contract for potash supplies entered into between the Government and Germany, on which the British Potash Co., Ltd., is entitled to 1 per cent. profit, is about £980,000. No further profits have been received by the company, whose contract, owing to strikes at Rotterdam and Hamburg, has been rendered less remunerative. The average cost per ton, including bagging, of German potash salts c.i.f. at the chief port in the United Kingdom has been: Muriate (80%), £19 13s. 1d.; muriate (90—95%), £21 8s. 8d.; sulphate (90%), £22 3s. 11d.; manure salts (30%), £11 13s. 1d. The muriate is calculated on an 80 per cent. basis.—(Mar. 24.)

German Dyestuff Supplies.

Replying to a series of questions put by Mr. Raffan, Mr. Bridgeman said that the method of distributing the German "reparation" dyestuffs was adopted on the advice of the Colour Users' Association. It was decided that the dyestuffs were to be allocated at fixed prices according to proportionate requirements rather than sold by auction, so that the smaller consumers should receive a share, and that allocations should be made to consumers only. The proceeds from the sale are credited to the Reparation Fund under the Peace Treaty, and it was not desirable that the prices charged in this country should be higher than those charged in other countries. The Colour Users' Association prepared a statement as to the requirements of its members, without reference to the possible supplies from Germany. Public notice was given to enable consumers not members of the Association to state their requirements. No preferential treatment in respect of notification of the German dyes available or their allocation was given to the Bradford Dyers' Association or the Calico Printers' Association. The question of the desirability of modifying the arrangements in respect of future consignments was under consideration.—(Mar. 24.)

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for March* 11 *and* 18.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of firm or agent.	MATERIALS.	Reference number.
British West Indies	Glassware	328
"	Glass, earthenware, paper ..	359
Canada	Soap, perfumes, medicines ..	318
"	Soap, druggists' sundries	320
"	Hides, leather	322
"	Chemicals, soap, glass, etc. ..	†
"	Optical glass	†
"	Coconut and blown rapeseed oils	‡
"	Tallow for soap making	‡
"	Artificial silk from viscose ..	‡
Egypt	Oils, paints (tender for)	**
Belgium	Dyes, photographic requisites ..	333
"	Edible oils	334
"	Chemicals, colours, varnishes ..	335
France	Tinplate	337
"	Linseed oil, waxes, borax, alum, soda, lithopone	363
"	Chemicals, pharmaceutical products	365
Iceland	Paints, varnishes, wax cloth ..	367, 368
Italy	Chemicals, minerals, metals ..	338
"	Hides, skins, leather, china clay..	369
"	Drugs	370
Norway	Linseed oil	377
Rumania	Chemicals, metals, hides, skins, leather	339
Spain (Canary Isles)	Condensed milk, oils	340
Morocco	Iron rods for ferro-concrete work	344
"	Cement, earthenware, corrugated iron sheets, iron rods, brass, copper, tinplate, sugar, mineral oils	346
Syria	Dyes, glass, porcelain	349
Persia	Drugs	380
Japan	Asphalt, pitch, glass, paint, etc...	379a
Dominican Republic	Glass, crockery, galvanised corrugated sheets	383
Mexico	Glass, earthenware	384
Argentina, Uruguay Paraguay	Heavy chemicals, metals, candles, washing soap, laundry blue ..	381a
Peru, Ecuador, Bolivia	China, earthenware, chemicals, linseed oil, caustic soda.. ..	385

* The High Commissioner for Australia, Australia House, Strand, London, W.C. 2.
† The High Commissioner for Canada, 19, Victoria Street, S.W. 1.
‡ The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.
** Sir A. L. Webb, K.C.M.G., Queen Anne's Chambers, Broadway Westminster, S.W. 1.

TARIFF. CUSTOMS. EXCISE.

Australia.—Trade is now permitted with Czecho-Slovakia and other parts of the former Austro-Hungarian Empire (except Hungary).

Brazil.—The export of sugar is prohibited.

Canada.—The prohibition of the import of intoxicating liquors has been removed as from January 1.

Denmark.—The importation of certain kinds of sugar is permitted only under licence.

The export of all alkalis, including ammonia, potash and soda, and all salts thereof, potash fertilisers, chloride of lime, and saltpetre is prohibited as from February 27.

Finland.—The "Import Free List" has been cancelled and practically all foreign goods will require import licences, but goods purchased before January 20 and already paid for are exempted from this requirement.

France.—The export of coal tar and products obtained directly therefrom by distillation, and of raw hides, horse and calf skins prepared, tanned, tawed, or curried, is prohibited as from March 2.

France and Algeria.—The "Coefficients of Increase" applicable to chemical products have been modified as from February 26. The full list of the modifications is given in the issue for March 18.

Gambia.—The import duty on spirits has been amended.

Germany.—The export of aluminium, lead, zinc, Britannia metal, copper, nickel, alloys and wares thereof is prohibited except under licence as from February 25. Exceptions to this proclamation include aluminium foil, printing and stereotype plates, imitation gold leaf, and some wares of the above metals.

Among the articles that may be imported without licence are vegetable fibres, raw cocoa, rubber, gutta percha, balata, asbestos, waste paper, certain kinds of glass, books in all languages, newspapers, etc.

The import duties on petroleum, lignite tar oil, turf oil, schist oil, other mineral oils, mineral wax, cartgrease, lubricants, tinplate and certain wares of aluminium, tin, copper, and nickel, and glue have been re-imposed.

Gold Coast.—The import duties on the various classes of spirits have been increased as from January 16.

Johore.—The import duties on alcoholic beverages have been revised as from February 1.

Netherlands.—Export prohibitions have been temporarily raised from, *inter alia*, phosphatic fodder lime, certain nuts and fruits, oil-seeds, certain metal by-products and scientific instruments (except those made of platinum).

Seychelles.—All goods not otherwise charged with duty or specially exempted are liable to an *ad valorem* duty of 15 per cent.

Spain.—The new "Minimum" Tariff rates on coal tar dyes are (pesetas per kg.): Dyes derived from coal tar in powder or crystals, 4; dyes derived from coal tar in paste or liquid, 2; thiocarbon, 4.

Switzerland.—Among the articles the export of which is covered by General Export Licence are saltpetre (not purified), certain kinds of paper and cardboard, certain manufactures of rubber, clay, raw mineral earths, cryolite, magnesite, steatite, pumice, certain manufactures of glass and of iron, copper, bronze, zinc and tin, mercury, perfumery, sulphuric acid, oleum, tartrates, carbon bisulphide and other chemicals, albumen, dyewoods, certain colours, polishes, lubricating grease, vanilla, casein, and certain vegetable textile materials.

The export of saccharin is no longer covered by General Export Licence.

West Africa.—The special restrictions on the import of all spirits (except trade spirits, which are prohibited) have been withdrawn.

GOVERNMENT ORDERS AND NOTICES.

PATENTS AND DESIGNS ACTS, 1907 AND 1919.

The President of the Board of Trade has issued (March 15) an Order that Sections I. and II. of the Patents and Designs Act. 1919, shall come into operation on April 1, 1920.

[These Sections provide for the prevention of abuse of monopoly rights in case the patented invention is not being worked in the United Kingdom on a commercial scale, by authorising the Comptroller to endorse the patent as a "licence of right," and thereby allowing others to work it under certain conditions.]

By an Order in Council of March 11, the provisions of Section 91 of the Patents and Designs Act, 1907, as amended by the two similar Acts of 1914 and 1919, are made to apply to Czecho-Slovakia, as from October 20, 1919, as that country has now acceded to the International Convention and Protocol for the protection of industrial property.

BASIC SLAG.

On account of the increased cost of production and transport, the Minister of Agriculture and Fisheries has authorised makers of basic slag to withdraw the rebates of 2s., 3s., and 4s. per ton previously allowed for deliveries made from March to April. The agreed maximum prices for ground basic slag delivered in the months in question remain the same as those ruling from September 1, 1919, to February 29, 1920. In all other respects the prices and conditions of sale already announced remain in force until May 31, 1920.

COMPANY NEWS.

LEVER BROTHERS, LTD.

At the twenty-sixth annual general meeting, held at Port Sunlight on March 11, Lord Leverhulme, the chairman, referred to the widened scope of the company, which had now over 100 associated companies and an authorised capital of £100,000,000. During the past year the following companies had been taken over:—Joseph Crosfield and Sons, Ltd., Wm. Gossage and Sons, Ltd., Price's Patent Candle Co., Ltd., John Knight, Ltd., The Niger Co., Ltd., and the Southern Whaling Co., Ltd. Replying to the charge of profiteering, he said that they had to carry enormous stocks of raw material, and consequently must follow market prices. The policy of selling for export at prices above those ruling at home was unbusinesslike and impossible. That no excessive profits had been made was shown by the fact that the dividend paid to the ordinary shareholders and co-partners, including the amount carried to the special reserve, was less than 2½ per cent. on the turnover. The value of soap exported from the United Kingdom last year was £8,500,000; the company had always maintained the supply necessary for the home trade, and the surplus only had been exported. An idea of the extent to which prices of raw material had risen could be gained from the following figures for June, 1914, and December, 1919, respectively:—Tallow, £33 and £101 per ton; artificial tallow, £26 14s. and £95; cotton oil, £28 19s. and £99 15s.; palm oil, £28 and £90; resin, £14 and £67; kernel oil, which was £40 9s. 6d. a ton in 1914, was taken for margarine manufacture—for which it is unsuitable—and an inferior oil at £97 took its place. The profits on soaps based on the market prices for raw materials had all diminished, *e.g.*, laundry soap from 10·83 to 6·34 per cent., "Lux" from 24·8 to 18·38 per cent. The policy pursued for over 30 years had been to make the profits of the company independent of those made at Port Sunlight. At the present time, if these works were closed down the shareholders in Lever Bros. would suffer no inconvenience or loss. The profits supplied by connexions in Africa, America, Oceania and elsewhere, had made the company secure in any industrial dispute, or even war, in any part of the United Kingdom or elsewhere. The company had intended to introduce the six-hour day, but opposition from the trade unions had stood in the way. Owing to the enormously increased volume of business, the estimated profits of the company, with those of associated companies, for 1920 were approximately £3,375,000; last year they realised £2,500,000. On December 31 last the market value of the stocks was over £16,000,000.

BENZOL MANUFACTURERS, LTD.

An adjourned extraordinary general meeting was held on March 3 to consider a resolution for the sale of Mitcham Benzol Refinery for 60,000 ordinary shares of £1 each in Benzol and By-Products, Ltd. As the company already owns the Crigglestone Colliery and Coke Oven Works, near Wakefield, it will be in a position to manufacture motor spirit from start to finish. The capital will be £700,000, divided into 350,000 ordinary shares and 350,000 10 per cent. cumulative preference shares, each of £1, and 336,000 of the latter will be offered to the public. The resolution was carried unanimously.

BORAX CONSOLIDATED, LTD.

The twenty-second ordinary general meeting was held on March 11, the chairman, the Earl of Chichester, presiding. The chairman said that the company's mines in Asia Minor had been handed over by the Turkish Government in good order, except in regard to certain plant, for which a claim had been lodged. These mines were now producing on a diminished scale owing to shortage of miners. The company's very extensive mines and deposits in North and South America had been developed ahead of requirements during the war, and at present there was a larger amount of ore in sight than at any previous period. Trade demands had been very heavy during the second half of the past year. There had been great difficulty in supplying to the associated refiners adequate supplies of raw material, and in obtaining coal, soda, etc., for the Continental works. Conditions are now improving; new uses had been found for borax; and prospects were bright. The net profits for the past year were £442,023, which represented 8 per cent. on the total issued capital, including debentures and the carry forward (£5,370,000). Dividends paid and payable for the year were 6 per cent. on the preference shares and 15 per cent. on the ordinary shares. The reserves now amount to £762,000, and the carry forward is £103,347.

LEGAL INTELLIGENCE.

LIABILITY FOR DAMAGES DUE TO AN EXPLOSION. *Belvedere Fish Guano Co., Ltd.,* v. *Rainham Chemical Works, Ltd. Ind, Coope and Co., Ltd.,* v. *same.*

Judgment was delivered by the Court of Appeal concerning the liability for damages to the premises of the two plaintiff companies caused by an explosion of dinitrophenol at the Rainham Chemical Works. Lord Justice Scrutton had held that the defendant company was liable (this J., 1919, 294R). This company claimed to be free from liability as it was acting under the instructions of the Ministry of Munitions.

The Master of the Rolls held that the question was one of personal liability. Messrs. Feldman and Partridge had introduced the manufacture of the explosive, and had made an agreement with the Ministry of Munitions; they had leased a site upon which the manufacture was afterwards carried on; the company formed subsequently had entered into occupation as agents for the lessees; and Messrs. Feldman and Partridge were governing directors of the company with absolute security and permanent power. They were therefore personally responsible, and the appeal must be dismissed.

Lord Justice Atkin concurred, and Lord Justice Younger dissented. The appeal was dismissed with costs.

TRADE NOTES.

BRITISH.

The British Industries Fair, 1920.—The three sections of this Fair, held respectively at London, Birmingham, and Glasgow, were opened to trade buyers from February 26 to March 5, inclusive. The very spacious accommodation afforded by the Crystal Palace was well utilised, over 1,100 firms exhibiting, and about 150,000 visitors attending. According to all reports, the aims of the organisers were well fulfilled. As previously stated, the purely chemical exhibits were confined to the Glasgow section, and in London the chief point of interest to chemists was the display of scientific glassware. A comparison of the goods of this description shown during the past five years leaves no doubt that their variety has been increased, and that their form has undergone a continuous improvement. The National Physical Laboratory opened an inquiry bureau and exhibited thermometers, etc. It was interesting to hear that no fewer than 30,000—35,000 clinical thermometers are now being tested weekly at the Laboratory, and that the percentage of rejections had fallen from 6—8 to 2½ since the enactment of the Clinical Thermometer Order; also that the number of tests of Class A (precision) volumetric glassware is 600—800 per week, and of the Class B ware 6000—8000 per week.

The Birmingham section of the Fair was mainly devoted to engineering tools and appliances and examples of practically every class of metals, alloys, and metallurgical inventions for industrial purposes. Several firms made a special feature of such products as pure nickel and nickel laboratory ware, nickel and other metallic salts used as catalysts, and copper, arsenic, and other compounds used as insecticides and disinfectants. To the metallurgist the Fair was of very great interest for every class of metal and alloy, both ferrous and non-ferrous, for engineering and technical work was exhibited, with innumerable examples of their application to engineering operations. The heating and lighting and power sections showed the applications of town gas and suction gas, petrol, and paraffin. The portable lamps furnishing high-temperature flames which may be used for chemical and technical work were noteworthy, and a number of gas-heated muffles and furnaces for the heat treatment of metals was also exhibited. The industrial laboratory of the Birmingham Gas Department had a large stand exhibiting these appliances. A number of stands contained the wares of varnish and paint manufacturers and oil and colourmen, with modern devices for their application in various industries. Some, as, for instance, the anti-rust compositions figuring under various trade names, had a distinct interest for the chemist. There were also some exhibits of explosives for use in mining and agricultural work.

In the section of the Fair held at Glasgow, textiles and clothing occupied the greater part of the space, and the portion allocated to chemicals was not very extensive. Good displays were made by the leading dye manufacturers, especially by The British Dyestuffs Corporation and by Scottish Dyes, Ltd. The range of dyes, including vat colours, shown at these two stands was very considerable, and proved that good progress had been made within the last year or so in the production of the shades most in demand, although the range is far from equalling that which was available before the war. Various intermediates and products of medicinal value were shown at the same stands. A very striking exhibit of dyed fabrics was shown by Messrs. Morton, of Carlisle, the dyes employed being those manufactured by Scottish Dyes, Ltd.

Apart from dyes, the chemical section contained little that was novel or remarkable. The by-products of coal were shown by several firms, and the alkali trade was also represented, but the exhibits were on conventional lines. Fine chemicals received little attention. On the whole, the picture of the British chemical industry presented was a disappointing one, and it is to be hoped that another year will see a more representative collection. Domestic products, such as prepared foodstuffs, polishes, disinfectants, cleansing agents, etc., were both numerous and varied, and it was evident that great pains had been taken to make them known to the public as well as to the trade. Such products, however, are usually disguised under trade names, without indication of their chemical character, so that they are of little direct interest to the chemist.

FOREIGN.

The Oilseeds and Vegetable Oil Market in Holland.—In 1917 imported oilseeds were valued at about £3,577,656, and vegetable oils at about £4,153,465, and exports were valued at £329,069 and £85,784 respectively. The only increase over the 1914 figures was in the imports of vegetable oils, which was to make up for the deficit in home production.

The production of vegetable oils in the Netherlands is a very important industry, oil-milling being intimately connected with many basic industries of the country. The principal raw materials consumed are linseed, rapeseed, and imported copra, palm kernels, groundnuts and soya beans. Rotterdam is the chief port of entry for oilseeds and vegetable oils. Groundnuts are imported chiefly from West Africa, and linseed comes principally from Argentina. In 1919 the East Indies supplied Holland with 50·9 per cent. and Great Britain with 49·1 per cent. of the copra imported. The entire importation of soya beans in 1917 was supplied by the Dutch East Indies. Many supplies, however, are not imported direct, but through Belgium, Great Britain, Hamburg, etc., and even in the case of direct importation the source may vary from year to year.

The following table shows the imports of oilseeds into the Netherlands for the first six months of 1914 and 1919:—

Oilseeds.	Jan.-June, 1914 metric tons.	Jan.-June, 1919 metric tons.
Copra	55,536	1,857
Linseed	168,512	11,838
Palmnuts	38,340	4,575
Groundnuts	59,114	7,195
Rapeseed	14,083	832
Soya beans	14,463	—

The chief centre of the oil-milling industry is in the Zaanland district, within easy access of Amsterdam and the North Sea Canal. In the Netherlands there are 63 factories manufacturing linseed oil, with linseed cake and meal as by-products. The Dutch export trade in vegetable oils has declined considerably, as will be seen from the following table:—

Vegetable oils.	Jan.-June, 1914 metric tons	Jan.-June, 1919 metric tons.
Coconut	1,175	3,829
Cottonseed	30	3,558
Linseed	16,436	2,737
Olive	611	12
Palmnut	4,158	—
Patent	177	1
Groundnut	4,491	31
Rapeseed	162	2,040
Sesame	108	2
Soya bean	1,229	1,452
Other oils	133	2,336

The oil-milling industry and the trade in vegetable oils were in a condition of stagnation at the beginning of 1919, but by April shipments of oilseeds or vegetable oils began to arrive in considerable quantities. Trade for the first six months of 1919, however, while not equal to that for the corresponding period of 1914, showed every sign of vigorous revival.—(*U.S. Com. Rep., Dec.* 29, 1919.)

Chemical Trade in Argentina.—Generally speaking, before the war all heavy chemicals were imported from Europe, but during and since the war the United States has supplied the bulk of the requirements. Caustic soda (76%) is now supplied entirely from the United States to the extent of 8000 tons per annum; on the other hand, the consumers of soda ash show a preference for the European product, and about 50,000 tons is consumed annually. The chloride of lime market has recently dropped owing to excessive supplies; for this product strong packages (drums or casks) are essential. The chief demand in silicate of soda (annual consumption 4000—5000 tons) is for the European product of 140° Tw. Sulphur is now supplied entirely by the United States to the extent of 20.000 tons per annum. Rosin is all supplied by America, but as this material is used for soap making, it has to compete against home-produced animal fats, and manufacturers cease to use rosin when the price exceeds $20 per 100 kg. In a similar manner the demand for paraffin wax depends on the price of stearin, the candle maker substituting one for the other according to price. The demand is estimated at about 7000 tons yearly, the qualities required being those of 118—125° melting point for winter and 125—132° for summer use. About 3000 tons of white arsenic is imported annually and used chiefly as an insecticide; the product must be of high purity and packed in small containers. At present the market is overstocked with acetic acid and chlorate and bichromate of potash. There is a great scarcity of sulphuric acid, and this material requires special care in transit. In pharmaceutical drugs and dyes the United States at present holds the bulk of the markets, but German agents have started taking orders for dyes, in many cases at prices 50 per cent. below the American quotations.—(*U.S. Com. Rep., Feb.* 2, 1920.)

The Groundnut Industry of China.—According to H.M. Commercial Counsellor in Shanghai, the export of groundnuts from China is a comparatively new trade. Before the war the oil was chiefly shipped to Shanghai, Canton and Hongkong, but now it is being largely sent to Dairen and Japan for re-shipment. Tsingtao is the principal point for the collection of groundnut oil for export. In 1913 Tsingtao exported 19,616,300 lb. of the oil, while the exports were 31,193,953 lb. in 1915, and about 80,959,391 lb. in 1918. The oil is generally ground at the places of production and brought to Tsingtao in waterproof baskets containing 160 lb. each. The price averages about 12 Haikwan taels per picul (133⅓ lb.).

The largest groundnut-producing district in China is Shantung, which has an estimated production of about 500,000,000 lb. of nuts every year. Some 266,000,000 lb. of shelled and unshelled nuts are exported yearly by this district in addition to the quantity mentioned above. Tientsin exported 7000 tons of shelled and 1620 tons of unshelled groundnuts in 1917. The nuts grown in the Luanchou districts (Luan River) are said to be superior in quality to those grown elsewhere in Asia. They are found in nearly every part of China, and contain about 46 per cent. of oil.

Before the war the bulk of the shipments went to Europe, more particularly France, but in 1918 over 80 per cent. of the total exports went to Japan and the United States. Cheap and almost unlimited supplies of this Chinese product are available, and the Mitsui Company, a Japanese firm, has a special fleet of ships which carry it from Tsingato to Japan and other countries.—(*Bd. of Trade J., Jan.* 29, 1920.)

New Maximum Prices for Nitrogenous Fertilisers in Germany.—Since the last maximum prices were fixed, on October 1, 1919, all the items determining the production costs of artificial nitrogenous fertilisers have more than doubled in price, and it has therefore been found necessary to raise prices so that the consumer will have to pay from 10·70—15 marks per kilogram of nitrogen, according to the nature of the fertiliser. On the other hand, the increased charges which have recently obtained for mixing and for certain added materials (*e.g.*, bone-meal, gypsum, lime) will be discontinued. The agricultural interests recognise the need for the revised prices, but they have succeeded in imposing the condition that the prices of agricultural products must in due season be raised proportionately. —(*Chem. Ind., Mar.* 10, 1920.)

The Italian Soap Trade in 1919.—Owing to the acute shortage of raw materials, the Italian soap makers were unable to take full advantage of the soap famine in Central Europe or of the general increased demand. English competition was keen, for the English soapmakers were in a better position in regard to raw materials, export facilities, and Government restrictions. Other difficulties faced by the Italian soap trade were the appearance of a great crowd of speculators on the market and adverse rates of exchange. Between the beginning and end of 1919 there was a difference of about 10 lire per £1 sterling, representing an addition of 20 per cent. to the cost of goods. Prices of raw material and of coal rose to an enormous extent, and rosin in particular was almost unobtainable. Notwithstanding the adverse conditions, the Italian industry, on the whole, has developed satisfactorily during the last few years, and increased attention has been given to scientific research.—(*L'Indus. Sap., Jan.* 31, 1920.)

Foreign Company News.—*United States.*—The authorised capital of chemical companies organised during 1919 in the United States amounted to $112,173,000, as compared with $65,565,000 in 1915, $146,160,000 in 1917, and $73,403,000 in 1918.

It is announced that sixteen paint and varnish companies have amalgamated under the title of the "Glidden Company." This company, which possesses plants in Canada and many parts of America, has its headquarters at Reading, Pennsylvania, and will be capitalised with $7,500,000 of 7 per cent. preferred, and 360,000 shares of common stock.—(*Bd. of Trade J., Mar.* 4, 1920.)

France.—The Société Commerciale des Potasses d'Alsace-Lorraine has taken the place of the Bureau de Vente de la Potasse d'Alsace (sales bureau for Alsatian potash). The company has offices at Mulhouse and will sell the potash minerals extracted from its mines or the salts produced in its factories.—(*Bd. of Trade J., Mar.* 4, 1920.)

Norway.—A new company, the Norske Molybdenprodukter, A/S. (Norwegian Molybdenum Products Co.), is about to be formed with a maximum capital of 500,000 kroner (£26,800). The objects are, to deal in molybdenum raw products, to produce and sell molybdenum and its products, and to carry on experiments for the advancement of the industry in Norway.—(*U.S. Com. Rep., Jan.* 27, 1920.)

Germany.—The Vereinigte Ultramarinfabriken A.-G., formerly Leverkus, Zeitner and Co., in Cologne, has at various times since the revolution been compelled to work at a loss. An agreement has been made with the firm of Fr. Bayer, in Leverkusen, by which the latter will take over the land and buildings of the ultramarine works, which, however, will continue to manufacture for a limited period. The company reports a net profit of 681,146 marks and a dividend of 10 per cent.—(*Z. angew. Chem., Dec.* 12, 1919.)

The German firm of Stinnes has recently purchased two large cellulose factories at Königsberg, the Nordeutsche Zellulosefabrik for 12 million marks, and the Königsberger Zellstoffabrik for 23 million marks. The two factories consume nearly half a million tons of wood yearly, and their purchase by the Stinnes group is expected to create a new situation in Prussian shipping.—(*U.S. Com. Rep., Feb.* 10, 1920.)

REPORT.

Extract from the Annual Report of the Local Government Board. Report on the Work of Inspectors of Foods for the Year 1918–19. *By* A. W. J. Macfadden. (*London: H.M. Stationery Office,* 1920.) *Price* 3*d*.

The work of inspectors of foods during the year was concerned mainly with the supervision of conditions under which food for the Armies was being manufactured and also with a number of special questions arising out of the abnormal conditions of food supply and distribution. Complaints as to the soundness and wholesomeness of imported frozen meat were investigated, and it was found that, although the appearance of the meat was sometimes even repulsive and suggestive of wasting disease, it was generally passable as sound; a good deal of the meat was dirty on the surface and had suffered from rough handling and conveyance in unsuitable wagons. With regard to unsuitable methods of conveying meat by rail, it is suggested that the railway companies, in their plans for replacing wastage in rolling stock, should give full consideration to the construction of vans for the conveyance of perishable foods. The liability of certain articles used in the preparation of food to become contaminated with arsenic has been kept under observation, but cases of arsenical contamination were not met with during the year. A case of contamination of self-raising flour with antimony was reported from Manchester, the introduction of the antimony appeared to be due to simple accident.

Two matters calling for reform are dealt with at some length, these being the inspection of home-killed meat and the supervision of places where food is prepared or kept for sale for human consumption. The position in regard to the inspection of home-killed meat is, from the public health point of view, most unsatisfactory; the remedy seems to be the compulsory closing of private slaughterhouses and the provision of public abattoirs, together with a number of skilled inspectors sufficient to inspect thoroughly both before and after slaughter every animal brought to be killed. Compulsory inspection would almost certainly entail the marking of meat which has been passed by the inspector, and this would be a safeguard to the retailer and the buyer. Evidence collected during the period of the war as to the sanitary conditions of food-preparing places showed that whilst in a number of the larger factories the conditions were satisfactory, in many others the opposite was the case; a very large proportion of the smaller factories was unsatisfactory in the extreme as regards structure, situation, cleanliness, etc. The firms who showed the least care in the cleanliness of their methods and premises were as a rule those who paid least attention to the soundness and wholesomeness of the materials they used. Proper regulation of places where food is prepared for sale has become a matter of increasing urgency.

The report also deals with problems relating to dietetics and nutrition; the significance of certain accessory substances (vitamines) in foodstuffs is discussed and the need for further organised research is emphasised.

REVIEW.

The Preparation of Organic Compounds. *By* E. de Barry Barnett. *Second edition, with* 54 *illustrations. Pp. xv.*+273. (*London: J. and A. Churchill.* 1920.) *Price* 10*s. net.*

The publication of a second edition of this book at a short interval after the first indicates that the plan of the book commends itself to many teachers of organic chemistry. A short theoretical discussion of the general methods of preparation of the different classes of compounds precedes the description of the laboratory details for the preparation of the example chosen as typical of its class. In this way the student is not allowed to regard preparations merely as exercises in manipulation.

Excellent as are several features of the book, it has several defects, is not always accurate, and is misleading on a few points. The reader soon gains the impression that it is largely a compiled translation from German literature. In the preface the author acknowledges his indebtedness to some excellent pre-war German text-books, but his admiration for these is no excuse for following them when improvements in method or adaptations to present-day conditions would readily occur to the experienced teacher of organic chemistry. For example, a method as given by the author of preparing *p*-nitrosophenol, which involves the use of glacial acetic acid, ether, and potassium nitrite; or, again, a method of preparation of a ketone by distillation of the barium salts of the appropriate fatty acids (instead of Senderen's method of the catalytic decomposition of the mixed acids themselves) would not be chosen by a modern exponent of organic chemistry, keen on economies in time and expense!

Most of the references are to the earlier German literature, very few to English or French sources. Thus, it is curious to find that the index under "Grignard's reaction" refers the reader (i.) to an English text-book on practical organic chemistry, and (ii.) to papers in the publications of the German Chemical Society.

It is a pity that the author has not followed in a systematic manner the nomenclature adopted in the publications of the English Chemical Society, thus he might have avoided the haphazard alternative use of "ethoxide" and "ethylate," "xylol," and "xylene," and the use of such names as "phenolates," "phenolcarboxylic," "cyclohexanole," "mannitol dibenzoate," etc., whilst most readers will regard as crude and inelegant such translations from the German as "splits out" (in reference to condensations), "steam-volatile," etc.

The author states that German patent specifications are more accessible than the English, and therefore gives the references to D.R.P., but this cannot be taken as an excuse for the omission of improved methods described only in E.P. More attention should have been given in parts of the book to the theoretical points involved, so that the student could not be misled, as he might easily be, for example, in the description of the menthenes and menthone.

Books of this type would be far more stimulating to the student if he were encouraged to consider the effect of a variation in the conditions laid down for certain of the preparations, as, for example, the different proportion of the ortho and para isomerides obtained in the nitration of phenol by an alteration in the temperature of the nitration or in the concentration of a reagent. Attention to these points would (in the event of a third edition being required) make the book one which, when its needless excess of Germanic flavour has been removed, could be recommended to all advanced students of organic chemistry.

Robert H. Pickard.

OBITUARY.

JAMES EMERSON REYNOLDS.

James Emerson Reynolds, who died suddenly on February 17, at his residence in London, was born at Booterstown, Co. Dublin, in 1844. Destined for the medical profession, he became a licentiate of the Royal College of Physicians and Surgeons of Edinburgh, 1865. Although his great desire was to devote himself entirely to chemistry, he practised medicine for a short time. His chance, however, soon came, for in 1867 he was appointed "Keeper of Minerals" at the National Museum in Dublin, and in the following year Analyst to the Royal Dublin Society. His first important contribution to chemistry was made in 1869, when he isolated thiocarbamide, the sulphur analogue of urea; this was a notable discovery at the time, since previous investigators, including Liebig and Hofmann, had been unsuccessful in their attempts to obtain the compound. In 1871 he described an interesting colloidal compound of mercury and acetone, the formation of which constitutes the basis of a delicate reaction for detecting the latter.

In 1873 he became professor of chemistry at the Royal College of Surgeons in Ireland, and in 1875 he was elected to succeed the late Dr. Apjohn in the chair of chemistry in the University of Dublin, a position which he held for twenty-eight years. He soon established for himself a high reputation as a teacher and lecturer. His lectures, which were profusely illustrated with convincing experiments, were always appreciated by his students. Reynolds was a pioneer in introducing quantitative experiments in the early training of the student of chemistry, and the first volume of his well-known "Experimental Chemistry for Junior Students" (published in four small volumes) was an original work in this respect.

Whilst much of his time was taken up by his professorial duties, he continued his researches; he prepared beryllium and investigated its specific heat, and in 1885 he commenced investigations on derivatives of silicon, containing the element in union with nitrogen. Several interesting new compounds were described in a series of over a dozen papers published in the Transactions of the Chemical Society up to 1909. In his last contribution to chemistry, published in the Proceedings of the Royal Society, 1913, he described the synthesis of the mineral anorthite $CaAl_2Si_2O_8$, which was prepared by the combined action of oxygen and steam at a high temperature on the synthetic compound $Ca(SiAl)_2$, a silicon-aluminium analogue of calcium cyanide. He always held the view that in nature aluminium appeared to play a *rôle* to silicon in the mineral kingdom similar to that of nitrogen to carbon in the organic world. He left Dublin in 1903, and went to reside in London.

Reynolds served as president of this Society in 1891—1892, in which capacity he presided over the only annual meeting of the Society held in Ireland. This meeting was held in Dublin in 1892, and all who were privileged to attend it will long remember the important address given by Prof. Reynolds and the exceptional welcome and hospitality accorded to the members of the Society.

He was elected a Fellow of the Royal Society in 1880, served as president of the Chemical Society in 1901—1903, and president of the Chemical Section of the British Association at Nottingham in 1893. He was an honorary M.D. (1880) and Sc.D. (1891) of Dublin University. He married in 1875 a daughter of Canon Finlayson, of Dublin, and has left two children.

E. A. WERNER.

PUBLICATIONS RECEIVED.

THE CHEMISTRY OF COAL. *By* J. B. ROBERTSON. *Pp.* 96. (*London: Gurney and Jackson.* 1919.) *Price* 3*s.* 6*d.*

FUEL PRODUCTION AND UTILISATION. *By* H. S. TAYLOR. *Pp.* xiv.+297. (*London: Baillière, Tindall and Cox.* 1920.) *Price* 10*s.* 6*d.*

LABORATORY MANUAL OF ELEMENTARY COLLOID CHEMISTRY. *By* E. HATSCHEK. *Pp.* 135. (*London: J. and A. Churchill.* 1920.) *Price* 6*s.* 6*d.*

INDUSTRIAL ORGANIC ANALYSIS. *By* P. S. ARUP. *Second edition revised and enlarged. Pp.* xi.+471. (*London: J. and A. Churchill.* 1920.) *Price* 12*s.* 6*d.*

QUANTITATIVE ANALYSIS IN THEORY AND PRACTICE. *By* P. W. ROBERTSON *and* D. H. BURLEIGH. *Pp.* 63. (*London: Edward Arnold.* 1920.) *Price* 4*s.* 6*d.*

QUANTITATIVE ANALYSIS BY ELECTROLYSIS. *By* ALEX. CLASSEN *and* H. CLOEREN. *Revised, rearranged and enlarged English edition, by* W. T. HALL. *Pp.* xiii.+346. (*New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.*, 1919.) *Price* 17*s.* 6*d.*

MOLINARI'S CHEMISTY. VOLUME I: INORGANIC. *Second edition, translated from the fourth revised and amplified Italian edition by* T. H. POPE. *Pp.* xix+876, *with* 328 *illustrations and* 2 *plates.* (*London: J. and A. Churchill.* 1920.) *Price* £2 2*s.*

THE PHOTOGRAPHIC RESEARCHES OF F. HURTER AND V. C. DRIFFIELD. *Memorial volume edited by* W. B. FERGUSON. *Pp.* xii.+374. (*London: Royal Photographic Society of Great Britain.* 1920). *Price* 25*s.*

PROGRES DE LA CHIMIE EN 1918. *Traduction française autorisée des "Annual Reports on the Progress of Chemistry for* 1918, *issued by the Chemical Society." Publiée sous la direction de* A. KLING. *Pp.* 321. (*Paris: Gauthier-Villars et Cie.* 1920.) *Price* 15 *francs*+50%.

UEBER DIE KONTROLLE UND HERSTELLUNG VON SACCHARIN. *By* OSKAR BEYER. *Pp.* 141, *with* 12 *illustrations.* (*Zürich: Rascher & Cie.* 1918.)

THE TECHNICAL INSPECTION ASSOCIATION GAZETTE. *Vol. 1., No.* 1. *December,* 1919. (*London:* 44, *Bedford Row, W.C.* 1.)

DIRECTORY OF DANISH EXPORTERS, IMPORTERS, AND VARIOUS OTHER FIRMS. *Pp.* 166. (*Copenhagen: Sylvester Hvid.* 1919.)

THE CHEMICAL AGE: VOLUME I., JUNE—DECEMBER, 1919. *Pp.* xi.+750. (*London: Benn Brothers, Ltd.* 1919.) *Price* 15*s.*

PUBLICATIONS OF THE UNITED STATES BUREAU OF MINES. DEPARTMENT OF THE INTERIOR. (*Washington: Government Printing Office.* 1919–20.)

- BURNING STEAM SIZES OF ANTHRACITE, WITH OR WITHOUT ADMIXTURE OF SOFT COAL. *Reprint of Engineering Bull. No.* 5.
- MOTOR GASOLINE PROPERTIES, LABORATORY METHODS OF TESTING AND PRACTICAL SPECIFICATIONS. *By* E. W. DEAN.
- WAR GAS INVESTIGATIONS. *By* VAN H. MANNING.
- VITIATION OF GARAGE AIR BY AUTOMOBILE EXHAUST GASES. *By* G. A. BURRELL *and* A. W. GAUGER.

PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY. DEPARTMENT OF THE INTERIOR. (*Washington: Govt. Printing Office.* 1919.)

- FLUORSPAR AND CRYOLITE IN 1918. *By* R. F. BURCHARD.
- GOLD, SILVER, COPPER, LEAD AND ZINC IN THE EASTERN STATES IN 1918. *By* J. M. HILL.
- SILICIA *in* 1918. *By* F. J. CATZ.

THE POSITION OF SCIENTIFIC SOCIETIES.

H. DROOP RICHMOND AND J. M. WILKIE.

During the past five years not only has production been diminished, but a considerable proportion of the world's wealth has been sunk in the war, with the result that there is general financial stringency. Currency has been depreciated, and the financial position of the many is worse than it was in 1914. Scientific societies are feeling a financial pinch, and it is an open secret that this is having the closest consideration of the various governing bodies.

Broadly speaking, the bulk of the expenses of a scientific society is due to the dissemination of knowledge of the science which it promotes, chiefly in the form of publications which, apart from the subsidy from the society, are not usually self-supporting. Perhaps this is more true of chemistry than of any other science; and the science of chemistry has probably more institutions promoting special branches, with more separate publications, than any other. Hence persons interested in chemistry generally find it necessary to support a number of societies, and thus receive a variety of publications.

It is an unfortunate fact that the objects of the societies to some extent overlap, and that their publications therefore cover much of the same ground; it is quite common for a chemist to receive four or five separate journals and to find the same papers or abstracts in each of them. It is also true that many chemists belong to a society because it includes a special branch, and that the society's journal may contain much matter which interests them but little.

The effect of the war has not been the same on all chemical institutions. Some societies have taken advantage of the decreased productivity of chemical literature to curtail their publications and to effect economies; others have increased their activities, developed in new directions, and while in many cases doing useful work, have used up their available funds. The result is that while all institutions are feeling the financial stringency, some can only be saved from pecuniary difficulties either by an immediate curtailment of their activities or of the privileges of members, or by a very substantial increase of the subscription. From private inquiry it appears that most chemists are receiving incomes about 25 to 30 per cent. above pre-war rates, and as the cost of living has more than doubled, it follows that chemists in general are ordering their expenses so as to effect considerable economies in their mode of life. If this is the position of the constituent members of the chemical institutions, the institutions themselves must follow suit, *i.e.*, they cannot increase their subscription by more than 30 per cent. without risking a marked fall in membership, and economies must be effected. It is to be hoped that the governing bodies will put the position before the membership.

Several new societies have come into existence since the commencement of the war; for instance, the agitation which culminated in the arrangement entered into by the Institute of Chemistry with the British Association of Chemists resulted directly or indirectly in the formation of at least two new bodies, and other societies have sprung into being. This has resulted in increased expenditure on the part of many chemists who had not been connected previously with any scientific or professional organisation, and partly at least accounts for the fact that the increase of membership of the older societies has been small in comparison with the increase of persons having chemical interests.

To turn from the general to the particular, there is a marked upward tendency in the expenses of all chemical institutions. So far the only one which has increased its subscription materially is the Institute of Chemistry, which has doubled it for fellows and students, and advanced it by 50 per cent. for associates; as a very large number of the fellows also belong to other chemical institutions, this doubling of the subscription represents, roughly, about 15 to 20 per cent. of the total chemical subscriptions. This increase is within the limit of 25 to 30 per cent., above which resignations are sure to follow, and if another society follows suit the limit will be reached or passed, and the effect will probably be most keenly felt by the society making a substantial increase.

It may be pointed out that the *de facto* increases in the subscriptions to certain societies do not constitute an argument in favour of increasing those to others, but the reverse, for, to use a colloquialism, "the pitch is already queered."

A further point for consideration is that the strength of a society lies in its young members, and there are many young men, and in the near future there will be many more, who are entering the field of chemistry with small reserves, and high rates of subscription will tend to hinder their absorption into the chemical institutions, to the detriment of both; for advantages of membership are largely social and mutual to old and young alike, and the society habit, if encouraged when young, makes for strength and by widening the outlook helps to prevent "blind alley" troubles.

It does not appear that any rise exceeding 30 per cent. is necessary, for there is ample room for economy by a closer union of societies, which, in addition to attracting new members, although they have different objects, have yet the same broad basis of the advancement of chemistry. Indeed, many steps in this direction have been taken already. A Federal Council is in existence, and, though little is heard of its activities, is doubtless working to this end; it can and must be speeded up. An arrangement exists between some societies with regard to the pooling of abstracts, but this is only carried out in a halting and tentative manner; it is probably only the beginning of a joint publication of abstracts, possibly including all the English-speaking societies. Further economies could be effected by a joint secretariat and a joint list of members which would have a commercial value as a chemical directory, and might even pay for its publication.

Action must, however, be taken soon, and the membership at large must be consulted, preferably by joint local meetings organised by the local sections of the Society of Chemical Industry, of the Institute of Chemistry or other localised bodies open to members of all the chemical institutions, and in the meantime individual societies will be wise to stay their hand.

Such a union as that outlined above might be established on the following broad general lines:—

1. Each institution to preserve its autonomy, and to be responsible for the publication of its own transactions. The subscriptions to be as small as possible.
2. A joint journal of abstracts to be published, which may be purchased by the members of any of the joint societies at a price just covering expenses.
3. A joint ephemeral journal, if such is considered necessary by the membership, to be published on the same lines.
4. Advantage to be taken of the local sections of some societies to make them local sections of all, joint meetings of all chemists interested being held.
5. One central office and one secretarial staff to transact the routine business of all the societies. This would be the seat of the Federal Council.

CANTOR LECTURES ON CELLULOSE*

C. F. CROSS.

The lecturer reviewed the present position of the chemistry and industrial application of cellulose in the light of his experience in this field, extending over 40 years, with illustrative examples drawn from his personal researches in the many branches of the subject. The lectures, three in number, were classified as follows:—I. Compound celluloses (natural raw materials), their chemistry, natural history and special technology. II. Cellulose industries, including the industries of plastic cellulose. III. Constitutional and speculative discussion.

I. It will be remembered that the lecturer's high reputation in the field of cellulose research had its origin in work published in 1880 on the "Chemistry of Bast Fibres," in collaboration with E. J. Bevan. In this work the jute fibre played the part of prototype for the whole class of lignocelluloses, and this fibre, as a type, has possessed a particular fascination in many subsequent researches, on account of its chemical homogeneity and strict conformity. On the experimental foundation laid in those researches the modern knowledge of the chemistry of wood has been built up. This early work brought the lecturer in touch with the technological problems of the jute industry and led to the study and elucidation of the peculiar form of bacterial attack, known in the jute trade as "heart damage," which later was recognised as a disease common to lignocelluloses as a group.

The lignocelluloses were originally formulated by Cross and Bevan as chemically combined compound celluloses (ester-like compounds of cellulose with lignone or lignic acid). Later, Wislicenus expounded a theory of interpenetrating colloidal gel-formation, which was accepted perhaps a little too hastily, and the probability is that the compound ester view will have to be restored as affording the better explanation of the facts. The lignocellulose type is not confined to pronounced lignocelluloses, such as jute and woody fibre. Cross and Bevan's researches on the bast fibres (1880) indicated the presence of the lignone complex in esparto grass. Unpublished researches in recent years have made it apparent that the proportion of this lignone (or lignic acid) complex in esparto is relatively large, but that it is not associated with the cellulose fibre. Esparto may be described as a structure of cellulose fibres surrounded by or embedded in a readily hydrolysable ligno-pentosan, that is, an ester-like compound of lignone and pentosan. Allusion was made by the lecturer to a soluble constituent in the juice of white currants which could be regarded as an analogous compound of lignone with a hemicellulose. Thus we are provided by Nature with a whole range of materials of ligno-cellulose type, in which the lignone is associated with cellulose proper, hemicelluloses or pentosans, the investigation of which opens up an important field.

Of the other classes of compound celluloses we may admit that the so-called pectocelluloses are probably not compounds, but merely associated deposits of celluloses with hemicelluloses. On the other hand, the ester-like nature of the little-studied cutocelluloses has recently been confirmed by the researches of Cross and Bevan on Raffia (J. Soc. Dyers and Co., 1919, **35**, 70). These investigations only point the way to the exploration of what is, experimentally, a very difficult subject, but they suffice to emphasise the fact that the formation of esters of cellulose with the higher fatty acids is not outside the range of practical possibility and to suggest the valuable industrial potentialities of a synthetic cutocellulose.

* Delivered before the Royal Society of Arts, Feb.-March, 1920.

II. The scientific foundations of the cotton-spinning industry are being systematically investigated by W. L. Balls, and the influence of the various physical factors has been studied by exact methods. The development of the artificial silk and cellulose ester industries, with which the lecturer has been brilliantly identified since their inception, was discussed. By a treatment analogous to the viscose reaction, under conditions which preclude the formation of definitely soluble xanthogenic esters, it has been possible to obtain in the fibrous celluloses extreme but controllable hydration effects which exaggerate all the minute structural details of the fibre. This treatment has been applied both to scientific investigations and to the production of new technical effects in the textile and paper-making industries.

III. In this lecture the constitutional theories developed by the lecturer in recent years were discussed, the organised colloids being conceived as of the order of liquid systems with extremely small and labile ultimate constituent groups. Some may find it difficult to accept the physical and colloidal methods of speculative constitutional research as effective substitutes for the older chemical methods. A system which is infinitely labile is not a system at all, and it is open to question whether some of the colloidal theories which have been woven around the constitution of cellulose have not tended to sterilise rather than fertilise by substituting words for deeds. Be that as it may, it is certain that a vast amount of objective research is necessary before any profound modification of the older conceptions is really called for. Such objective research on the physical side is being prosecuted by S. J. Lewis, and the data thus accumulated cannot fail to be of the utmost value both to the technical investigator and to an understanding of the physics common to the colloidal state in general. Constitutional deductions as to the chemical structure of cellulose in particular should, however, not be hastily drawn from them. Cellulose as a chemical individual or complex is one thing, but cellulose as a colloid, exhibiting the phenomena of hydration, adsorption and interpenetration, may share its physical properties with other organic aqueous colloids quite different in chemical structure.

J. F. Briggs.

THE COMPLETE GASIFICATION OF COAL.

Recognised authorities consider that a cheaper town gas can only be produced by converting a higher proportion of the original energy of the coal into gaseous form. With present facilities complete gasification of the coal may be effected by first carbonising the coal in retorts and then converting the remaining 10 cwt. of coke into blue water gas. Assuming that 1 ton of coal containing 31 million B.Th.U. yields:—

	B.Th.U.		B.Th.U.
(a) 13,000 cb. ft. coal gas at	520	=	6,760,000
(b) 18,600 cb. ft. blue gas at	280	=	5,208,000
31,600 cb. ft. mixed gas at	378	=	11,968,000

it is seen that 38·6 per cent. of the original energy is converted into gaseous energy. Such a two-stage process involves losses due to the consumption of 4 cwt. of coke per ton of coal for heating the retorts, to the loss of the sensible heat of coke leaving the retorts, to the formation of breeze during the handling of coke, and to the consumption of coke during the operation of "blowing" in the water-gas plant.

At the present time there is a considerable choice of plants both of German and of British origin designed to effect the complete gasification of coal in one stage whereby much loss is avoided. It is generally accepted that by this means it is possible to obtain 60,000 cb. ft. of gas per ton of coal, but it is preferred to assume that one ton of coal will yield 50,000 cb. ft. of 375 B.Th.U.=18,750,000 B.Th.U. This represents a recovery of 60 per cent. of the original energy in gaseous form, or an additional 6,782,000 B.Th.U. when compared with the two-stage process. The average percentage composition by volume of this "complete" gas is as follows: Hydrogen 50, carbon monoxide 35, methane 7, unsaturated hydrocarbons 1, carbon dioxide 3·5, and nitrogen 3·5. The incombustible constituents amount to less than half of the lowest proportion suggested in the Report of the Fuel Research Board, and it is considered that there should be little difficulty in overcoming objections to a comparatively high percentage of carbon monoxide.

The product of complete gasification is of a lower calorific value than that which will be generally supplied in the near future, but when the principle of supplying a low-grade gas has become established there should be little opposition to the general provision of a gas of 375 B.Th.U. The general introduction of the system will take time because of the capital at present invested in retort benches and water-gas plants, but most gas undertakings require an immediate increase of productive capacity. "Complete" gas, because of its higher calorific value, is a more desirable diluent for straight coal gas than is blue water gas. Furthermore, the process entails probably only 20 per cent. of the labour involved in coal gas manufacture. Doubt has arisen in connexion with the quality of "complete" gas actually obtained in practice, as in at least one case it has been found that the quality depreciated during after-treatment owing to the condensation of the more valuable constituents. The "Tetragas" system is designed to obviate such depreciation.

The gas produced is most suitable for industrial heating operations owing to its higher flame temperature when compared with straight coal gas and to the increased radiation from the combustion of carbon monoxide. Much depends upon the cost of the gas, but it is concluded that the adoption of the principle of complete gasification represents the only possibility of selling gas at a pre-war rate expressed upon a volume basis.—(*Times Engin. Suppl., Mar.*, 1920.)

CONTROL OF PLANT OUTPUT.

The output required from a plant will, in general, depend on the demand for the particular product and on existing stocks. In some chemical operations, however, it is not an easy matter to fix the demand for an intermediate product in a multi-stage process, since the required output depends on the work in succeeding stages, and not merely on the demand for the finished product In such cases of "linked" productions, it is often difficult for a manager to control manufacture in such a way as to keep the various operations in balance, and so ensure a steady output, week in and week out, from all the plants concerned.

A good example of this type of "linked" production is furnished by the manufacture of an explosive, such as TNT, guncotton, or nitroglycerin. For any of these products there will be required at least six or seven distinct plants, and the object of control will be:—

(*a*) To obtain a steady output from each plant, and so avoid spasmodic working, which is bad both for plant and labour.

(*b*) To get an output corresponding with the required output of finished product.

(*c*) To maintain constant the stocks of intermediate products which previous practice has shown to be essential for smooth running.

A satisfactory method of effecting the desired control is illustrated below by reference to the manufacture of TNT.

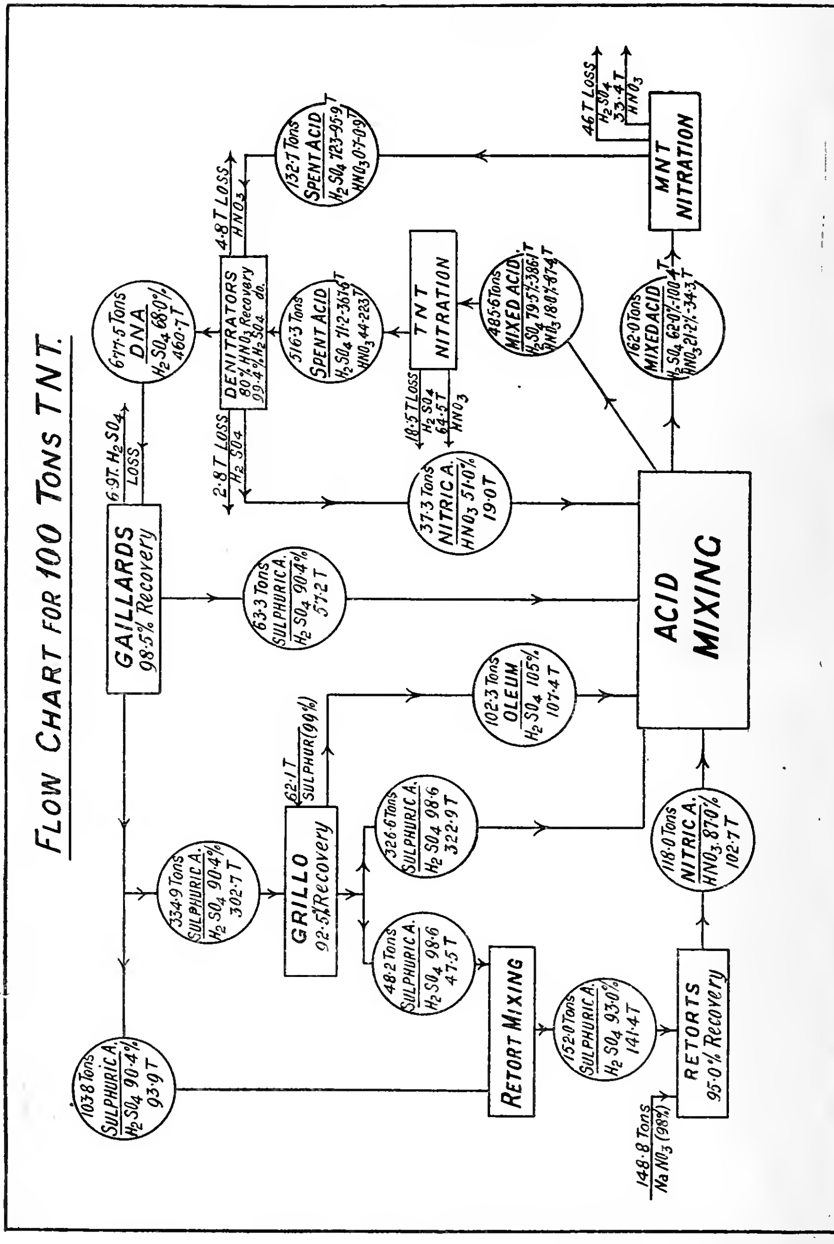
The first objective is to establish the work of each plant in terms of final product. In the case of TNT manufacture, the plants involved will be nitric acid retorts, oleum plant, concentrators, denitrators, mixing plant, MNT nitrators, TNT nitrators (for simplification the plants for toluene and TNT purification are here omitted). The capacity and efficiency of all these plants must be known, and with this information the "flow" of materials can be calculated for (say) 100 tons of TNT. It is convenient to set forth this information in the form of a chart as shown overleaf. From this "Flow Chart" a daily (or weekly) programme can be mapped out for each plant depending on the required output of TNT.

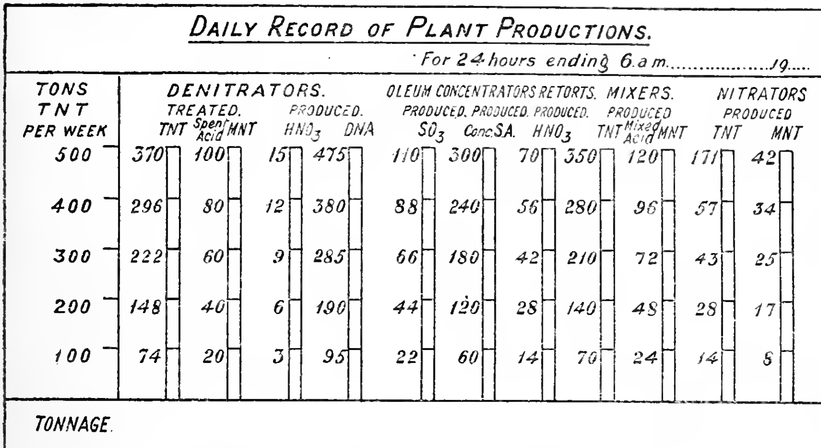
After fixing the daily work of each plant, it is necessary to get a daily return from each, showing the work done and the stocks of intermediate products. It is very convenient to have these returns made on the type of form given in the illustration, since they suggest at once to the manager the most important items of information. In the "Stock Sheet" each column will represent the maximum storage capacity for each kind of acid, and the actual stock can be shaded in as shown. The plant productions are recorded on a somewhat simliar type of form. This is so arranged that a horizontal line through a given weekly production of TNT marks off on the vertical columns the daily figure required from the particular plant for this weekly production of TNT (the figures are derived from the "Flow Chart"). Thus for normal working the ends of the shaded parts of the columns, representing the day's work, should approximate to a horizontal line, and any deviation from this would direct attention at once to abnormal working.

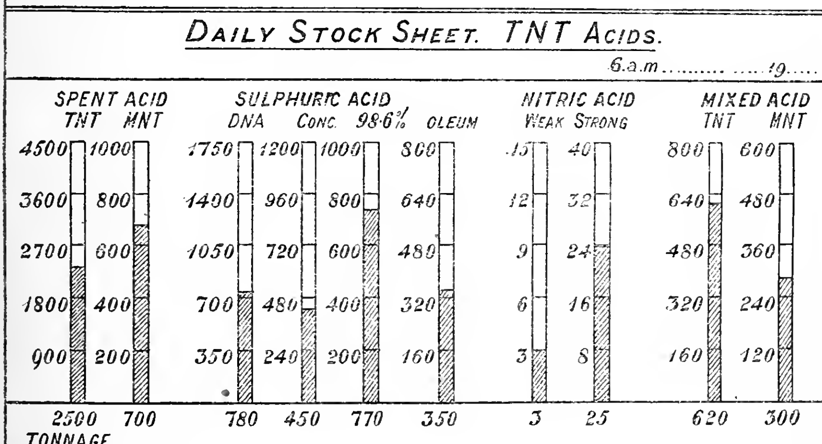
The daily production form alone is not sufficient to enable the production to be carefully watched over a period of some weeks, because a daily fluctuation in output may in some cases be unavoidable. To keep track, therefore, of these fluctuations, the excess (or deficit) should be noted and converted to equivalent tons of TNT. The excess (or deficit) is then added to the excess (or deficit) from the previous days' working, so that the over—or under—production to date for each plant can be noted. It is convenient to have these figures plotted as shown on page 127, where a production of sulphur trioxide is given for a period of three weeks. A similar graph would be made for each plant operation shown in the production form. A glance at these graphs (easily constructed by any girl clerk) will inform the manager each day, not only what parts of the factory are out of balance, but the amount of "boosting" or "checking" that may be necessary.

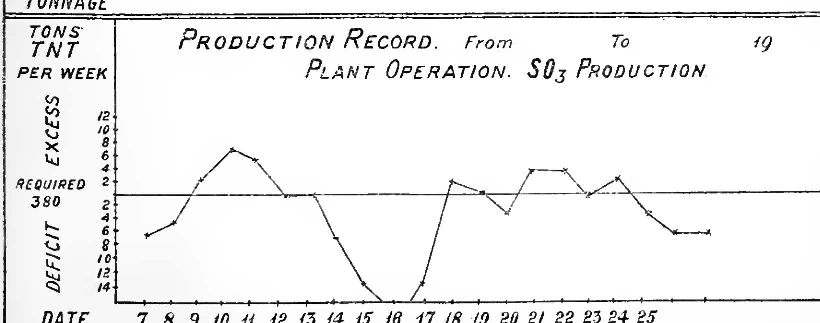
It will be clear that the success or failure of the method depends on whether the "Flow Chart" represents the actual working conditions of the plants involved; hence care must be taken in its construction, and any departure from previous practice which this chart standardises must be stopped or the chart amended accordingly.

With slight modifications, the method here outlined could be extended to the control of many chemical operations, but it will be evident that its main value lies in its application to multi-stage processes on a large scale. With such processes it is clear that only by some such method as that here described will the manager be able, with the minimum expenditure of time and energy, to comprehend daily the production position, and so control output effectively.


FLOW CHART FOR 100 TONS TNT.
GAILLARDS 98·5% Recovery
6·9T. H_2SO_4 LOSS
677·5 Tons DNA H_2SO_4 68·0% 460·7 T
DENITRATORS 80% HNO_3 Recovery 99·4% H_2SO_4 do.
4·8 T LOSS HNO_3
2·8 T LOSS H_2SO_4
132·7 Tons SPENT ACID H_2SO_4 72·3–95·9 T HNO_3 0·7–0·9 T
516·3 Tons SPENT ACID H_2SO_4 71·2–361·6 T HNO_3 4·4–22·7 T
TNT NITRATION
18·5 T LOSS H_2SO_4 64·5 T HNO_3
485·6 Tons MIXED ACID H_2SO_4 79·5%–386·1 T HNO_3 18·0%–87·4 T
MNT NITRATION
46 T LOSS H_2SO_4 33·4 T HNO_3
162·0 Tons MIXED ACID H_2SO_4 62·0%–100·4 T HNO_3 21·2%–34·3 T
37·3 Tons NITRIC A. HNO_3 51·0% 19·0 T
63·3 Tons SULPHURIC A. H_2SO_4 90·4% 57·2 T
ACID MIXING
102·3 Tons OLEUM H_2SO_4 105% 107·4 T
62·1 T SULPHUR (99%)
GRILLO 92·5% Recovery
334·9 Tons SULPHURIC A. H_2SO_4 90·4% 302·7 T
326·6 Tons SULPHURIC A. H_2SO_4 98·6 322·9 T
48·2 Tons SULPHURIC A. H_2SO_4 98·6 47·5 T
103·8 Tons SULPHURIC A. H_2SO_4 90·4% 93·9 T
RETORT MIXING
152·0 Tons SULPHURIC A. H_2SO_4 93·0% 141·4 T
RETORTS 95·0% Recovery
118·0 Tons NITRIC A. HNO_3 87·0% 102·7 T
148·8 Tons Na NO_3 (98%)


DAILY RECORD OF PLANT PRODUCTIONS.
For 24 hours ending 6 a.m. .... 19....
TONS TNT PER WEEK
500
400
300
200
100
DENITRATORS.
TREATED. TNT Spent Acid MNT
PRODUCED. HNO_3 DNA
OLEUM CONCENTRATORS RETORTS.
PRODUCED. SO_3 PRODUCED. Conc. S.A. PRODUCED. HNO_3
MIXERS. PRODUCED TNT Mixed Acid MNT
NITRATORS PRODUCED TNT MNT
370 296 222 148 74
100 80 60 40 20
15 12 9 6 3
475 380 285 190 95
110 88 66 44 22
300 240 180 120 60
70 56 42 28 14
350 280 210 140 70
120 96 72 48 24
171 57 43 28 14
42 34 25 17 8
TONNAGE.


DAILY STOCK SHEET. TNT ACIDS.
6 a.m. .... 19.....
SPENT ACID TNT MNT
SULPHURIC ACID DNA CONC. 98·6% OLEUM
NITRIC ACID WEAK STRONG
MIXED ACID TNT MNT
4500 3600 2700 1800 900
1000 800 600 400 200
1750 1400 1050 700 350
1200 960 720 480 240
1000 800 600 400 200
800 640 480 320 160
15 12 9 6 3
40 32 24 16 8
800 640 480 320 160
600 480 360 240 120
2500 700 780 450 770 350 3 25 620 300
TONNAGE


TONS TNT PER WEEK
PRODUCTION RECORD. From To 19
PLANT OPERATION. SO_3 PRODUCTION
EXCESS
12 10 8 6 4 2
REQUIRED 380
2 4 6 8 10 12 14
DEFICIT
DATE
7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

NEWS FROM THE SECTIONS.

CANADA.

Toronto Branch.

A very successful meeting was held at the Engineers' Club, Toronto, on February 20. Prof. E. G. R. Ardagh presided, and the subjects discussed included oleomargarine, a proposed exhibition of chemical products, the relation of undergraduates at Toronto University to the Branch, and the question of publicity in connexion with the Society.

The Order-in-Council, enacted during the war, authorising the importation, manufacture and sale of oleomargarine terminates in September next, and Canadian manufacturers are now urging its continuance on a permanent basis. This was also practically the unanimous opinion of the meeting. Mr. J. R. Donald urged that the Society should petition Parliament, and it was decided that the executive committee should consider the matter and report to the next meeting.

Canadian chemical manufacturers and makers of laboratory supplies are discussing the desirability of holding an exhibition on the lines of the successful expositions held in New York and Chicago. The occasion of the Canadian National Exhibition held yearly in Toronto would be eminently suitable, and it is hoped that the project will materialise in 1921. There is also a desire to have a display, if only a modest one, at the forthcoming joint meeting of the Society of Chemical Industry and the Convention of Canadian Chemists at Toronto in May.

A small committee was formed to consider and report on the question of publicity and the relations of the Society to the daily press. On the subject of undergraduates, it was suggested that efforts should be made to interest the student in the Society during his first year.

MANCHESTER.

On March 25, in the Rooms of the Manchester Literary and Philosophical Society, Mr. E. L. Rhead read a paper on "Non-ferrous Metals Used in Chemical Plant."

Attention was first directed to the subject of heterogeneity of structure and properties caused by the presence of impurities or by changes during solidification, mechanical treatment, or the effects of heat. The variations in behaviour of metals under similar conditions were traced to such causes, and the manner in which these differences were accentuated, diminished, and overcome were described. The troubles arising from the use of unsuitable lead and of lead containing oxide were indicated and insistence laid on the use of pure lead for acid work. Specimens showing the crystalline character of this metal, the manner in which antimony and copper separate completely from it, and samples showing corrosion due to local impurities were exhibited.

The corrosion of copper and copper alloys and the influence of variation in their physical properties were next discussed. It was shown that metal internally stressed, such as hard-rolled sheets or hard-drawn tubes, and subsequently imperfectly annealed, was more readily attacked and more liable to "season cracking," and it was suggested that the latter trouble arose from unequal stresses developed in the material by inequalities, and variation in the rates of flow. Attention was directed to the low elastic limit of copper and brass, materials which were unsuitable for valve seats for high-pressure and superheated steam, and for which nickel and nickel alloys could be usefully substituted. In connexion with copper alloys, reference was made to the "water line" corrosion of materials immersed to a small or great extent in corroding liquids, and it was suggested that the difference in the amount of corrosion occurring in these two cases might be due to electrical conditions produced by the "gas contact" at the surface. Corrosion due to contact between metal and other solid matter and accompanied by liberation of gases was also discussed. Finally, the author dealt with the resistance of aluminium to corrosion; "flaky" erosion due to physical differences and corrosion beginning with minute spots uniformly disseminated were referred to, and figures relating to the resistance of the metal to nitric acid and ammonia were given.

BIRMINGHAM.

The meeting held on March 11, with Mr. L. P. Wilson in the chair, was devoted to the reading and discussion of four papers on catalysis.

Dealing with "Catalysis Applied to the Oxidation of Oils," Dr. R. S. Morrell reviewed the literature of siccatives, and in connexion with the theory of drying emphasised the necessity for considering the interfacial tensions of drying-oil films to air, water and nitrogen. Measurements of surface tension of metallic drying oils had shown that lead differed markedly from cobalt and manganese, and these differences were best explained by Gibb's Rule.

Mr. A. W. Knapp, in his paper on "Catalysis Applied to Oil Hardening," reviewed the work of the past 15 years directed to discovering the most active form to be given to the nickel catalyst and the most suitable apparatus for effective contact. He had found that hardening could be performed by passing hydrogen through a solution of colloidal platinum or palladium made into an emulsion with fat with the aid of gum arabic. This process was unsuitable for commercial use, but a great improvement was effected by precipitating these metals on metallic magnesium, which was superior to the oxide. The author questioned the wholesomeness of some of the hardened fats which the public had been consuming.

Mr. L. P. Wilson spoke on catalysis in the oxidation of cellulose in the manufacture of artificial silk by the viscose process. The catalysts used were generally oxides or hydroxides of metals with two valencies (*e.g.*, Fe, Ni, Co, Ce, Va, or Mn). Lead had a negative value, but used in conjunction with manganese, the effect of the latter was increased.

A paper on "Catalysis Applied to Vulcanisation" was read by Dr. D. F. Twiss and Mr. S. A. Brazier.

A meeting was also held on March 25, at which Dr. A. Slator read a paper on "An Apparatus for Estimating Carbon Dioxide." This apparatus was originally devised to measure the carbon dioxide formed when sugars are fermented by yeast, but was found later to be generally applicable. The carbon dioxide is liberated in a distilling flask which is fitted with a trap and connected to a condenser through which the gas is delivered into standardised baryta solution. The apparatus can be exhausted, and the residual gas is eliminated by boiling the contents of the flask. The author indicated the possibility of estimating sugars by alcoholic fermentation on the lines of the above method.

Colonel J. G. Wright, of Toronto, contributed a paper on the dehydration of milk, in which he described the process devised by Dr. S. M. Dick, of Minneapolis, U.S.A., by which the milk is not subjected to a temperature higher than 71° C. The milk powder obtained is stated to be quite soluble, to be free from any "cooked" taste when redissolved, and to keep indefinitely.

The annual meeting was held during the evening. The following were elected members of the Local Committee: Prof. G. T. Morgan, Dr. T. J. Murray, and Messrs. H. J. Alcock, E. C. Rossiter and H. Silvester, in place of the retiring members, Messrs. F. H. Alcock, G. D. Fitzpatrick, F. C. Lantsberry, W. J. Pickering and Dr. E. W. Smith.

NOTTINGHAM.

At the meeting held on March 12, with Major S. R. Trotman in the chair, Prof. F. S. Kipping gave an account of his work, begun over 20 years ago, on the preparation of compounds containing an asymmetric silicon atom resoluble into optically active enantiomorphs.

Attempts directed to the preparation of derivatives of triphenylsilicane were not successful. The condensation of alcohols and phenols with silicon tetrachloride produced compounds containing an asymmetric silicon atom, which, however, were very unstable. In 1903 the author discovered that silicon tetrachloride would react with Grignard reagent giving compounds of the type $R_1R_2R_3SiCl$, but attempts to resolve these were unsuccessful. The further replacement of the chlorine atom by benzyl and the sulphonation of this compound gave a product containing two asymmetric silicon atoms which was resolved by means of the dextro-methylhydrindonium salt. Finally, by the use of chlorsulphonic acid, the compounds benzylmethylethylpropylsilicane sulphonic acid and dibenzylethylpropylsilicane monosulphonic acid were prepared, both of which gave well-crystallised salts with optically active bases. The latter compound was resolved into its optical antipodes by the aid of its brucine salt. An interesting class of compounds prepared in the course of these researches was the condensation products of the silicols $R_3.Si(OH)$, a further study of which, and also of the so-called siliconic acids, would doubtless throw considerable light on the structure of the silicic acids.

In replying to the discussion, Prof. Kipping mentioned that the first optically active silicon compound was only prepared after four years' work.

The hon. secretary's report, read at the annual meeting held on March 31, comments on the success of the meeting held at Derby, and on that held on March 11 (*cf. s.*), and suggests that a lecture on some definite achievement in pure chemistry might be made an annual event. All the meetings were well attended, but it is a matter for regret that the number of papers dealing with research work is not commensurate with the growth in membership.

In moving the adoption of the report Mr. Richmond referred to the honours recently conferred on members of the Section, *viz.*, Mr. F. H. Carr (chairman), Dr. W. J. Bowis and Mr. M. M. Barrowcliff (*cf.* p. 134 R). When Sir Jesse Boot offered the resources of his works to the Government, Mr. Carr was put in charge of operations, which included the preparation of gas-mask fillings, work on poison gases and the manufacture of saccharin. The production of sterilising tablets in amount sufficient to meet the Government demand was effected in four days of the most strenuous work. Reference was also made to the distinguished services of Major S. R. Trotman. The results of the election of the Officers and Committee were announced as follows:—Mr. J. H. Dunford succeeds Mr. Carr as chairman, Mr. J. T. Wood becomes a vice-chairman, and the new members of Committee are Messrs. D. J. Law, A. G. C. Paterson, A. D. Powell, E. B. R. Prideaux, H. D. Richmond and J. White.

Mr. J. T. Wood then gave an account of the applications of chemistry in tanning. The stretching of hides referred to in the Iliad gave results similar to those of the present-day oil tanning. The empirical methods of this ancient industry were founded on a chemistry more complex perhaps than any other. The chrome tanning process was then described, with various improvements, such as the use of sulphur dioxide instead of glucose as a reducing agent, introduced by Procter. The formation of gelatin tannate etc. could be well explained by the useful generalisations of colloid chemistry. Silica- and stannate-tanned leathers had been similarly produced.

AMERICA.

The annual meeting was held in New York on March 20. Mr. Sumner R. Church was elected chairman, and the vacancies on the Committee caused by the retirement of Messrs. T. R. Wagner, J. Teeple, H. S. Miner, C. W. Nicholls and T. R. Duggan were filled by the election of Messrs. C. E. Sholes (retiring chairman), R. J. McKee, H. R. Bishop, W. Cohoe, D. D. Jackson and H. G. Carroll.

GLASGOW.

The Section held a dinner on March 16 in honour of Professor C. H. Desch and Mrs. Desch, who are leaving Glasgow for Sheffield, where the former has been appointed professor of metallurgy. Speeches were made by Mr. Quintin Moore (chairman), Professor J. J. Henderson, and Mr. D. A. MacCullum, who voiced the general regret that the Section was losing its vice-chairman and the University two distinguished teachers and research chemists. Mrs. Desch, who is a Fellow of the Institute of Chemistry, gave lectures on chemistry at the University during the period of the war.

BRISTOL AND SOUTH WALES.

The annual meeting of the section was held on March 25, at the University, Bristol. Mr. E. Walls, chairman, presided. The following changes were made in the composition of the local executive:—Vice-chairman, Dr. C. M. Thompson; Committee: Messrs. W. R. Bird, H. E. Cox (hon. sec. of the South Wales sub-committee), J. H. Duncan, V. F. Eberle, and R. Robertson, in place of the retiring members, Messrs. L. J. Davies, J. M. Dodds, E. C. Evans, G. H. Hedley, and C. M. Thompson. There are now over 200 members on the roll of the section.

Following the business meeting, Prof. F. E. Francis gave an account of "Some Chemical Curiosities of the War," in which he dealt with recent applications of helium, argon, lethal and lachrymatory gases, catalysts, titanium and silicon chlorides for smoke screens, glycerin from sugar, acetone from carbide, etc.

MEETINGS OF OTHER SOCIETIES.

ROYAL SOCIETY OF ARTS.

A paper was read on March 24 by Mr. L. Gaster on "Industrial Lighting and its Relation to Efficiency." The connexion of proper lighting with increased output and better conditions of labour was shown, as well as its influence on the prevention of industrial accidents. An interesting experiment on improved lighting in Chicago was quoted, which was conducted with a large number of works embracing a wide variety of industries. The experiment included three periods:—(1) ordinary lighting; (2) improved lighting; (3) reversal to ordinary lighting. The results showed that, on a conservative estimate, an increased cost of lighting amounting to not more than 5 per cent. of the pay roll would lead to an increased production of quite 15 per cent. The small cost of installing good lighting was illustrated by the fact that in one case the lighting installation had cost only 3 per cent. of the entire first cost of the works. In conclusion, the speaker said that though Great Britain had been the pioneer in industrial lighting, as in the Safety First movement, she had fallen somewhat to the rear, and expressed the hope that the lead formerly held would be regained.

THE CHEMICAL SOCIETY.

The presidential address was delivered on March 25 by Sir James J. Dobbie on the occasion of the annual meeting of the Society.

One of the most significant consequences of the war is the recognition by Government that it is the duty of the State to intervene in the development and protection of "key" industries, and the closing words of the Report of the Nitrogen Products Committee that, "as far as the United Kingdom is concerned, nitrogen fixaton and allied processes will constitute a new "key" industry," are of enormous importance to our country.

The speaker described the main facts relating to the supply and disposal of the chief industrial nitrogen compounds in England and Germany both before and during the war (this J., 1920, 25 R), and, in referring to the critical condition in regard to supplies of these compounds which this country experienced in 1916—1917, and the means taken to alleviate it, said that the scientific and technical work of the Nitrogen Products Committee would form a lasting memorial to the skill and energy of the chemists and physicists who took part in it.

The question of having at our disposal abundant supplies of nitrogen products is also of great importance in times of peace, notably for agricultural purposes, and there is urgent need for exploiting the industrial possibilities of a cheap and abundant supply of synthetic ammonia. The Solvay process, for example, is stated to be already in operation in Germany in association with the Haber process; and increased production of atmospheric nitrogen will lead to developments in the use of the oxygen and rarer elements of the air. Many branches of the nitrogen problem still call for investigation both in connexion with the by-product and the synthetic industries; for example, low-temperature carbonisation (now under investigation by the Fuel Research Board), the utilisation of by-products obtained at electric power stations in the treatment of coal for recovery of ammonia, and the Häusser process, by which the heat of explosion of a mixture of combustible gas and air is used to effect the union of nitrogen and oxygen. It is satisfactory to note that the syndicate which is taking over the undeveloped nitrogen works at Billingham-on-Tees has also taken over the section of the staff engaged on the synthetic ammonia problem, and that important nitrogen fixation schemes are in course of development in Egypt, South Africa, Canada, Newfoundland, the West Indies, New Zealand, Ceylon, and India.

Our past attitude towards the nitrogen problem illustrates a defect in our attitude towards such problems generally. Where our individual interests are not affected we are prone to be indifferent to and to overlook developments in other countries which in their results may be of vital importance to us as a nation. Hence it was that before the war no consideration whatever was given to the national aspects of the nitrogen question either in peace or war conditions, and that no precautions were taken against the more obvious dangers.

In the course of its long inquiry the Nitrogen Products Comittee experienced great difficulty in obtaining accurate statistical and other information, and in some cases no data whatever were procurable; therefore the Committee's recommendation that annual statistics of the nitrogen and other industries should be officially collected and published was worthy of the strongest support. At the beginning of the war, too, we possessed no adequate account of the state of the nitrogen industries on the Continent, and it is urgently desirable that means should be devised of keeping the departments concerned with the technical and scientific work of the nation in close touch with developments abroad. Like the citizens of "The New Atlantis," we, too, have need of "merchants of light" who will journey into foreign countries and bring back "books and abstracts and patterns of experiments of all other parts."

THE FARADAY SOCIETY.

The general discussion, held on March 23, on "Basic Slags: Their Production and Utilisation in Agriculture and other Industries" was noteworthy inasmuch as it brought together chemists, steelmakers and agriculturists on a common platform. Prof. F. G. Donnan occupied the chair.

The question of obtaining adequate supplies of basic slag has of late assumed increased importance owing to the practical supersession of the Bessemer process of steel manufacture by the open-hearth basic process, which furnishes a poorer slag. Dr. E. J. Russell classified the types of slag now in use into (1) Bessemer slag, containing about 20% of P_2O_5, (2) open-hearth basic slag with 7—14% P_2O_5, and (3) open-hearth basic slag into the production of which calcium fluoride had entered, with 7—10% P_2O_5. Allowing for their different P_2O_5-contents, (1) and (2) are of equal value in agriculture, but (3) has proved to be less effective. The phosphoric content was, probably, rightly assumed to be the most effective component, but there is scope for inquiry in regard to the action of calcium, manganese, and iron; the silico-phosphate, presumably present, may have more value than the normal phosphate alone. Home agriculture requires from 300,000 to 400,000 tons of Bessemer slag annually, and its provision was of vital importance. To the steelmaker basic slag was a by-product, yet it might prove to his advantage to improve its quality. The phosphorus content might be increased by enriching the pig-iron, by fractionating the slag (probably the best method), or by adding ground mineral phosphate to the molten slag. A further problem was to increase the availability of the phosphorus content of fluorspar slags.

Dr. J. E. Stead said that he did not see how the solubility of the fluorspar slags could be improved; mineral phosphate might advantageously be ground with the basic slag, but there was apparently no practicable method of incorporating the mineral with the molten slag so as to produce a homogeneous mixture. Mr. D. Sillars said that in Germany mineral phosphate was blown by an air blast into the liquid slag, and that the use of fluorspar could be obviated by reducing the sulphur in the fuel.

Sir T. H. Middleton dealt with basic slag from the national standpoint. He showed its value for the improvement of grassland and the bearing of this upon the increase of the area of tillage land and on our supply of home-grown food. In a paper on "A Comparison of the Effect of Various Types of Open-hearth Basic Slags on Grassland," Mr. G. S. Robertson maintained the inadequacy of the official citric acid solubility test; important differences might exist between two slags of this type showing the same solubility. Therefore extended field trials should be undertaken to compare the fertilising values of the different slags.

A paper on the "Solubility of Basic Slags," by Dr. Stead with Messrs. F. Bainbridge and E. W. Jackson, showed that the low citric solubility of fluorspar slags was due to the formation of artificial apatite. Mr. D. Sillars contributed a paper containing a useful description and comparison of the Bessemer and basic open-hearth processes from the point of view of the nature of the basic slag produced. He and other representatives of the steelmakers took a prominent part in the discussion. Willingness to co-operate with agricultural interests was expressed by all, but no definite practical proposal was made. It was, however, agreed to form a committee, under the *ægis* of the Ministry of Agriculture, to bring together representatives of the interests concerned.

NEWS AND NOTES.

UNITED STATES.

Research on Vitamines.—The Committee on Food and Nutrition, Division of Biology and Agriculture, of the National Research Council, has planned a very extensive programme of work in which the investigation of the vitamine content of various foods is prominent. It is understood that the work will cover foods of all classes and also experiments on the effect of heat upon these accessory substances. The comparison of the vitamine content of commercial canned foods, home-canned foods, and home-cooked foods will be of especial interest.

Yeast-Foods.—Experiments have been conducted on so-called yeast-foods with the following results in the case of one of the better known preparations. In making 1000 loaves, each weighing 1·5 lb., 4·92 lb. of the stimulant was used, and the quantities of the individual constituents were:—Calcium sulphate 1·23 lb., ammonium chloride 0·48 lb., potassium bromate 0·01 lb., sodium chloride 1·23 lb., flour 1·97 lb. The savings recorded were as follows:—Flour 9·5 lb., sugar 4·19 lb., salt 1·19 lb., yeast 5·80 lb., shortening 0·41 lb. It appears that the character of the gluten is also changed, enabling bread of better appearance to be made from low-grade flours and without affecting nutritive qualities.

Milk-Containers.—In view of the probability that glass bottles will become more costly owing to labour and fuel conditions, efforts to produce a container from waste paper and wood pulp have been increased. A new process which blows the pulp upon the form and then dries it by blowing through air heated to 600° F., is stated to produce a good container at a low cost. One dollar's worth of ground wood pulp will produce 2133 one-pint bottles at a manufacturing cost lower than that of collecting and washing glass bottles. There are still some problems to be solved in connexion with proofing the container with material that will resist oils, fats, and water without imparting a disagreeable flavour and being at the same time cheap and easy to apply.

The American Ceramic Society.—During the recent meeting of the American Ceramic Society 131 papers were presented, many of which contained results of scientific value. In several of the discussions the point was brought out that the value of scientific investigation is now becoming more and more appreciated in this industry, which is evidenced by the way in which many firms have set up their own scientific organisations. It is, however, recognised that there is place for co-operative effort, and the Glass Division of the Society has appointed a committee to co-operate with the National Research Council for the purpose of selecting subjects for investigation, inquiring into facilities available for the work, selecting suitable *personnel*, and elaborating a sound scheme of finance.

Corrosion of Hot-water Pipes.—It has been found that the corrosion of pipes in hot-water heating systems is due to the free oxygen present. In systems provided with storage tanks containing expanded steel lathing or metal plates, or those that have open heaters where gases can escape, no corrosion has been found after many years of service. The advice formerly given in regard to wash-out systems, to replace the water occasionally, is now being superseded by directions merely to draw off any accumulated sediment and introduce fresh water only when necessary. Corrosion on the plates of steam turbines has been retarded or stopped by the use of heavy paraffin base oil which forms a protective coating.

Use of Buttermilk in Bread.—A method has been devised for condensing buttermilk into a semi-solid smooth paste having a high nutritive value. Used in bread-making, it gives a loaf of increased food value and with an agreeable flavour; also the lactose combines with the dextrine to make a delicious brown crust, which appears at a comparatively low baking temperature.

Wood-Alcohol Poisoning.—Following the enactment of prohibition legislation, the occurrence of a large number of cases of wood-alcohol poisoning has given rise to the passing of many measures designed to protect the public. In one State, manufacturers, distributors, and dealers in alcoholic preparations not recognised by the Pharmacopœia or the National Formulary must satisfy the State Department of Health that the preparations do not contain wood alcohol; and the Attorney-General's Department is empowered to place an embargo on all non-official preparations containing alcohol, unless the authorities are satisfied that no wood alcohol is present. The situation is of interest to chemists, since at the present price of wood alcohol (two or three times that of denatured alcohol) it is evident that the usual source of wood-alcohol poisoning is the denaturing substance in denatured alcohol, and it is feared that unless poisoning can be lessened by co-operative effort, legislation may be enacted which will be detrimental to chemical interests. The high cost of methyl alcohol is due to the demand for it in the dye industry.

BRITISH INDIA.

The Indigo Industry.—The revival of the indigo industry in India is the subject of a communication from Prof. H. E. Armstrong to *The Times* of April 8. Recent progress has been so substantial that success appears to be assured. Lack of union among the planters should cease now that an Indigo Planters' Co-operative Association has been established with the main object of effecting the necessary centralisation of the final stages of manufacture. From information supplied by Mr. W. A. Davis, Indigo Research Chemist at Pusa, it appears that the decline in fertility of the indigo estates is in process of being arrested by increased application of phosphatic manures, and that the supply of the latter will be much improved as the projected increased production of sulphuric acid materialises. Valuable data have been obtained on the effect of different conditions of growth on the percentage of potential colouring matter in the plant, and on the extraction process; as the latter becomes understood, the output should be increased by a maximum of 50 per cent. Prof. Armstrong reiterates his conviction that natural indigo is much superior to synthetic indigotin—as a vintage wine is superior to manufactured alcohol—and in support states that extended trials on a practical scale made by Messrs. G. Garrett and Sons have recently shown that the depth of shade produced with the natural paste is from 5 to 20 per cent. deeper than when dyed with indigotin. Indian indigo has been in great demand of late for Japan and at prices above those which ruled in the old prosperous days, but it cannot compete with synthetic indigotin in the English market owing to loss on exchange and high freight charges. There is no doubt that for many years the Eastern market will absorb the whole of the Indian output. In 1913 Germany and Switzerland exported to China the equivalent of 9000 tons of 60 per cent. indigotin indigo; last year India produced only 600 tons of this grade, and even when the industry was at its highest the average production was only about 7,000 tons per annum.

SOUTH AFRICA.

New Pig-Iron Industry in Northern Natal.—A new plant is being erected at Newcastle, Natal, which will have an output of from 100—120 tons of pig-iron every 24 hours. The ore is either hæmatite or magnetite, and contains from 50—65 per cent. of metallic iron; it is obtainable within a radius of 50 or 60 miles. Production is expected to begin in April or May of this year.—(*U.S. Com. Rep., Feb.* 28, 1920.)

Coal Exports.—The quantity of coal exported from the Union in 1919 was 1,208,000 short tons, valued at £1,033,000, compared with 856,000 short tons, worth £337,000, in 1913. There was a decrease in the amount of bunker coal shipped, *viz.*, 1,276,000 as against 1,452,000 short tons in 1913, the corresponding values being £1,906,000 and £1,502,000. During the past year new markets have been found for South African coal, notably Argentina, Uruguay, British East Indies and Egypt. On the other hand, consignments to Portugese East Africa fell off considerably.—(*Official.*)

FRANCE.

Artificial Silk Manufacture.—The world's production of artificial silk rose from 2000 metric tons in 1902 to 5000 tons in 1906 and 8000 in 1914. The production in Germany is estimated at 5 tons daily, and that of France, as soon as certain new installations are completed, will show a capacity of 4 tons per day. Lack of fuel and transport are more serious obstacles to the recovery of the industry than shortage of raw materials. A certain amount of viscose silk was used for war purposes, including sacks for explosives and gas-mask fabrics. In the years before the war the development of the artificial silk industry had no injurious effect upon that of real silk, which showed a correlative expansion. At Lyon a product known as silk cellulose is being manufactured by an entirely new process (U.S. Pat. 1,184,820). This new product has a brilliancy comparable with that of schappe silk, and its properties are closer to those of natural silk than any of the older artificial silks. The new silk, moreover, can be spun into threads considerably finer than those of ordinary artificial silk, and is particularly suitable for the manufacture of velvets. It is stated that the structure of the wood fibre is preserved, and the regular geometric form of the elements contributes greatly to the strength and durability of the fabric. A demand for the lowering of the import duty on artificial silk (15 fr. per kg.) in France has been rejected, because it is considered that owing to the shortage in all countries of the world at the present time a lowering of the duty would not materially increase importation.—(*U.S. Com. Rep., Feb.* 14, 1920).

GENERAL.

Report of the Tropical Agricultural Committee.—The committee appointed by the Secretary of State for the Colonies to consider the desirability of establishing a Tropical Agricultural College in the British West Indies has reported that, as a matter of Imperial concern, steps should at once be taken in this direction. The importance is shown of providing instruction in the principles of agriculture and the cultivation and preparation of tropical produce, so much of which constitutes the raw material employed in the mother country. Equal importance is assigned to the need of full provision for the prosecution of research and for the training of scientific investigators in tropical agriculture. The Committee further recommends that the College be established in Trinidad, as this island possesses a wide variety of industries and is of easy access; and that it should be incorporated in the United Kingdom as a company limited by guarantee, prior to the grant of a Royal Charter. The subjects taught at the College should include agricultural and organic chemistry, sugar technology and agricultural engineering and physics, as well as the usual agricultural subjects. Provision should be made for a school of sugar technology equipped with a small but complete plant on a working scale, and an oil technology branch might be added if Trinidad be selected. In the event of Trinidad and the Windward and Leeward Islands being unable to provide adequate support for the projected institution, it is proposed to reconsider the claims of Jamaica.

Chemical Research in the Sudan.—Throughout the difficult period of the last five years scientific work has been carried on in the Anglo-Egyptian Sudan at the Wellcome Tropical Research Laboratories at Khartoum, which, built by the Sudan Government in 1903—4 and equipped by the generosity of Mr. H. S. Wellcome, have proved to be a real centre of scientific research in Central Africa. Much of the work done has been bacteriological, and both the first director, Dr. Andrew Balfour, and his successor, Dr. A. J. Chalmers, whose retirement in March will be a great loss to the laboratories, have produced a steady stream of valuable scientific contributions. The chemical section was from its beginning presided over by the late Dr. W. Beam, whose death in April last at the age of 55 was deeply regretted. Dr. Beam devoted most of his time to research work on chemical matters of local interest, much of which is published in the reports of the Wellcome Laboratories. Since 1911, however, the work has appeared in various other publications: his last paper—on the estimation of small quantities of antimony (Beam and Freak)—appeared in the *Analyst* for 1919. Dr. Beam has been succeeded by Dr. A. F. Joseph, formerly professor of chemistry at the Ceylon Medical College, from whom will be found a contribution on the important subject of the Nile Sudd in another part of this issue (p. 91 T). With easier times ahead it is to be hoped that the great development of the Sudan which is expected to take place will be accompanied by a corresponding growth in its scientific exploration.

The Alsatian Potash Industry.—Since the armistice the output of the potash mines in Alsace has increased by over 300 per cent. In 1913 approximately 696,000 metric tons was produced, and in November last the output was 74,484 tons. From January to November, 1919, the average production per miner rose from 0·933 to 1·48 tons per day, and the average daily wage varied from 22 to 23 francs. The estimated production of crude potash during 1920 is 1,320,000 tons (=about 220,000 tons K_2O), 2,040,000 tons for 1921, and 2,340,000 tons for 1922. The transport crisis has much hindered the exportation, the only economical way at present being to ship by rail to Strasbourg, and thence by barge to Rotterdam or Antwerp. Since May, 1919, some 100,000 tons of potash of various grades have been shipped to the United States. There have been rumours of a possible understanding between the German and French potash interests respecting the control of sales and prices, but such an understanding would meet with much opposition.—(*U.S. Com. Rep., Feb.* 20, 1920.)

The Potash Situation in Germany.—The Potash Syndicate has officially notified that the production in 1919 was 8·6 million double cwt. (860,000 metric tons) of pure potash (K_2O), of which about 6·2 millions was consumed in Germany. These figures compare with 11 millions and 5·3 millions, respectively, in 1913. The home demand exceeds 10 million double cwt., and as the demand from abroad is at least equal to this the Syndicate is compelled to turn down many foreign orders. Owing to coal shortage about one-half of the mines is lying idle, and added to this there is a shortage of railway trucks. Recently barges with a combined freight-space of 40,000 tons had to return empty from Hanover to the Rhine because there were no trucks available to convey potash salts to them. Agriculture in East Germany is, in particular, suffering from these conditions. The Syndicate is of the opinion that the only hope of improvement lies in abandoning the 8-hour day and the paying of wages by time-rate to workers in the transport services and factories where locomotives and railway material are turned out.—(*Chem. Ind., Feb.* 5, 1920.)

Potash Felspar in Norway.—In a recent address Mr. A. Holter, a Norwegian engineer, referred to the suggestion that a material containing a higher percentage of potash, *e.g.*, potash felspar, should be used in the manufacture of cement. Norway, he pointed out, has abundant supplies of this felspar, and the quantity hitherto exported has not exceeded 30,000 tons—40,000 tons a year, including the higher grade sorted felspar, the supply of which is limited. Millions of tons of impure felspar lying near the seaboard remain to be exploited, and Mr. Holter is of the opinion that much of the first-grade rock can and will be used by the cement industry, thus opening up prospects of a big export trade in the second-grade material. Tests carried out by a Norwegian company have shown that the raw material gives an excellent cement. If in the near future the entire Norwegian cement industry attains an output of 2·5—3 million barrels per annum, and if the native felspar be utilised by all the works, then the production of potash would practically cover the country's requirements.—(*Nororwegian Trade Review*, 1919, 4, 63—66.)

Wage Rates in the Danish Chemical Industry.—The following table gives the wages paid in *ore* (100 *ore* =1s. 1½d.) per hour in the Danish chemical industry:—

	1914.	April-June, 1919.
Dyeing improvers ...	— ...	141·8
Oilmill ,, ...	58·4 ...	145·5
Oilmill hands	43·4 ...	120·4
Rubber workers ...	— ...	125·4
Male hands	— ...	73·4
Female ,, ...	50·0 ...	125·5
Sulphuric acid workers	46·6 ...	118·9
Hands in other trades	27·8 ...	69·1

Wages have not risen to the same extent as in other countries, so that labour in the Danish chemical industry is comparatively cheap.—(*Z. angew. Chem., Jan.* 2, 1920.)

Wage Rates in the German Chemical Industry.—The *Reichsarbeitblatt* for December, 1919, gives the wages paid per hour in the German chemical industry as follows:—

	1914 Pf.	1917 Pf.	1918 Pf.	Dec. 1918 Pf.
Locksmiths	47	68	85	155
Artisans in building trade ...	45	64	77	130
Boiler foremen and machinists	42	56	69	127
Foremen	42	54	67	124
Laboratory hands	38	56	69	118
Outdoor workers	34	48	67½	113
Juvenile workers	—	42	52½	65
Female workers	—	37½	45½	80

—(*Chem. Ind., Jan.* 27, 1920.)

The Bohemian Glass Industry.—Of the 129 glass factories in the former Empire of Austria-Hungary 103 are located in Czecho-Slovakia, and for the nine months ended October 31, 1919, the exports of glass from this new republic amounted to 17 million kronen (krone=10d.). An official report states that the industry has been revived with great difficulty, the chief obstacle being shortage of coal and raw materials. Owing to these causes, most of the factories are only working single shifts. The industry was also threatened with foreign competition, but by prompt attention to the export trade, the Bohemian glass makers have retained most of their old markets, and at the present time the entire outputs are sold for a long time ahead.—(*U.S. Com. Rep., Jan.* 31, 1920.)

Graphite Production in German Austria.—Both in Germany and Austria there was a great shortage of graphite during the war. As only flake graphite is suitable for making graphite crucibles, the deposits in South Bohemia and Lower Austria alone were of any use. According to *Bergbau und Hütte*, the quartz-glass crucibles used as substitutes were not satisfactory. Before the war the production of flake graphite was much neglected, practically the whole demand being satisfied from Ceylon and Madagascar. Latterly the home production and manufacture of graphite products have been so much developed that it is believed that the country is now independent of imported material. Among the localities where graphite mining has been developed since 1914 are Hengstberg (near Korning, in Lower Austria), Oetz (near Spitz, on the Danube), the neighbourhood of Waidhofen, etc.—(*Schweiz. Chem.-Z., Feb.* 25, 1920.)

The Carbide Industry in Norway.—The Norwegian carbide industry, which was greatly developed during the war, has of late suffered a serious setback. At the present time it is undergoing a crisis; many factories have had either to reduce their output or to close down, and it is feared that some of the producing companies will go into liquidation.—(*Schweiz. Chem.-Z., Feb.* 16, 1920.)

The Carbide Industry in Bavaria.—With the exception of a small factory in Freyung vor dem Walde, which was enlarged during the war to a capacity of 6000 tons of carbide, the Bavarian industry is confined to two works, both the property of the Bavarian Nitrogen Works Co. One of these, which already before the war had an annual output capacity of 15,000 tons, is supplied with power from its own water power installation at Tacherting a.d. Alz. These works have recently been extended to utilise an additional 24,000 h.-p., and to produce a further 50,000 tons per annum. The works of the Wacker Co. has at present only one carbide furnace; it obtains its 4000 h.-p. from Austria, and is planning to use an additional 36,000 h.-p., which, however, will not be available for two or three years. The carbide produced at this factory is used for making acetone, acetic acid, alcohol, etc., while the output from the larger works above mentioned is utilised solely for conversion into cyanamide at the company's plant in Trostberg.—(*Schweiz. Chem.-Z., Feb.* 16, 1920.)

Electricity Supply Undertakings in Germany.—A law was passed in December last to provide for the division of the whole country into districts, each being provided with a board under Government control. All plants used for generating or distributing electricity will be controlled by these boards, save such as belong to companies which generate the electricity mainly or wholly for their own use. Plants with a capacity of 5,000 kw. or more are affected, and those in course of development may be taken over if so desired by the owners, the indemnity to be based either on the running costs or on the income over an average of the three years before the war. In case of appeal, a court of arbitrators is to be appointed, the final court of appeal being the Supreme Court of the Finance Ministry.—(*Mitt. Reichb. d. Techn., Dec.* 27, 1919.)

Magnesite and Talc Deposits in Manchuria.—It is reported that the magnesite and talc deposits in Manchuria are very extensive and have great potential value. All the deposits are situated between 3—10 miles of the South Manchurian Railway and are mostly under Japanese control. The talc is said to compare favourably with the high-grade French product.—(*U.S. Com. Rep., Jan.,* 20, 1920.)

Sulphur Production in Germany.—Before the war the supply of sulphuric acid in Germany was almost exclusively derived from sulphur contained in imported pyrites, but some was obtained from the gases evolved in the roasting of zinc and lead ores. The sulphur dioxide obtained from the zinc smelters, by burning sulphur, and from spent oxide, was employed principally in the cellulose and sugar industries. When foreign supplies were cut off at the outbreak of war attention was turned to home sources, and large deposits of pyrites, more particularly those occurring at Messen, were reopened; spent oxide was utilised more efficiently; use was made of substances like kieserite and gypsum; and the production of sulphur dioxide from kieserite by heating it with coal in revolving furnaces was undertaken by the Griesheim-Elektron company. In 1915, when peace still seemed distant, much attention had to be given to the provision of elementary sulphur, the pre-war consumption of which was about 45,000 tons per annum. Deposits of native sulphur are scarce in Germany, and although some occur in the districts of Rybnick and Ratibor, these contain barely 10 per cent. of sulphur, and the technique of treatment has not been developed. The problem was solved by reducing gypsum to calcium sulphide and burning the hydrogen sulphide obtained from this to sulphur and water. The calcium sulphide was converted to hydrogen sulphide with magnesium chloride liquor, as discovered by Schaffner and Helbig. The manufacture was undertaken by Sulfur G.m.b.H. on the property of a disused cement works near Walbeck, and by the Deutsche Claus-Schwefel-Gesellschaft at Bernburg, both of which obtained magnesium chloride from neighbouring potash works. Operations were commenced in January, 1917, and by the end of the year were working smoothly. The output of the Bernburg factory is now 30 tons a day. The process of production from anhydrite is as follows: The mineral is broken up, dried, mixed with dry coal, and heated in a revolving furnace to about 1100° C. After cooling, the product, containing about 70 per cent. calcium sulphide, is ground up and treated with magnesium chloride liquor, the whole being heated with live steam. The hydrogen sulphide evolved is passed to a gasometer, mixed with air, and then passed downwards through four large Claus furnaces, containing bauxite as contact material. The sulphur obtained is of 99·95 per cent. purity. The waste gases are passed into a cold dust chamber, where more sulphur is deposited. The spent liquor containing calcium chloride and magnesium hydrate is pumped into large reservoirs, and after settling the clear solution is run off (cf. this J., 1919, 285 R). Up to the end of 1919, 22,300 tons of elementary sulphur had been produced by this process. The plants are still in operation, as the sulphur so obtained is cheaper than the imported article. Attempts are now being made to improve efficiencies; at present the yield of calcium sulphide is barely 60 per cent. of the theoretical, but this could be much improved by the use of plant specially built for the purpose; in fact, a 90 per cent. yield should be attainable; and, further, it is considered possible that in course of time the cost of production of sulphur by this process will be on a level with that of its production from the native element. The "Badische" company attempted to produce sulphur from gypsum by reducing the sulphur dioxide liberated from it with carbon monoxide, both reactions proceeding simultaneously in a blast furnace. Practically no output was obtained from a plant erected to produce about 5,000 tons a month. —(*Z. angew. Chem., Mar.* 2, 1920.)

PERSONALIA.

Mr. B. D. Porritt, chief chemist to the North British Rubber Co., has been appointed director of research by The Research Association of British Rubber and Tyre Manufacturers.

Mr. C. L. Claremont has been appointed by the Ministry of Agriculture and Fisheries chemist for research work in connexion with the Rats and Mice (Destruction) Act, 1919.

The following are among the announcements of appointments to or promotions in the Order of the British Empire (Civil Division):—

Knight Grand Cross (G.B.E.): Prof. A. E. Shipley (Vice-Chancellor of Cambridge University).

Knight Commanders (K.B.E.): Mr. R. W. Cohen (Petroleum Adviser to the War Office); Dr. S. F. Harmer (Director of the Natural History Departments, British Museum); Mr. A. Mansfield (Director of Oils and Fats, Ministry of Food); Dr. J. E. Petavel (Director, National Physical Laboratory).

Commanders (C.B.E.): Mr. G. S. Albright (Messrs. Albright and Wilson, Ltd.); Mr. D. H. Baird (Messrs. Baird and Tatlock (London), Ltd.); Mr. J. C. Burnham (Superintendent, H.M. Factory, Gretna*); Prof. H. L. Callendar (Professor of Physics, Imperial College); Dr. C. C. Carpenter (Chairman, South Metropolitan Gas Co.); Mr. F. H. Carr (British Drug Houses, Ltd.); Capt. A. P. H. Desborough (Superintendent, R.N. Cordite Factory, Holton Heath); Prof. F. G. Donnan (Munitions Inventions Panel*); Prof. P. F. Frankland (Deputy Inspector of High Explosives*); Mr. W. Gavin (late Director of Flax Production); Prof. J. C. Irvine (Chemical Warfare Research Committee*); Mr. J. G. Lawn (late Professor, Johannesburg School of Mines*); Mr. Michael Longridge (Munitions Inventions Panel*); Dr. T. M. Lowry (Ordnance Committee*); Mr. W. Macnab (Technical Adviser, Explosives Supply Dept.*); Dr. R. A. O'Brien (Director, Wellcome Physiological Research Laboratories); Mr. G. Stubbs (Government Laboratory); Mr. W. J. U. Woolcock (Association of British Chemical Manufacturers).

Officers (O.B.E.): Mr. C. E. Alexander (Director, United Glass Bottle Manufacturers, Ltd.); Mr. P. R. Allen (Castner-Kellner Alkali Co., Ltd.); Mr. H. J. Bailey (Technical Adviser, Acids Section, Explosives Supply Dept.*); Mr. W. R. Barclay (Technical Adviser, Non-Ferrous Metals Dept.*); Mr. E. Batty (Assistant Controller, Optical, Glassware and Potash Dept.*); Mr. E. Bury (Skinningrove Iron Co., Ltd.); Mr. E. R. Deacon (Research Chemist, Woolwich Arsenal); Mr. W. P. Dreaper (Superintendent, H.M. Factory, Ellesmere Port*); Mr. E. V. Evans (Chief Chemist, South Metropolitan Gas Co.); Dr. J. J. Fox (Government Laboratory); Mr. T. E. Gardner (Director, West Riding Chemical Co.); Mr. W. H. Gibson (Royal Arsenal, Woolwich); Dr. F. H. Hatch (Iron and Steel Production Dept.*); Mr. J. C. W. Humfrey (Chief Analyst, Sheffield Laboratory*); Mr. H. Johnson (General Manager, Courtaulds, Ltd.); Mr. F. W. Jones (Chemist and Consultant on Explosives*); Mr. T. E. Lescher (Hon. Sec. The Drug Club); Prof. G. T. Morgan (Chemical Warfare Dept.*); Dr. J. E. Myers (Chemical Warfare Dept.*); Mr. G. H. Perry (Director of Chemical Division, Inspection Dept.*); Mr. R. B. Pilcher (Registrar, Institute of Chemistry); Mr. O. F. A. Sandberg (Steel Expert, Inspection Dept.*); Mr. C. Simmonds (Govt. Laboratory); Mr. J. Kent Smith (Technical Director, Kent Smith, Ltd., Sheffield); Dr. H. Lloyd Snape (War Pensions Advisory Committee); Mr. H. Stephens (Chemical Warfare Dept.*); Mr. H. B. Stevens (Manager,

* Ministry of Munitions.

J. Bell, Hills and Lucas, Ltd.); Mr. C. E. Stromeyer (Manchester Steam Users' Association); Mr. C. D. Sykes (Works Manager, Albright and Wilson, Ltd.); Mr. P. Tainsh (Explosives Supply Dept.*); Mr. A. W. Tangye (Chemist, Brunner, Mond and Co., Ltd.); Mr. Thorpe Whitaker (Adviser to Dyes Dept., Board of Trade); Mr. T. J. Underhill (Inspector, Victualling Stores, Deptford).

Members (M.B.E.): Mr. C. W. Bailey (Chief Chemist, H.M. Factory, Langwith*); Mr. M. Barrowcloff (Boot's Pure Drug Stores, Ltd.); Mr. D. Burton (Chemist, High Explosives Inspection Dept.*); Dr. H. T. Calvert (Explosives Supply Dept.*); Mr. A. S. Cobden (Chief Accountant, H.M. Factory, Oldbury*); Mr. J. S. Dick (Research Chemist, Woodwich Arsenal); Mr. P. V. Dupré (scientific services to various Govt. Depts.); Mr. W. B. Edwards and Mr. A. E. Garland (Principal Assistant Chemists, Directorate of Chemical Inspection*); Mr. A. T. Etheridge, Mr. A. Forster, and Mr. R. Genders (Research Chemists, Woolwich Arsenal); Mr. K. C. D. Hickman (Research Chemist, Chemist Projectile Laboratory*); Mr. H. J. Hodsman, High Explosives Inspection Dept.*); Mr. W. C. Hothersall (Research Chemist, Wolwich Arsenal); Mr. J. P. Millington (Censor, War Office); Mr. L. Orange (Explosives Supply Dept.*); Mr. C. J. Peddle (Derby Crown Glass Co., Ltd.); Dr. H. E. Watts (Explosives Supply Dept.*).

PARLIAMENTARY NEWS.

Protection of Special Industries Act, 1920.

A Bill was introduced in the House of Lords, and read a first time, on March 17, which is designed "to prevent dumping and to establish a Special Industries Council to advise as to the promotion and assistance of Special Industries." It may be briefly summarised as follows:—When the prices charged for goods imported into the United Kingdom are less than those current in the country of origin, the importation of such goods may be prohibited by order of the Board of Trade. Any such order shall be laid before Parliament within one month after it is made. A council, known as the Special Industries Council, shall be established to advise the Board of Trade as to the measures needed to promote and assist such special industries. "Special industries" are defined as those supplying commodities which are essential to the national safety, as being absolutely indispensable to important industries carried on in the United Kingdom, and which are entirely or mainly supplied from abroad. They include the production or manufacture of synthetic dyes and drugs, spelter, tungsten, magnetos, optical and chemical glass, illuminating glassware, scientific and optical instruments, hosiery needles, and thorium nitrate. The Council will consist of five to nine persons of commercial and industrial experience, who will be appointed by the President of the Board of Trade. The duty of the Council will be to watch the course of industrial development and, in consultation with any Government department interested, advise the Board as to the promotion and assistance of any "special industry." It may examine any proposals to this effect and advise the Board what steps should be taken and on what terms assistance should be given. A detailed report of the proceedings of the Council has to be presented to Parliament each year. Any application to the Board for State assistance for a special industry shall be laid before the Council, together with any information in the possession of the Board regarding such industry, and the Board may require any firm or persons engaged in that industry to furnish information.

COMPANY NEWS.

COURTAULDS, LTD.

The seventh ordinary general meeting was held in London on March 27. Mr. H. G. Tetley, chairman, said that the company had been unable to expand during the war, and that all it could do was to purchase some existing factories. Latterly, however, several of the factories had been enlarged, a new one had been laid down at Nuneaton, and a site for another had been acquired from the United Alkali Co. at Flint, where a very large new works is to be erected forthwith. Although the British market had been supplied with artificial silk yarn at prices very much below those obtaining in any other country, the net profits (£2,280,861) had been entirely satisfactory, but nearly one-half of these had been derived from the company's holding in the Viscose Co. in America. That company had been very successful; it had commenced the erection of a third factory, which should soon reach the producing stage. No entirely satisfactory solution of dealing with this holding had been found, and it therefore remains an unvalued asset. The directors preferred not to place a valuation on these shares; they were included in the balance-sheet at par value, *viz.*, 9½ million dollars; a few years ago they were valued at 3½ times par, and since then great progress had been made. A final dividend of 4s. per share, free of tax, on the increased capital (£4,000,000; *cf.* this J., 1919, 464 R) was passed, £500,000 was placed to reserve account, and £229,077 carried forward.

BRITISH ALUMINIUM CO., LTD.

Extraordinary and ordinary general meetings were held in London on March 30. At the former it was resolved to increase the company's capital to £1,500,000 by the creation of 500,000 new £1 ordinary shares, and to capitalise part of the reserve account by paying up in full at par 400,414 ordinary shares and distributing them among existing holders at the rate of two new shares for three old.

Addressing the ordinary general meeting, the chairman, Mr. A. W. Tait, reported a gross profit for the past year of £348,108 and a trading profit of £292,327, compared with £420,426 and £351,697 respectively, for 1918. The diminution in profits was due mainly to the stoppage of all war work. For about nine months after the armistice the demand for aluminium had been almost negligible, and hence production had to be curtailed. Since then the demand had increased steadily and at the present time the works were producing at full capacity. During 1919 a large proportion of the sales made was on Government account and at a nominal profit, but towards the end of the year, when the Government terminated its agreement with the producers, the company purchased the whole of the balance of stock in its hands. Now that the industry had returned in a large measure to its ordinary business, prospects were good, and in particular the demands of the motor and electrical trades were in excess of pre-war requirements.

Although the productive capacity of the industry was much increased during the war, especially in America and Norway, it was probable that the increased output would be rapidly absorbed, and that further developments would be required. At the moment the situation was not clear, as in France the industry was short of coal, and in Switzerland of coal and bauxite. The large works erected in Germany during the war depended entirely upon the generation of electricity with brown coal, and it was considered unlikely that they could be economically run in normal times. The company would not proceed with its water-power scheme in this country until the Government had declared its policy on hydro-electric development. The company's power scheme at Orsières, in Switzerland, had not been proceeded with during the war, but work had been resumed in 1919. It was, however, not proposed to incur any large expenditure until conditions regarding labour, materials, and transport on the Continent had become more settled.

Costs of production had risen considerably during the past year, and there had been difficulty in obtaining essential raw materials, especially bauxite. The levy of an export tax on this material, now being considered by the French Government, would impose a serious handicap on the industry in this country, but it would lead to the development of home and Empire resources of this mineral.

The chairman then reviewed the company's financial position. The reserve account at December 31 stood at £520,414 (now to be reduced to £120,000 by the bonus distribution), the depreciation reserve account at £500,000, and stocks of metal, etc. at £285,664. Debentures and debenture stock stood at £1,358,879. The total dividend on the ordinary shares for the year is 10 per cent.

THE SALT UNION, LTD.

The directors' report for 1919 states that the export trade materially revived during that year, but both the coastwise and the inland home trade were handicapped by bad transport conditions. The company has acquired the existing salt works and brine supply of Messrs. Board and Co., in Somersetshire. Progress with the big power station of the Mersey Power Co. (a subsidiary company) has been slow owing to labour difficulties. The net profit for the year was £302,781, on an issued capital of £1,400,000 (debentures £1,200,000), which, with the balance brought in, allows of a dividend of 15 per cent. on the ordinary shares, and leaves £24,007 to be carried forward.

At the annual meeting, held on March 19, in Liverpool, the chairman, Mr. G. H. Cox, referred to expected competition from Germany. That country has large supplies of crushed rock salt ready for shipment from Hamburg, which is on offer at moderate rates. German salt is already on sale at the Scotch fishing centres and in Manchester, and as it consists of a crushed white rock which requires no coal for its production, competition from this source is formidable, not only here, but in other parts of the world. A fully equipped research department, under Dr. W. E. Gibbs, has been established, and laboratories are under erection.

UNITED GLASS BOTTLE MANUFACTURERS, LTD.

At the annual meeting, held on March 31, Mr. E. F. Oldham, the chairman, said that the policy of the company was to continue to instal Owens machines in its factories, and no fewer than 12 or 18 of these machines were to be put into the new works now under erection at Charlton. Owing to the necessity for all bottle-manufacturing firms to preserve a united policy and to promote economy in production, the company had sold practically all its ordinary shares to British Glass Industries, Ltd., at £3 10s. per share.

The gross profit for 1919 was £133,864, and the net profit £96,023. The ordinary shares received a total dividend of 30 per cent. less tax, and the carry-forward is £45,897. The issued ordinary capital is £417,530, and the reserves total £160,000.

Brunner, Mond and Co. and Electro-Bleach and By-Products Fusion.—It has been officially announced that the proposed exchange of shares between these companies has been ratified (this J., 1920, 98 R).

TRADE NOTES.

BRITISH.

Opportunities for British Manufacturers in Canada.—A correspondent in Toronto asks us to draw the attention of British chemical manufacturers and of makers of scientific instruments and laboratory ware to the urgent desirability of placing their Canadian business in the hands of agents in Canada. The practice almost invariably followed has been, and is, to establish agents in New York City to handle both American and Canadian business. Always a mistake, he states, such a policy is at the present time inconceivably bad, in view of the adverse rates of exchange; a Canadian purchaser of a British article must buy it in New York and pay for it in American dollars. The policy of establishing Canadian agencies in Canada is being adopted by American firms, and before the war it was always followed by the Germans. He hopes that the scales will soon fall from the eyes of British producers.

Canadian Trade in 1920.—During 1920, Canada imported goods to the value of \$970,773,307, an increase of \$47,652,259 over 1919. The imports were derived chiefly from the United States (78%), United Kingdom (10%), British Colonies and Possessions (4%), and Cuba (1%). Chemicals to the value of \$19,402,070 were imported, a decrease of over 14 million dollars compared with the previous year. Other imports, expressed in millions of dollars, included:—Coal 59, iron and steel 151·7, brass 4·5, copper 7·3, tin 10·6, paints, colours and varnishes 4·2, paper 9·4, rubber 14·3, and soap 1·3.

The total exports in 1920 were valued at \$1,291,013,187, an increase of \$21,694,843 over 1919. The exports were directed to the following countries:—United Kingdom (39%), United States (35%), British Colonies and Possessions (6%), France (5%), and other countries (15%). The exports included the following goods, the values of which are given in millions of dollars:—Explosives 23·4, aluminium (7668 tons) 4·6, asbestos (143,103 tons) 9·9, copper 12·5, gold 5·7, iron and steel 64·8, nickel (19,081 tons) 7·5, silver (14,000,00 oz.) 15·4, paper 60·7, rubber 10·1, wood (unmanufactured) 97·2, and wood pulp (7·3 million tons) 38·3.—(*Bull. Dept. Trade and Com., Canada, Mar.* 8. 1920.)

Jamaica in 1918.—On the whole the agricultural situation during 1918 was satisfactory, although crop production was restricted by the drought. Both imports and exports increased in value, though not in quantity. The United States supplied 67·6 per cent. of the imports, while the share of the United Kingdom has decreased to 16·1 per cent. (see J. 1919, 216 R). The exports taken by the United Kingdom and the United States amounted to 50·2 and 23·3 per cent., respectively. The exports of sugar fell to 26,000 tons, a decrease of 6,000 tons on the previous year, but every effort is being made to obtain a greatly increased output. The exports of coconuts in 1918 was 22 million, as against 30 million in 1917, owing to the effect of the hurricane in that year. Logwood and its extracts shrank in value from £540,000 to £400,000. The citrus trade had a moderate success, orange oil still being in demand. Pimento was in firm demand at increased prices. A species of wild pimento (*Anomis Jamaicensis*) has been found to yield an essential oil quite distinct from pimento oil or bay rum oil, and its commercial possibilities are being investigated. Plantations of sisal are being established on poor land of small value. The Government Laboratory dealt with 1234 samples during the year, as against 1198 in 1917.—(*Col. Rep.—Ann., No.* 1024, *Feb.*, 1920.)

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for March 25 and April 1.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number:—

Locality of firm or agent.	MATERIALS.	Reference number.
Australia	Imitation leather	386
British India ..	Chemicals, dyes, metals	1134
Canada	Essential oils, oxalic acid, citric acid, tartaric acid, cream of tartar, gelatin, gums	435
" ..	Mirror glass	*
" ..	Blue annealed steel sheets, spelter	*
" ..	Leather	389
"	Glass, china, crockery	391
" ..	Chemicals, drugs, oils, paint, varnish, gums, dyes	392
" ..	Carbon blocks	*
South West Africa	Leather, leather belting, wire, brass and bronze netting ..	395
Belgium	Weldless steel tubes	442
Czecho-Slovakia ..	Oils, leather	443
Denmark	Chemicals	402
France	Drugs	404
"	Chemicals	447, 448
"	Chemicals for dyeing industry ..	448a
Germany	Pig iron	405
Greece	Paper, cardboard	406
Hungary	Cotton, rubber and balata ..	407
"	Mica, micanite, vulcanised fibre..	408
"	Square and round iron bars, iron sheets and plates, galvanised sheets and wire, zinc sheets, tinplate	451
Italy	Black steel sheets	410
Norway	Textiles	412
Spain	Chemicals	453
Sweden	Textiles	416
Switzerland ..	Chemicals, textiles	418
" ..	Heavy chemicals	454
" ..	Drugs, sugar, edible oils, oil seeds, tallow, turpentine, resin ..	455
" ..	Pig iron	456
Smyrna	Tinplate	459
Syria	Alizarine	420
Turkey	Textiles	419
United States ..	Chemicals, paint, manures ..	422
" ..	Heavy chemicals, tanning materials	426
Argentina ..	Galvanised iron	463
" ..	Textiles	428
Brazil	Chemicals, drugs, textiles.. ..	429
Cuba	Earthenware, china	430
Mexico	Silicate of soda, materials for soap making	465
Philippine Islands.	Glass, china, porcelain	462

* The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

Markets Sought.

A firm in British Columbia desires to get into touch with importers of theobromine in the U.K.

A firm at Vancouver wishes to hear from U.K. firms interested in molybdenum properties in Canada. [Inquiries to the High Commissioner for Canada, 19, Victoria Street, London, S.W. 1.]

A resident in Vilna wishes to get into touch with U.K. importers of wood pulp and timber. [402a.]

TARIFF, CUSTOMS, EXCISE.

Australia.—The various prohibitions of import at present in force will be removed on May 19.

The export of trade spirit is prohibited save with the consent of the Minister for Trade and Customs as from January 21.

Belgium.—The export of newsprint paper is prohibited.

Brazil.—The regulations respecting consular invoices may be seen at the Department of Overseas Trade.

France (Madagascar).—An export duty of 3 per cent. *ad valorem* has been levied on, *inter alia*, corundum, graphite, guano, hides, lard, rock-crystal, rubber, tallow, vanilla, animal wax, and certain kinds of wood.

Greece.—Among the articles affected by the new customs tariff modifications are margarine, timber, tanning materials, dye woods, ochres, tin, medicaments, solid metallic colours, toilet soap, benzine, compressed gases, condensed milk, sole leather, sugar, alcohol, alcoholic beverages, earthenware, faience, articles of silver, gold and platinum, paper, cardboard, and petroleum.

Latvia.—The *ad valorem* rates of import duty for the various classes of goods is set out in the issue for March 25. Among the articles on the "free" list are sugar and ores.

A special import licence is required for, *inter alia*, alcoholic beverages, articles of gold and silver, cut glass, Dresden china, perfumery, toilet soap, and patent leather.

A special licence is required for the export of all goods and the export of flax and linseed is reserved to the Government.

Lithuania.—Among the articles the import of which is free are fertilisers, raw hides, animal fats, metal and mineral ores, edible vegetable oils, raw rubber, and salt.

The *ad valorem* duty on other goods varies from 5 to 25 per cent., and in some cases importation is permitted only with the consent of the Ministry of Commerce and Industry.

Morocco (French Zone).—Subject to an *ad valorem* duty, certain kinds of goods may be imported from Germany for a period of six months ending July 20. Among the articles affected are alimentary products, building materials, glass, china, and earthenware.

The consumption duties on sugar and alcohol have been increased as from March 7.

Netherlands.—Export prohibitions have been temporarily raised from animal glue, antimony, lead, lead alloys, platinum, zinc, tin, tin alloys, and paper.

New Zealand.—The export of preserved, condensed, and dried milk is prohibited save with the consent of the Minister of Customs, as from January 19.

Persia.—The new customs duties affect textile materials, alcoholic beverages, skins, leather, window glass, bottles, salts of soda, chloride of lime, certain metals, drugs, dyes, soap, and manufactures of paper and rubber.

Switzerland.—The proposed new customs duties are to be of a temporary character pending the definite revision of the tariff. The changes fall into two classes—(1) the imposition of duties on articles which are now free of duty and (2) an increase of existing duties.

Turkey.—Export prohibitions are still in force in the case of, *inter alia*, starch, salt, olive oil, sugar confectionery, raw hides, sulphur, locally manufactured soap, window glass, colours, cement, plaster, lime, lead, iron, tin, zinc, nickel, silver, gold, petroleum, benzine, compounds of quinine, aspirin, and neo-salvarsan.

GOVERNMENT ORDERS AND NOTICES.

Prohibited Exports.—The Board of Trade (Licensing Section) has notified the removal from List A of Prohibited Exports of the following goods, as from March 25 last:—Soaps, ointments, tooth powders, disinfectants, containing not more than 10 per cent. coal tar derivatives.

REVIEWS.

THE DYEING INDUSTRY. *Being a third edition of "Dyeing in Germany and America."* By S. H. HIGGINS. *Pp.* 189. (*Manchester: The University Press; London: Chapman and Hall, Ltd.,* 1919.) *Price* 8*s.* 6*d. net.*

The original edition of this book was a report to the electors of the Gartside Scholarship of a tour to some of the dye works in Germany and America undertaken by the author. The work has been enlarged, in the present edition, by the addition of articles on special subjects in which the author has been personally interested, by a *résumé* of recent patent literature, and by chapters devoted to colour production. The result is a book for which we cannot help thinking a more appropriate title might have been found, for it is impossible to regard it as a well-proportioned account of the dyeing industry as a whole since it is devoted almost exclusively to the dyeing, bleaching and finishing of cotton; and within this scope it is rather in connexion with special processes that the work is of value and interest. As regards Germany and America it is clear that the facilities given to the author to visit works were somewhat restricted. His descriptions of special machinery are far from clear or adequate, and would have been much assisted by drawings. A good account of the general conditions of the cotton-dyeing industry in America is given together with interesting details of the state and position of labour. In the chapter on Instruction in Dyeing, the author gives the impression of being more at home with his subject, and his comparative criticisms in this connexion stand in marked contrast with the rest of the work; but his satisfaction with the position of scientific and technical knowledge in England as compared with that in foreign countries is based on observations on the cotton industry alone. In silk-dyeing and weighting, in the dyeing of wool and fabrics made of mixed materials, the author would have found evidence of a very different character, but with these branches of the dyeing industry he does not deal. The author's account of progress of the industry during the war period consists of a series of short abstracts of the patents taken out during that period. It is to be regretted that no attempt is made to distinguish those processes which have proved of practical value on a commercial scale.

The last third of the book is taken up with a general account of colour-production, including details of the organisation of German works visited by the author, followed by an account of the consequences of the war in connexion with the supply of dyestuffs in England, America, France and Japan, and the steps taken in those countries to meet the difficulties.

The quality of the author's style and manner of reasoning may be illustrated by the following quotation:—"Cotton, unlike wool, does not grow on the back of an animal, and therefore cannot have the value of wool as a clothing material."

It will be seen that this book is of very doubtful value either to the dyer or the general reader, not because the author is not possessed of valuable information, but because he has compiled the book by putting together notes and reflections connected with the subject, made at widely different times, with little attempt at rational arrangement or sense of proportion. The more recent portions of the book reveal a greater experience and riper judgment which might well have been employed in remodelling the whole work. A misprint on page 44, line 2, requires correction.

B. LEECH.

LABORATORY MANUAL OF ELEMENTARY COLLOID CHEMISTRY. *By Emil Hatschek. With* 20 *illustrations. Pp. viii.* + 135. (*London: J. and A. Churchill.* 1920.) *Price* 6*s.* 6*d. net.*

Although there now exists a number of text-books dealing with the properties of colloids, in which also the methods employed for their preparation and investigation are described, students have to some extent been handicapped by lack of suitable laboratory manuals dealing with colloid chemistry. It is of undeniable importance that all our students of chemistry should now gain some knowledge of colloid chemistry in view of the continuous developments in this domain; and although lecture courses on colloid chemistry are no doubt frequently given in our leading universities, familiarity with the properties of colloids can, of course, only be obtained by practical experimental work by the student himself. It has therefore been the aim of the author to supply the student with a suitable laboratory manual containing "accurate and very detailed directions for carrying out the fundamental operations, for making a number of representative preparations, and for examining them by the standard methods." From the large amount of material available, the author has made a very satisfactory selection, and his book will deservedly find use in a large number of laboratories. At the present time it is not only the student who needs help but also the teacher, and many teachers of chemistry will welcome the guidance which a book by so well-known a worker and so experienced a teacher in this field affords. Mr. Hatschek has done his work well, and although his laboratory guide will doubtless undergo a process of evolution as experience extends, all teachers will be grateful for the help which they will derive from the pioneer work before us.

ALEXANDER FINDLAY.

PUBLICATIONS RECEIVED.

PRINCIPLES OF METALLOGRAPHY. *By* R. S. WILLIAMS. *Pp.* 158, *with* 75 *figures.* (*New York: McGraw-Hill Book Company; London: Hill Publishing Company, Ltd.* 1920.) *Price* 12*s.*

CEMENT. *By* B. BLOUNT, *assisted by* W. H. WOODCOCK *and* H. J. GILLETT. (*Monographs on Industrial Chemistry, edited by* SIR E. THORPE.) *Pp.* 284. (*London: Longmans, Green and Co.* 1920.) *Price* 18*s.*

A TEXT-BOOK OF INORGANIC CHEMISTRY. *Vol. IX., Part I.: Cobalt, Nickel and the Elements of the Platinum Group. By* DR. J. N. FRIEND. *Pp.* xvii.+367. (*London: Charles Griffin and Co.* 1920.) *Price* 18*s.*

HANDBOOK OF COMMERCIAL INFORMATION FOR INDIA. *By* C. W. E. COTTON. *Pp.* 383. (*Calcutta: Superintendent Government Printing, India.* 1919.)

THE CHEMICAL INDUSTRIES OF GERMAN RHINELAND. *A Summary of the Report of the British Chemical Mission on Chemical Factories in the Occupied Area of Germany. Pp.* 29. (*London: Association of British Chemical Manufacturers.* 1920.)

THE DEVELOPMENT OF THE ATOMIC THEORY. *By* A. N. MELDRUM. *Pp.* 13. (*Oxford University Press.* 1920.) *Price* 1*s.* 6*d.*

MINISTERIO DA AGRICULTURA, INDUSTRIA E COMMERCIO, SERVICO GEOLOGICO E MINERALOGICO DO BRASIL. *Regioes Carboniferas dos Estados do Sul. By* E. P. DE OLIVEIRA. (*Rio de Janeiro: Imprensa Nacional.* 1918.)

NITROGEN FIXATION—A "KEY" INDUSTRY.

It is at last possible to state authoritatively that the fixation of atmospheric nitrogen is about to be undertaken in earnest, under such conditions and auspices as will ensure its immediate and vigorous prosecution on a scale commensurate with its supreme importance for the safety of the country in war and its prosperity in peace.

A syndicate comprising Messrs. Brunner, Mond and Co., Ltd., and Explosives Trades, Ltd., has purchased the extensive site at Billingham-on-Tees, in the county of Durham, acquired by the Government during the war for the purpose of building thereon a nitrogen fixation factory. Nothing was, however, accomplished on the site itself beyond the erection of one or two stores and the laying out of a road, but a considerable quantity of material was ordered, and all of it that can be utilised has been taken over by the Syndicate. Meanwhile, to save time, a special staff of engineers and chemists has been engaged for some months in designing the details and general arrangements of the proposed plant and in working out the many difficult problems inherent in the process.

Of the several fixation methods now known the Syndicate has selected that which consists essentially in the manufacture of ammonia by the combination of nitrogen and hydrogen at a high temperature under pressure. The ammonia thus formed will be converted to the extent required into nitric acid and (or) nitrates. The process developed so successfully in Germany shortly before the war is based upon the same principle; without it the Germans could not have supplied themselves with explosives, and, indeed, would never have dared to declare war.

Messrs. Brunner, Mond and Co. were requested by the Government to undertake the formation of a syndicate for the fixation of atmospheric nitrogen as a result of observations of the firm's capabilities, initiative, and methods, which the High Explosives Department, under Lord Moulton, had ample opportunities of making during the war. Fortunately for the country, Lord Moulton realised at a very early stage that we could only supply ourselves with sufficient high explosives by adopting ammonium nitrate as their chief constituent, and so fully was his foresight justified that during most of the war the quantity of ammonium nitrate used for the purpose was considerably more than one-half of the total weight of high explosives made. The manufacture of ammonium nitrate had, however, to be built up from the beginning, as the output previous to the war was exceedingly small, and the method used quite inapplicable during hostilities. Messrs. Brunner, Mond and Co. undertook the task, and devised several entirely new methods, as well as special plant and apparatus, for the immense output required, amounting to hundreds of tons per day; *but it was all made from imported nitrate.*

The excellent report of the Nitrogen Products Committee demonstrates very clearly the very great danger to which we are exposed so long as we are dependent upon a foreign and far-distant country for our power to manufacture explosives in appreciable quantity, as we must be until the atmospheric nitrogen fixation industry is established in England. Nitric acid enters into the composition of nearly all the explosives used in modern warfare, and some form of "fixed nitrogen" is required for their manufacture. This acid together with ammonia are the essential raw materials. The normal output of ammonia in this country is quite insufficient to supply the enormous demand for explosives in modern warfare; moreover, it is (as ammonium sulphate) by far the most important fertiliser we produce, and to the extent to which it is used for explosives it is diverted from agriculture just at the time when it is imperative to increase the home-grown food supply to the utmost extent. Hence we are thrown back upon "nitrates," which mean in practice the natural deposits of nitrate of soda in Chile. By the most strenuous exertions we succeeded in importing sufficient nitrate from Chile throughout the war; otherwise we could not have continued the struggle. If for any reason the Chilean nitrate supply had been cut off, either by the action of the Chilean Government, or because we could not provide or protect the ships carrying it to our shores, our position would have been desperate.

So far as the importation of nitrates is concerned that was precisely the plight of Germany. Our blockade stopped all imports, and the stocks of nitrate in the country were soon exhausted. The Germans had, however, developed the fixation of nitrogen from the air to such an extent before the war that it was a comparatively simple matter for them to increase the output during the war, and thus make themselves independent of outside sources of supply.

The overwhelming necessity for establishing nitrogen fixation within our own borders is proved beyond all question. Until that is done we shall remain in a position of the greatest insecurity.

In the case of a material not required in peace, but consumed in enormous quantities during war, it is always a very difficult and precarious matter to make suitable and efficient provision beforehand for its production in an emergency. Unused plant perishes or becomes obsolete, and workers skilled in the art are lacking. This consideration does not apply to nitrogen fixation, because its products, ammonia compounds and nitrates, are indispensable in times of peace as fertilisers for agriculture. Hence it can be worked continuously and on an economic basis, and should eventually enable us to dispense with the large importations of nitrate of soda at present required for agricultural purposes, a position which Germany has already attained.

There are special provisions in the Treaty of Peace applicable to matters affecting the security of the country, and of these nitrogen fixation ranks second to none in vital importance.

CHEMICAL WARFARE.*

One of the most striking contrasts between the late war and those which preceded it is the rapid development of scientific and mechanical methods of warfare, which resulted from the concentration of most of the scientists and engineers of the world on war problems. Of the new developments none was more far reaching in its effects on land than the introduction of gas and smoke, and on the sea smoke played an important part in naval tactics.

Gas was employed during the war in two ways, in cylinders and in projectiles, and both of these methods were introduced by the Germans almost simultaneously in April, 1915. The reasons given for introducing gas into warfare were:—(1) the enemy lacked sufficient supplies of high explosives, (2) he had found that preliminary bombardments with H.E. and shrapnel failed to guarantee the success of an infantry attack; but there is little doubt that the surprise effect of a use of a lethal gas

* From a paper read by Brigadier-General H. Hartley before Section B (Chemistry) of the British Association for the Advancement of Science.

contrary to the Hague Convention formed another and more powerful reason.

Use of cloud gas.—The first cylinder attack was made by means of chlorine on April 22, 1915, against the French on a frontage of about four miles in the north of the Ypres salient. It was a great opportunity for a decisive stroke, but the Germans failed to take advantage of it. The quantity of gas used was too small to make it effective to a great distance, the front of discharge was comparatively short, and the Germans failed to exploit the partial success they gained. In December, 1915, a more formidable attack was made to the N.E. of the Ypres salient with a mixture of phosgene and chlorine, and a much higher concentration of gas was obtained. However, our troops were adequately protected, and only those who were surprised or who failed to adjust their respirators properly became casualties. Five similar cloud attacks took place in 1916, each consisting of a short discharge of a very high concentration, so as to obtain the maximum effect of surprise. No serious attempt was made to follow up any of these later discharges with an infantry attack. The last German cloud attack on the British front was on August 8, 1916.

Immediately after the first use of gas in April, 1915, steps were taken for effective reprisals on our part. Special Companies R.E. were formed which consisted largely of chemists who were specially enlisted as corporals for this purpose. After seven weeks' training in France they carried out our first gas attack with chlorine cylinders at Loos on September 25, 1915. By the end of the war the Special Brigade R.E. had carried out 768 gas operations in which 5,700 tons of gas was liberated. Twenty-five per cent. of these operations were cloud discharges, the remainder being trench mortar or projector attacks. In addition, the units of the Brigade were frequently employed in producing smoke clouds, which played an important part in infantry attacks. Abundant evidence exists both in captured documents and in prisoners' statements of the heavy casualties and loss of *morale* which the enemy suffered as a result of the operations of this Brigade, and their enterprise and gallantry were repeatedly mentioned in despatches by the Commander-in-Chief.

Use of gas projectiles.—As the wind was usually unfavourable for the German use of cloud gas, their efforts were mainly directed to the development of the gas shell. Employed in this way gas is a much more flexible weapon than in cylinders, as its use is far more independent of atmospheric conditions and a much wider range of substances can be used, with properties suited to different tactical purposes. Certain little-known organic compounds were selected as being most suitable, and thanks to the technical resources of the German dye industry, a monthly output was soon obtained amounting to several hundred tons of organic derivatives, which prior to the war had only been prepared in small quantities in the laboratory.

The gas shells first used by the enemy on the British front contained crude brominated xylene or brominated aliphatic ketones, both useful as lachrymatories but without toxic value. In 1916 the toxic chlormethyl chlorofomate was used against us in large quantities during the battle of the Somme. Later this was replaced by trichlormethyl chloroformate; a similar liquid, which was used until the end of the war, was the well-known Green Cross shell filling. The use of phosgene in trench mortar bombs also began in 1916. In April, 1917, during the Arras battle, a variant of the Green Cross filling appeared containing 50 per cent of chloropicrin, a lachrymator with asphyxiant properties against which the use of the box respirator was found to be quite effective.

In July, 1917, Yellow Cross and Blue Cross gas shells (so named after their markings) were introduced, each of which had novel properties. Yellow Cross shell contained "Mustard Gas," which proved a most effective battle gas. Owing to its slight smell it is not easily detected, and, although it produces no immediate sensations of discomfort, exposure to a very low concentration is sufficient to put a man out of action owing to the effects of gas on the eyes and the lungs; serious blisters are produced either by splashes of the liquid or contact with any objects contaminated with it. Blue Cross shell contained bottles of diphenylchlorarsine, which when finely divided causes sneezing, irritation of the nose and throat, nausea and intense pain; this shell failed almost entirely to achieve its object, and in 1918 diphenylcyanoarsine was substituted for it, but without any noticeable change in efficiency. It is probable that favourable results had been obtained with these substances in the laboratory, which could not be reproduced under field conditions. The failure of the Blue Cross shell, many millions of which were fired, is a striking proof of the necessity of having an experimental station at which thorough field trials of any new developments can be carried out before these are put into service use.

Two other substances were used in large quantities by the enemy, phenylcarbylamine chloride, a strong lachrymator, first used in September, 1917, and dichlorethyl arsine, first used early in 1918, which caused irritation of the nose and throat, headache, and temporary loss of feeling in the extremities.

Thus by the beginning of 1918 the Germans had a number of different gas shells which could be divided into two main classes from the point of view of their tactical employment:—(*a*) Those containing liquids such as dichlorethyl sulphide which persist for long periods in the soil and could therefore only be used on ground which it was not intended to attack or occupy; (*b*) those containing relatively volatile liquids such as trichlormethyl chloroformate or ethyl dichlorarsine, or solids such as diphenylchlorarsine, which could be used immediately before an attack.

In his preparation for the offensive of March, 1918, the enemy relied to a considerable extent on the use of gas projectiles,* which had never been used before in such large numbers. Ninety per cent. of the ammunition allotted for some purposes contained gas, and it was estimated that several million rounds of gas shell were fired on March 21. From that date until the end of the war a large proportion of gas shells was used by the enemy in all offensive and defensive operations.

Gas shells and trench mortar bombs containing lachrymators were first used by the British during the battle of the Somme, but it was not until the battle of Arras in April, 1917, that our supplies of gas shell were sufficient to make them effective. From this date large quantities both of lachrymatory and of lethal shell were used with ever-increasing success, as was shown by numerous captured documents and by prisoners' statements.

"Mustard Gas" was first used by us in September, 1918, in the successful attack on the Hindenberg line. The French had used it three months earlier, and the results obtained showed that the enemy was taken completely by surprise and suffered heavy casualties. Apparently the Germans had not thought it possible that the technical resources of the Allies would be capable of producing this substance in large quantities in so short a time, and their first idea was that the French had filled shells with liquid taken from their "blinds." Examination in the laboratory showed that it had been made by a new method, and at the date of the armistice they were considering the possibility of adopting the Allies' method of manufacture.

In October, 1916, the "Livens Projector," a new type of trench mortar for firing gas bombs, invented by Major W. H. Livens, was used for the first time, and in 1917 it developed into one of the deadliest weapons of trench warfare. By means of the "projector" large numbers of bombs containing 50 per cent. of their weight of gas could be fired simultaneously on to important targets, producing very high concentrations of gas without any warning beyond the flash and noise of the discharge and the bursting of the bombs.

Offensive Research.—The foregoing sketch of the development of gas warfare gives some indication of the urgency and importance of the problems with which British chemists were confronted in 1915. Their solution on the offensive side required a research organisation for studying the toxic properties of known substances and for producing new ones that were likely to be more effective, for devising means for their employment and for testing their value under field conditions, and for working out methods of production on a large scale.

Offensive research was carried out originally under the advice of the Scientific Advisory Committee and later of the Chemical Advisory Committee of the Ministry of Munitions, while defensive research was done in the Anti-Gas Department of the War Office. This separation of offensive and defensive research was unfortunate, as many of the problems were common to both sections. In October, 1917, the two organisations were united in the Chemical Warfare Department of the Ministry of Munitions. The department was expanded rapidly to meet the increasing demands on it, and at the date of the armistice it employed 189 research chemists, in addition to a large number of chemists who were giving part of their time to chemical warfare problems.

Laboratory researches on the offensive side were carried out mainly in the Universities, and we owe much to the professors and their assistants for their patriotic devotion to work which was never pleasant and usually involved considerable risks.

The manufacturing situation was difficult owing to the lack of suitable plant and of technical resources. In April, 1915, there was only one plant in the country producing liquid chlorine, with an output of seven tons a week. But the energy of the manufacturers enabled our first gas attack to be made in September, 1915, and by December 31, 860 tons of gas had been sent to France. Subsequently the production increased continuously, the output of gas in each year being:—1915, 860 tons; 1916, 5150 tons; 1917, 18,500 tons; 1918 (ten months), 15,500 tons.

Defensive research.—The defensive problems of gas warfare were of even greater importance than the offensive, for, although the nation which has the better gas possesses an advantage over its opponent, it is not necessarily overwhelming. While if troops are equipped with a respirator that fails to give protection in a gas attack, the situation of April, 1915, is repeated and offers an opportunity that might easily be made decisive. It is hard therefore to over-estimate the value of the work of the Anti-Gas Department. Fifty-five million respirators were produced by the department, and of these nineteen millions were box respirators. Speed is essential in gas warfare either to avoid or to effect surprise, and it is fortunate that, so far as defensive appliances were concerned, research, design, inspection, and manufacture were all under one department. The respirator sent to France within a few days of the first gas attack (a wad of cotton wool which was to be dipped in a solution of sodium thiosulphate and sodium carbonate), gave protection for a few minutes against concentrations of chlorine of the order of 1 part in 10,000 parts of air. The latest type of box respirator, adopted in August, 1917, and called the "N.C. Container," when new protects its wearer for upwards of half-an-hour against 1 part of phosgene in 100 parts of air.

TANK WAGON AND STORAGE TANK CHARTS.

E. G. WHEELER.

The usual construction of storage tanks is that of a cylindrical body with "dished" ends, and the general plan at present in use for the determination of the liquid contained at any given depth is either to calibrate each tank with known volumes of liquid at the observed depth or to read from tables compiled for cylindrical tanks with flat ends; the former involves considerable labour, and probable inaccuracy, whilst the latter makes no allowance for the "dished" ends. By means of these charts it is possible, after effecting three simple movements on the diagram, to read off the required gallonage accurately and directly; calculation of any kind is thus completely obviated.

The charts have been constructed for the determination of the volumes of liquid contained in a storage tank, from the observation of the depth of liquid and the internal dimensions of the tank.

The internal dimensions of the tank have been specified thus (see fig. 1):—

Cylindrical length	(AB)	$= l_1$.
Overall length	(CD)	$= l_2$.
Diameter	(EF)	$= d$.
Depth of liquid	(GH)	$= h$.

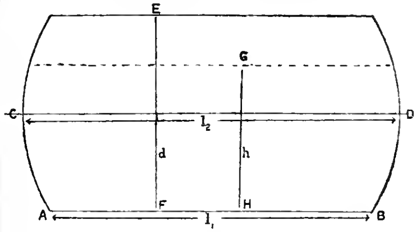


Fig. 1.

The formula for calculating the volume of liquid in a storage tank at any given depth is obtained thus:—

The volume of the cylindrical portion of the tank for a depth of liquid h is:—

$$V = \frac{d^2 l_1 \sin^{-1}\left\{\dfrac{2\sqrt{h(d-h)}}{d}\right\}}{4} - \frac{l_1(d-2h)\sqrt{h(d-h)}}{2}$$

The volume of the end sections of the tank is obtained by the application of the integral calculus to a horizontal section of thickness dz at a distance z below the axis of the tank (see fig. 2).

The volume of liquid (V) in a storage tank at a depth h is thus found to be:—

$$V = F(l_1, l_2, d, h,) = \frac{d^2 l_1 \sin^{-1}\left\{\dfrac{2\sqrt{h(d-h)}}{d}\right\}}{4}$$

$$- \frac{l_1(d-2h)\sqrt{h(d-h)}}{2} + \frac{\{d^2-(l_2-l_1)^2\}(d-2h)\sqrt{h(d-h)}}{6(l_2-l_1)}$$

$$+ \frac{\{d^2+(l_2-l_1)^2\}^3}{192(l_2-l_1)^3} \sin^{-1}$$

$$\left[\frac{2\sqrt{h(d-h)}\{d^2+(l_2-l_1)^2\}}{d\sqrt{\{d^2-(l_2-l_1)^2\}^2+16(l_2-l_1)^2h(d-h)}}\right]$$

$$- \frac{\{d^2-(l_2-l_1)^2\}[\{d^2+(l_2-l_1)^2\}^2+2d^2(l_2-l_1)^2]}{192(l_2-l_1)^3} \sin^{-1}$$

$$\left\{\frac{2\sqrt{h(d-h)}}{d}\right\}$$

The use of of a parameter for showing the change of a function containing two variables has been developed by the author for the graphical representation by rectangular co-ordinates in one plane of a function containing any number of variables.

The method has been applied to the variation of the stem correction of a thermometer, a function which contains three variables—the first unexposed reading, the auxiliary temperature, and the temperature of the bulb. (See Wheeler, J.S.C.I., 35, 23, 1198—1200.)

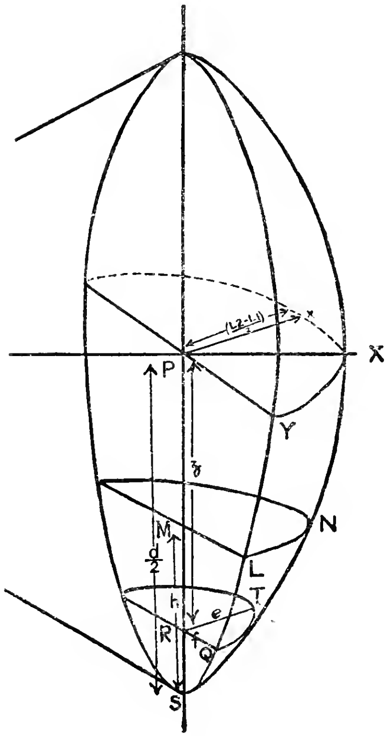


Fig. 2.

The application to the case of four variables is exemplified in the determination of the cubical contents of a tank with the dimensions l_1, l_2, d, at any depth of liquid h.

The general case of the development of the function

$$V = F\ (l_1,\ l_2,\ d,\ h,)$$

for the plotting of the curves is as follows:—

Give suitable numerical values to d and h

Then $V = F\ (l_1,\ l_2,)$.

Plot parameters of V_1 with l_1 and l_2 as rectangular co-ordinates.

Set out d on the axis of l_2 so that the scales have the relation $d = ml_2 + n$

$$\text{Then } V_2 = F\left\{\ l_1,\ \frac{d-n}{m}, d,\ \right\}$$

Plot parameters of V_2 with l_1 and d as rectangular co-ordinates.

Set out h on the axis of l_2 so that the scales have the relation $h = m_1 l_2 + n_1$.

$$\text{Then } V_3 = F\left[\ l_1,\ \frac{h-n_1}{m_1},\ \left\{\frac{m(h-n_1)}{m_1} + n\right\}.h,\ \right]$$

Plot parameters of V_3 with l_1 and h as rectangular co-ordinates.

The expressions obtained for the parameters of V_1, V_2, and V_3 become increasingly complicated, while the plotting of these parameters has involved the solution of some thousands of cubic equations, in connexion with which I have to acknowledge my indebtedness to Dr. G. N. Watson, professor of mathematics in the University of Birmingham, who has carried out, practically *in toto*, the substitution of numerical values and the solution of the resulting equations.

By reference to fig. 3—a reduced section of one of the charts—the method of use can be readily observed. A given storage tank has the dimensions:—

$$l_1 = 25'\ 4'',\ l_2 = 27'\ 10'',\ d = 8'\ 3{\cdot}5'',$$

and was found to contain 6′ 6·7″ of liquid.

Find the point of intersection of the ordinate of $l_1 = 25'\ 4''$ and the abscissa of $l_2 = 27'\ 10''$ (A), then move parallel to the short dash lines to the junction with the abscissa of $d = 8'\ 3{\cdot}5''$ (B), then move parallel to the long dash lines to the junction with the abscissa of $h = 6'\ 6{\cdot}7''$ (C), when the gallonage content can be read off from the continuous lines—7500 gallons.

Every long dash line represents a storage tank of particular dimensions, so that it is easily possible to mark or to draw in position the line corresponding to each tank in use and then, for any particular tank, to start from the corresponding long dash line and read off the gallonage content at the observed depth of liquid—*e.g.*, the tank specified in the example is represented by the long dash line EF. It is assumed in all cases that the tank occupies a horizontal position.

An auxiliary graph has been prepared for use when the overall length of the tank has been specified thus (see fig. 4):—

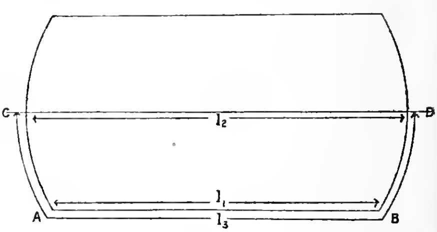


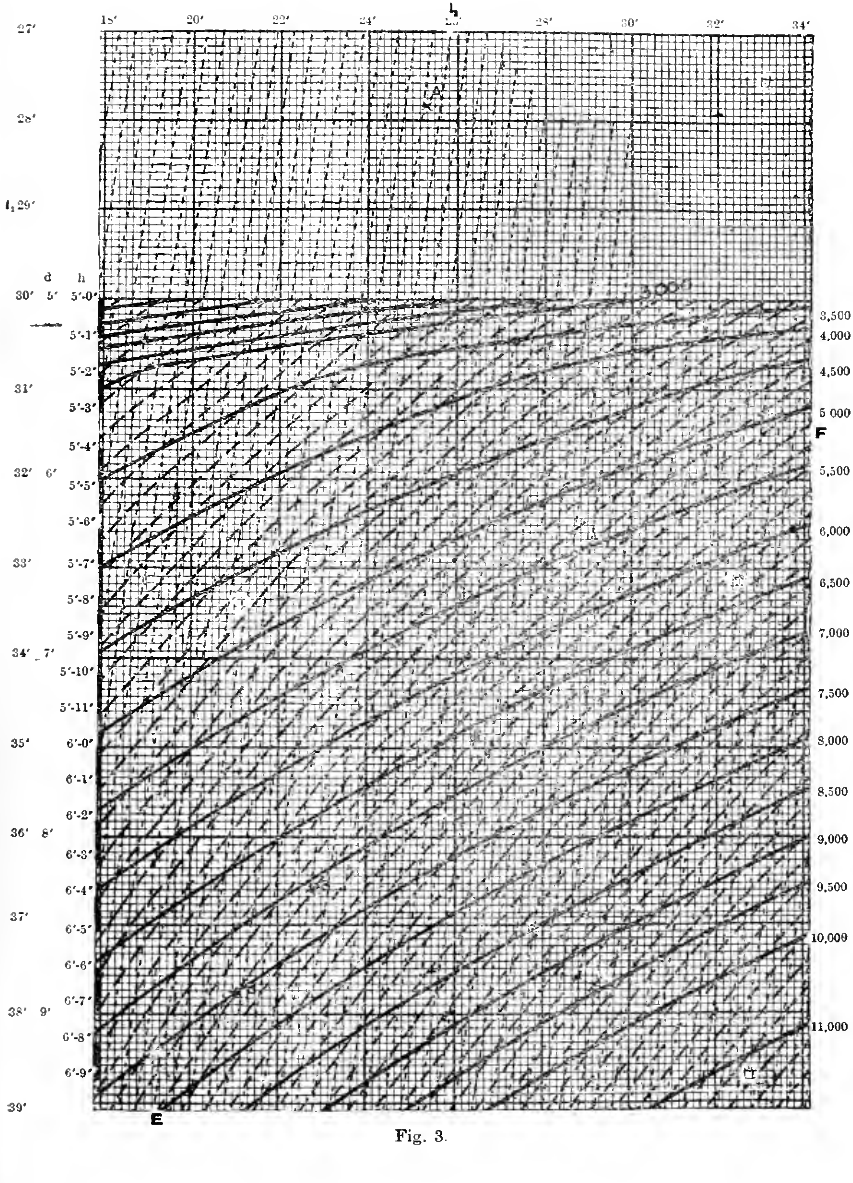
Fig. 4.

From the values of $(l_3 - l_1)$ and d the corresponding value of $(l_2 - l_1)$ is read from the parameter of the graph; by adding to this the value of l_1, l_2 is obtained and the point corresponding to l_1 and l_2 is then found on the maingraph.

The charts will be specially useful in obtaining a check on the contents of a travelling tank as determined by the weighbridge reading and the observed specific gravity of the liquid.

A smaller "water chart" gives an accurate correction for the residual water which often collects at the bottom of a tank.

The charts can also be used to find:—(a) the depth of liquid that will be equivalent to a given gallonage in a particular tank; (b) the dimensions of a tank that is required to contain a given gallonage.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A
E
F

Fig. 3.

It is claimed that these charts combine simplicity in use, accuracy of reading and variations of the dimensions and shape, in a way which hitherto has not been available. The formula developed in the article "Formula for Contents of Cylindrical Tanks with Spherical Ends" (J. Ind. Eng. Chem., 6, June, 1914, p. 517) is only an approximation, and its use involves considerable calculation. Most other attempts to obtain a method for rapidly determining the contents of storage tanks are confined to the particular case of a tank in which the radius of the bumped head is equal to the diameter of the tank; notably "The Gauging of Storage Tanks—Method of accurately and rapidly determining the Volume Content of Material in Horizontal Cylindrical Tanks," by K. B. Howell (J. Ind. Eng. Chem., 8, May, 1916, p. 430), and "The Gauging of Storage Tanks," by R. L. Ogden (*ibid.*, 8, Jan., 1916, p. 58).

A complete set of charts measuring 40″×40″, mounted on linen and varnished, can be obtained from A. W. Deering, Chartered Secretary, Suffolk House, Laurence Pountney Hill, E.C. 4, for the sum of £5 5*s.*, post free.

NEWS FROM THE SECTIONS.

CHEMICAL ENGINEERING GROUP.

The first annual meeting and dinner were held at the Waldorf Hotel, London, on April 15. Mr. J. A. Reavell, the chairman-elect of the Group, presided at the former, in the absence of Prof. J. W. Hinchley. The hon. treasurer's report shows a balance of £20, after allocating £200 towards the cost of printing the "Transactions" of the Group. The membership numbers 310. The hon. secretary's report states *inter alia* that the work of the Data Sheet Sub-Committee has been retarded through the illness of Prof. Hinchley. The following have been elected to the Committee: Dr. W. R. Ormandy, Messrs. E. Hill, H. F. V. Little, and Mr. J. H. West, who was elected during the year.

Dr. E. F. Armstrong presided at the dinner, and among the guests were Mr. John Gray, Mr. W. J. U. Woolcock, Eng. Vice-Admiral Sir George Goodwin, Prof. F. G. Donnan, and Mr. W. Macnab. Dr. Ormandy, in proposing the toast of the parent society, spoke of the unanimous desire of the Group to work in the fullest harmony with the Society; and Mr. Gray, in his reply, assured the Group that the Council would assist it in every way possible. In common with many other societies, the Society of Chemical Industry was passing through difficult times in the matter of finance, and the Council was considering the question of raising the annual subscription. He was sure that all the members would willingly bear any additional burden of this kind in order that the activities of the Society and the efficiency of its *Journal* should not be restricted.

Mr. Woolcock proposed the health of the Group and expressed the hope that through its agency a body of men would arise who would do even more for Great Britain than the chemical engineers of Germany had succeeded in during for their country. Mr. Reavell, replying to the toast, said that the Group had already done valuable work in bringing manufacturers together, and he looked forward to the good it would do in securing the provision of adequate plant and apparatus for instructional purposes in educational institutions.

Dr. Armstrong, in proposing "Our Guests," referred to the spirit of unrest which had affected our young chemists in common with other sections of the community. Such unrest, if of a constructive nature, was entirely good, and if wisely directed would give British chemists and British chemistry a far higher place in the activities of the State. As a result of the great part played by chemistry in the war, the chemical departments in our colleges were becoming overcrowded; this would inevitably lead to very severe competition for appointments in chemical industry, and only the fully trained would have any chance of success. The toast was replied to by Sir G. Goodwin and Prof. F. G. Donnan. The latter welcomed heartily the formation of the Group, spoke of the great value the projected "data sheets" would have for the student, and urged the need for introducing a practical atmosphere into the college workshops.

MANCHESTER.

The annual general meeting was held at the Grand Hotel on April 9. The report, which was read by Mr. Guy Radcliffe, the hon. secretary, bears witness to the excellent work being done by this section. The innovation of issuing in September a provisional programme for the whole of the session has been found of great convenience.

The Chairman's address on the Rhineland chemical works attracted considerable attention in the technical and general press, and was printed *in extenso* in the *Review* (1918, 408 R., 427R.), and most of the other papers presented found a place in the Transactions. In all, 10 ordinary meetings were arranged, 14 communications read, and 2 demonstrations given. The attendance was invariably large, exceeding well over 70 on the average. The annual dinner held in January, the presentation to Mr. L. E. Vlies, and the issue of a new edition of the "Handbook" of the section are briefly referred to, and also the success of inviting members of kindred societies to attend the sectional meetings. The membership is now approximately 635.

Eight candidates were nominated for the five vacancies on the committee, and the ballot resulted in the election of the following:—Prof. A. Lapworth, Messrs. W. H. Bentley, P. Gaunt, T. Horner, and T. R. Wollaston, who take the place of the retiring members:—Prof. A. Lapworth, Messrs. W. Andrews, W. B. Hart, S. E. Melling, and J. D. Paton.

A paper was read by Mr. B. A. Oldham on "Carbon Dioxide Recorders and their Application in Boiler Efficiency Control." The author dealt with the urgent need of controlling combustion, and emphasised the superiority of the methods based upon the determination of the carbon dioxide content of flue gases. He selected four instruments which could be recommended, and explained the principles upon which they work. The condemnation of many recorders in the past has been due, he stated, to the fault of the manufacturer in relying too much upon the clearness of the printed instructions instead of making a point of sending experienced men to supervise. On the other hand, credit must be given to the makers for valuable research and for teaching hundreds of coal consumers how to save.

LONDON.

Three papers were read and discussed at the meeting held on April 12, at Burlington House, Mr. Julian L. Baker presiding. The first, entitled "The Fertilising Value of Sewage Sludges," by Dr. W. E. Brenchley and Mr. E. H. Richards, was read by the latter.

The trials made by the Royal Commission on Sludge Disposal some 12 years ago indicated that the manurial value of sewage sludge is low. Since then, however, activated and slate-bed sludges have become available, and in the present paper the authors communicate the results of pot experiments made with these materials. The growth of barley in soil treated with 1 unit of sodium nitrate, with

1 and 6 units of activated sludge and with ½ and 1 unit of slate-bed sludge, showed the following percentage increases in the weight of the crop raised over that of the control sample:—51, 65, 92, 22, 32. After the barley had been cropped, mustard was sown in the soil left behind in the pots, and excellent results were so obtained, notably in the case of the heavier dressing with activated sludge, the increase here being 940 per cent. above that of the control sample. Thus this material may be of considerable utility, particularly from the standpoint of residual value; but the removal of the high water content (98 per cent.) presents difficulties which have not yet been overcome. In the ensuing discussion Dr. Rideal commented upon the high values shown in the authors' analyses for the potash and phosphorus in the sludges, and suggested that these two elements might have contributed largely to the results obtained.

The second paper, on "A New Test for Incorporation," by Dr. E. P. Perman, was read by Dr. T. M. Lowry. When two or more solid substances have to be intimately mixed by grinding, it is often convenient to control by analysis the efficiency of the mixing. Such analyses, when made upon a sample of ordinary size, may cease to show any irregularity in the distribution of the constituents, which, however, may yet be apparent to the naked eye. The method proposed by the author in such cases is to reduce very greatly the size of the sample analysed, so that if a sufficiently small portion of the mixture be taken any irregularity will at once become manifest. In the case described, viz., a mixture of TNT and ammonium nitrate, it was found possible to obtain the desired evidence of efficient incorporation by working on as small a sample as 1 mg., the nitrate component being estimated as ammonia by "nesslerising" in a Dubosc colorimeter. A series of analyses of pure ammonium nitrate was made, and the factor of error found to be 0·6 per cent. One mg. samples of the mixture were analysed after grinding for 1, 2, 3, 4, and 5 minutes, and corresponding to these times the average deviations were found to be 6·1, 3·2, 2·0, 1·1 and 0·6 per cent. respectively, thus showing that after five minutes the mixture had reached the limit of incorporation detectable by the method.

In the last paper, "Experiments on Decrepitation," by Dr. T. M. Lowry and Mr. L. P. McHatton, read by the former, some further experiments on the decrepitation of barytes were described (*cf.* J., 1919, 453 R.). It was found that the dimensions of the particles obtained by decrepitation varied more or less directly with the amount of moisture present in the crystals. Careful screening of a sample of this mineral had resulted in the isolation of a few small, clear crystals which did not decrepitate, indicating that decrepitation was not an invariable characteristic of this mineral. Experiments with rock salt also tended to show that the size of the fragments obtainable on heating was a function of the original moisture content.

MEETINGS OF OTHER SOCIETIES.

THE ROYAL INSTITUTION.

Two lectures were delivered by Sir John Cadman during March, one on "The Miner's Safety Lamp," and the other on "Petroleum and the War." In the former he traced the history of the lamp from Davy down to the modern improved types of Pattison, Hailwood, Marsaut, and Mueseler, and, as an indication of the value of this type of lamp, he mentioned that 750,000 are now in use in this country alone. An interesting point brought out was that Davy had laid down that the gauze mantle did not need to have more than 625 apertures to the square inch, and that the ordinary commercial gauze has 784 apertures (the official standard), which causes an unnecessary loss of illuminating power.

In his second lecture Sir J. Cadman spoke of the enormously increased demand for petroleum during the war. At the beginning of 1917 our requirements amounted to 3½ million tons per annum, or about twice that of the pre-war period, and by the end of 1918 to nearly 5½ millions. It was in 1917 that our stocks of oil began to be dangerously depleted, and the Government instituted a special department to take charge of petroleum affairs. The danger was overcome by (1) utilising tank tonnage with greater efficiency, (2) increasing tonnage by utilising the double bottoms of steamers for oil carrying, (3) economising in every direction, and (4) stimulating and increasing home sources of supply. The difficulties encountered were not merely domestic ones, for among the Allies there was great lack of co-ordination and co-operation, and it required the setting up of an Inter-Allied Petroleum Council, with a small executive committee, to bring about the desired improvements. So successful were the efforts of this body and of the special commissions sent to the United States and France that arrangements were completed for the handling of oil at the rate of 12 million tons per annum—two-thirds of which would have been absorbed by Great Britain—in the spring of 1919. Among the efforts made in this country to further the production of oil fuel were the establishment of the Alcohol Motor Fuel Committee and the successful production of crude oil from cannel coal on a commercial scale, which during nine months amounted to 5585 tons of oil from 45,527 tons of coal—an average of 30·67 galls. per ton. At the time of the armistice arrangements were well advanced to provide for a much greater output. The use of tar oils as fuel oil was also considerably developed; from a negligible quantity before the war the output was increased to 21,000 tons a month in 1917 and over 43,000 tons a month in 1918.

Referring to the drilling operations in Derbyshire, Staffordshire, and the Midlothian district, the lecturer stated that the flow of oil at Hardstoft (this J., 1919, 201 R) had been continuous to date at the rate of about one ton a day, and although, owing to various causes, none of the other borings had reached the stage at which evidence either negative or positive was available, there did not appear much reason to doubt that oil in commercial quantities would eventually be forthcoming, though it would take years to develop fully.

The present shortage of oil should cease when conditions become normal. One cannot, however, overlook the fact that the United States, which now provides 66 per cent. of the world's output, is rapidly absorbing much more of her own supply than hitherto. In that country there are now some 7,600,000 motor cars in use, and whilst before the war there were very few oil-burning ships, there are now 486, representing 3,798,000 tons deadweight. Of the 720 steel vesesls under construction, 636, aggregating 4,691,000 tons, will burn oil fuel, and when the programme is completed there will be a total of 1731 of the oil-burning type under the American flag.

SOCIETY OF PUBLIC ANALYSTS.

An ordinary meeting was held at Burlington House on April 14, with Mr. A. Smetham in the chair.

The first paper, on "The Turbidity Temperature of Fats, Oils and Fatty Acids: Part 1," by Mr. A. E. Parkes, dealt with the influence of traces of water and free fatty acids on the turbidity temperature, using acetic acid and alcohol as reagents. In a paper on "The Interpretation of

Milk Records," Dr. G. W. Monier-Williams gave an analysis of a series of milk records which showed that the fat content of the morning milk was continuously low. The cause of this was discussed, and the results compared with those of Richmond. The use of frequency curves in connexion with milk records was also considered. The third paper, by Dr. A. F. Joseph and Mr. G. A. Freak, was on "The Loss of Free Ammonia from Drinking Water Samples." In order to obviate the loss of free ammonia (by oxidation to nitrate) from samples of drinking water in the tropics, the samples are acidified, treated with toluene, or kept in ice, showing that the change is due to bacterial action. Mr. E. Sinkinson described "A Decanting and Filter-washing Machine," designed to wash precipitates with hot water, etc., both rapidly and with great precision, whilst the decanter works in conjunction with the filter-washer when used for agricultural analyses. A device is provided which automatically stops the machine when a precipitate has been completely washed.

THE CERAMIC SOCIETY.

At a meeting held at Stoke-on-Trent on April 12, Mr. B. J. Allen read a paper entitled "Drying Stoves Scientifically Constructed," referring mainly to a new type of stove for drying pottery, which was lately developed in the United States. The essential features include transport of the ware through the stove, with regulation of heat and humidity, etc. Inside the stove two endless sprocket chains are connected with a series of sprocket wheels, some above and some below, and boards for carrying the ware are suspended upon these chains in such a way that the boards are readily passed by the sprocket wheels as the chains move on. The boards are carried alternately upwards and downwards in passing through the stove, the number of flights depending on the length of the stove, and a large quantity of ware can be passed through a stove of minimum dimensions. Radiators of small steam pipes are fixed at the bottom of the stove, and vertical partitions—with one end fixed alternately to top or bottom—divide the stove into compartments. Radiators are also placed in the two end compartments to heat the air which enters when ware is being put in or taken out of the stove. Air currents are created and regulated by dampered pipes (having holes on the under sides) fixed across the upper parts of the stove, and connected with a fan or a ventilating shaft. Below the bottom radiators are removable trays, to catch clay dust loosened by ware being put in and taken out. Double walls of the casing of the stove give insulation through the intermediate air-space. The whole apparatus is at once highly sanitary, very efficient, and exceedingly compact. The workers never enter the stove, and the workshop temperature need not be affected by the dryer.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

On April 19, at an ordinary meeting, Mr. G. F. Robertshaw read a paper entitled, "Methods of Examination of Lubricating Oils."

The author discussed recent work on this subject, instancing the researches of Deeley, Langmuir, Allen, Hardy, Archbutt, Dunstan, and Thole, and put in a plea for the setting up of a committee of the Institution for the purpose of standardising the method of examination. The chief lubricants were briefly described, and attention was drawn to the recent report on solid lubricants (this J., 1920, 102R). The more economic use of fixed oils for edible purposes was touched upon and the opinion expressed that uncompounded mineral oils would ultimately replace the fixed oils. In this connexion the work of Southcombe is of interest. The refining and preparation of the chief types of oil were shortly described, and recent patents on synthesised lubricating oils were mentioned. The physical properties of lubricants and the methods of their determination were discussed, in particular the various means of estimating viscosity both by efflux and torsional apparatus. By means of the simple and ingenious instrument devised by Mitchell a rapid determination may be made without any other laboratory apparatus being called for. Surface tension, friction tests, specific gravity, cold test, emulsification value and volatility were touched upon also. On the chemical side the gumming test, the iodine value, determination of tarry matter, and examination of compounding means were referred to, and the author concluded by expressing the hope that collaboration between the chemist and the engineer would lead to the drawing up of schemes and specifications which would equally assist the manufacturer and the user.

In the discussion the president, Sir F. Black, pointed out that standardisation work of the character demanded by the author should be a matter for international co-operation, and promised that the council would always be glad to assist in such work.

Dr. Ormandy spoke on the same subject, and added that, in his opinion, the heat-loss suffered by lubricating oil was of considerable importance as a discriminating test. Mr. C. Craig and Dr. A. E. Dunstan put forward the colloidal nature of lubricating oils as being intimately connected with their characteristic behaviour, and the latter speaker drew attention to the fact that the unsaturated hydrocarbons present in lubricating oils played a prominent part in lubrication. Mr. A. Philip considered that the actual oiliness or lubricating power of an oil could not be arrived at from a consideration of the physical and chemical tests at our disposal.

PERSONALIA.

With deep regret we record the death on April 18, in London, of Dr. R. Messel, Foreign Secretary and Past-President of this Society.

Prof. A. K. Huntington, who vacated the chair of metallurgy at King's College, London, in October last, died suddenly on April 17.

The death is reported from Canada of Prof. E. Mackay, an active member of the Society of Chemical Industry and of the Canadian Institute of Chemistry.

Prof. L. T. O'Shea, whose death occurred on April 18, was professor of applied chemistry at Sheffield University. He was an acknowledged authority on fuel technology, and particularly in its bearing on coke-oven practice. His membership in this Society dated from 1885.

The death of Prof. W. Pfeffer, in his seventy-fifth year, removes a plant physiologist of the first rank, whose pioneer work on the measurement of osmotic pressure with semipermeable membranes and its influence on the theory of solutions are well known to chemists. As a biologist his work was distinguished by reliance upon exact quantitative methods of inquiry. Prof. Pfeffer was in turn ordinary professor at the Universities of Basel (1½ years), Tübingen (9 years), and Leipzig (33 years).

Prof. H. J. W. Hetherington, of University College, Cardiff, has been appointed Principal of University College, Exeter.

It is announced in *The Times* that the sum of £5000 has been offered by Mr. F. A. Heron, of Holywood, to the University of Belfast for providing the necessary equipment for the teaching of physical chemistry, and a further £1000 towards the cost of securing the required accommodation.

NEWS AND NOTES.

CANADA.

Reported Mineral Discoveries.—Recent exploration in the Courtenay District near Nanaimo, Vancouver Island, has disclosed the occurrence of coal-fields covering an area of about 15,000 acres.

The Canadian National Railway reports the discovery of talc in the Lake Winnipeg District, 80 miles north of Winnipeg.—(*Official*.)

Zinc Oxide Plant.—The first plant in Canada to manufacture zinc oxide was put in operation during March at Toronto by the Watts Chemical Co. The standard process of oxidising zinc (scrap) is used. The product is stated to be very pure and to satisfy the demands of the rubber industry.

Aluminium Transmission Lines.—Canada has probably a larger proportion of aluminium transmission lines than any other country. A recent survey by the Commission of Conservation shows that on all lines in the Dominion operating at 10,000 volts and over there are 13,000 miles of aluminium and 8,000 miles of copper wires.

Shawinigan Electro-Metals Co.—The plant of this company at Shawinigan Falls, Quebec, has been sold to the Northern Aluminium Co. It was erected during the war to manufacture magnesium, and produced 600 lb. per day of ribbon and powder. The purchasing company is still running its large aluminium plant at Shawinigan, which uses 50,000 h.p., and produces 60 tons of metal daily.

The Canadian Institute of Chemistry.—H.R.H. The Prince of Wales has graciously consented to become an honorary fellow of this Institute. The membership now includes 113 fellows and 3 associates. Prof. J. Watson Bain, of Toronto University, is president, and Mr. H. J. Roast, secretary and treasurer (393, Guy Street, Montreal, Quebec). The representation of Canada on the Council of the Inter-Allied Union for Pure and Applied Chemistry has been entrusted to this body.

Institution of Professional Civil Servants.—A new organisation bearing this title has been formed by scientific and technical men in Government employ to assist the Government and the Civil Service Commission in the task of classifying and adjusting their salaries, and generally to represent the interests of this important section of the Civil Service. A provisional council has been constituted with Mr. S. J. Cook, hon. sec. of the Ottawa Branch of the Society of Chemical Industry, as secretary and treasurer.

Nickel Coinage.—The Canadian Mining Institute, which met at Toronto on March 8, 9 and 10, dealt with the question of changing the present silver coinage of Canada to a coinage of pure nickel, and passed a resolution unanimously calling on the Dominion Government to take the necessary steps to effect such a change. It was pointed out that the prevailing high price of silver made this change highly necessary, apart from the fact that nickel is Canada's "national" metal, and that tests have shown that this metal would comply with all the requirements of good coinage.

New Oxygen Plants.—A new company—*The National Electro-Products Co.*—has erected a plant at Toronto for the manufacture of oxygen, cheap hydro-electric current providing the energy. This company intends to establish a chain of five plants across Canada, in order to meet the great demand for oxygen, chiefly for welding purposes.

Another Canadian company has been formed to produce oxygen, nitrogen, argon and other gases. It will be known as *The Dominion Oxygen Co., Ltd.*, and will at once proceed to erect five large plants in the chief industrial centres; it is a subsidiary of the Union Carbide and Carbon Corporation, which controls 36 distinct companies throughout the United States and Canada.

NEW ZEALAND.

Proposed Manufacture of Carbon Bisulphide.—Carbon bisulphide has been found very effective in New Zealand as a rabbit-poison, but difficulty has been experienced in obtaining sufficient supplies owing to the very high cost of the imported article. Quotations were £64 per ton f.o.b. London in March, 1917, and £68 per ton delivered in New Zealand from Melbourne in July, 1919. Manufacture in New Zealand by Taylor's electro-thermic process (this J., 1902, 1143, 1236) is now being seriously considered. It is stated that with an expenditure of 100 h.p., 5000 lb. of carbon bisulphide can be produced in 24 hours. The furnace, 16×41 ft., contains 40 electrodes arranged crosswise, and with two dynamos of 330 kw. working at 30—60 volts 14,000—15,000 lb. of bisulphide can be produced in 24 hours. Each electrode consists of 25 carbons, 4×4×48 in., and lasts about a year. The electrodes are placed at the foot of a vertical shaft furnace filled with small pieces of coal and charcoal; melted sulphur flows in below them, and the vapour traverses the hot carbon.

From calculations made by the Public Works Department it would appear that, assuming an annual output of 350 tons, the product could be profitably sold at 36s. per cwt. f.o.r. at the works, but for a lower output the price would have to be considerably higher. The estimated requirement for use against rabbits is 30 tons a year.—(*N.Z. Journ. of Agric.*, *Jan.*, 1920.)

BRITISH INDIA.

The Soap Industry.—The consumption of soap in India is not great; the imports are only about 18,500 tons a year, mainly from the United Kingdom, and the production in the country is estimated at about 21,000 tons (*cf.* Industrial Handbook of the Indian Munitions Board, 1919, p. 287), *i.e.*, only some 4 oz. per head of population per annum. This is undoubtedly due to the general low standard of life and comfort, for it cannot be said that the Indian is indifferent to cleanliness, but he generally washes both himself and his clothes without soap. It is to be anticipated that there will be a considerable improvement in the standard of wages, and with it there will be a growth in the demand for soap. Some of those who have made a special study of the subject consider that almost unlimited quantities of ordinary soaps could be disposed of in India, even at present, if steps were taken to organise the sale. Amongst the wealthier classes there is a considerable demand for toilet soaps richly scented and well got up. The Indian soap factories are mostly situated in Bombay and Upper India, but none of them is large and many are quite small, being practically run by a single proprietor with the aid of his family. The Government of Madras has erected a small but well-equipped soap works at Calicut with the object of introducing the industry into that province. The industry generally is somewhat handicapped by the absence of indigenous alkali works, but in normal times soda can be imported at moderate prices. Fats and oils, both vegetable and animal, are plentiful, yet the sources of supply require further development, which no large firm has undertaken hitherto. It is said, however, that the Sunlight Company is contemplating the erection of a large factory in Bengal, where it will have cheap fuel at its disposal, be in a position to import soda easily and have a large and dense local population to cater for. An important and enterprising firm of this kind will of course be able to deal with all the subsidiary undertakings such as oil-pressing, hardening of fats, glycerin recovery and candle manufacture. The small Indian manufacturer may, however, still be able to hold his own if he becomes more expert. At present much of the soap made locally is of very poor quality. Among the oils etc. that are used for soap making may be mentioned coconut oil, groundnut oil, mohra oil, rosin, and sardine-oil stearin.

SOUTH AFRICA.

The Paper Trade.—Prior to the war the bulk of the paper trade of the Union was in the hands of English and Canadian firms, but during recent years other countries, notably the United States, Sweden and Norway have secured a larger share of the business. In the newspaper and wrapping paper trade Sweden has built up a predominant position in this market since the war, apparently as the result of favourable freight conditions. The trade with Great Britain is mostly conducted through local agents connected with or appointed by the English manufacturers, and nearly all the local dealers and importers have agents in England who make up their orders weekly. The demand is fostered by extensive advertising. Manufacturers in the United States who desire to develop their trade in South Africa are advised either to send out a direct resident representative or to get in touch with an established agent paid by commission. Statistics for the paper and printing trades before and after the war indicate the various countries of origin and the changes which have taken place in sources of supplies as the result of the war. Although the values of paper imports have increased very considerably, it is estimated that the actual quantities imported were smaller in 1917 and 1918 than they were in 1913.—(*U.S. Com. Rep., Feb.* 25, 1920.)

Vegetable Oils and Fats.—The climatic and soil conditions in various regions of South Africa are such that practically all the soft oil-seeds could be grown, though tropical products like palm kernels and coconuts are excluded. The importance of the question to South Africa is shown by the following figures, which give the number of gallons of oil imported for industrial purposes in 1918:—Castor, 75,560 (£19,578); coconut, 178,960 (£39,579); colza and rape, 3,670 (£650); cottonseed, 28 (£6); linseed, 413,426 (£145,028); palm and palm kernel, 506,957 (£89,897); other vegetable oils, 42,413 (£7,376). The oils imported for food purposes in 1918 amounted to 137,234 galls., valued at £34,290, whilst palm kernels, copra, etc., were imported to the value of £196,121. These figures give a total value of nearly £400,000 to the imports of unmanufactured vegetable fats and oils, and, in addition, oil products worth nearly £1,000,000 are imported annually. An oil-seed industry in South Africa would have to face the competition of Eastern products obtained with cheaper labour and would have to pay heavy railway rates as against low sea rates, since the big oil-consumers reside mainly on the seaboard.

Three firms have oil mills in operation in the Union, viz., Lever Bros., at Congella; the South African Oil and Fat Industries, Ltd., at Jacobs; and the Mayville Oil Mills, near Durban. The Congella mill has a capacity of 150 tons of palm kernels per week, but as it was specially constructed to deal with these seeds, it would not work as efficiently with copra or groundnuts. Nevertheless, it is intended to extend the plant so that 150 tons of copra or groundnuts can be treated weekly. The mill at Jacobs can treat 300—400 tons of seed per month, and three benzene extraction units have been erected which allow of handling an extra 200 tons of seed per month. There is also a small plant at Salisbury, erected by the British South Africa Co., which mainly handles groundnuts; its capacity is roughly 600 short tons per annum. At Lourenço Marques there is a mill capable of treating 100 tons of sesame seed per month.

Developments in the cultivation and expression of oilseeds are anticipated in the Waterburg and Rustenburg districts, also in Zululand and Natal, and very promising results have been obtained by the Department of Agriculture of Rhodesia, which has given a lead in fostering the extended cultivation of oil-seeds.—(*S. African J. Ind., Jan.*, 1920.)

UNITED STATES.

Chemical Warfare Service.—The Army Reorganisation Bill, which passed the House of Representatives on March 18, contains a section providing for the Chemical Warfare Service as a separate unit of the Army with a brigadier-general in command and ninety officers and 1,500 men. Though there was much opposition in the House of Representatives to the Service being made a separate unit, this was overcome, and the Bill is now before the Senate, which is said to be unanimously in favour of the Service retaining its individuality and of full provision being made for its efficient development.

Sand and Gravel in 1918.—The production of sand and gravel in 1918 was 61,824,426 short tons, a decrease of nearly 15 million tons compared with 1917. Of this amount 2,172,887 tons was glass sand, the production showing an increase of 12 per cent. over 1917. The resources of the United States in glass sands are very great. The output of moulding sand was 4,910,178 tons, and that of filter sand 51,111 tons. Some special grades of moulding sand, such as the French sand for making fine bronze castings and the English refractory sands for lining certain iron furnaces, are imported.—(*U.S. Geol. Surv., Oct.* 31, 1919.)

Manganese and Manganiferous Ores in 1917.—Before 1917, the United States was largely dependent on foreign sources for the manganese it required, and in that year the imports of manganese ores amounted to 629,972 tons, 80 per cent. of which came from Brazil, whilst the imports of ferromanganese, nearly half of which had previously been supplied by Great Britain, fell from 90,928 tons in 1916 to 41,969 tons in 1917. Owing to war conditions there was great activity in locating and exploiting deposits of the ores in the United States, with the result that the output of high-grade manganese ore rose from 31,474 tons in 1916 to 129,405 tons in 1917. The recommendation of the American Iron and Steel Institute to the effect that lower-grade ferro-manganese and spiegeleisen should be made use of, led to a wider use of domestic ores in making the alloy. The resulting increase in production is shown by the following figures (short tons) for 1916 and 1917:—

Year.	Ore with 35% Manganese or more.	Ore with 10-35% Manganese.	Ore with up to 10% Manganese
1916	31,474	453,853	90,473
1917	129,405	730,759	130,185

In 1917 the number of plants making ferro-manganese rose to 23, with an output of 260,225 tons, and in the same year 17 plants were making spiegeleisen, with an output of 189,241 tons.—(*U.S. Geol. Surv., Oct.* 31, 1919.)

Silica in 1918.—The production of silica in 1918 was 193,643 short tons, valued at £220,943, and included:—quartz (vein quartz, pegmatite and quartzite), 71,740 tons; sand and sandstone, 98,956 tons; Tripoli, 19,982 tons; and diatomaceous earth, 2,965 tons. Flint "for consumption" to the value of £27,127 was imported into the United States in 1918.—(*U.S. Geol. Surv., Dec.* 4, 1919.)

Peat in 1918.—The quantity of crude, air-dried peat produced in the United States in 1918 was 151,521 short tons, an increase of 56 per cent. on the 1917 production. Practically all this peat was used in the manufacture of peat products.—(*U.S. Geol. Surv., Nov.* 18, 1919.)

Sulphur and Pyrites in 1918.—The sulphur produced in the United States rose from 520,582 long tons in 1915 to 1,353,525 tons in 1918. The production of pyrites in 1918 was 464,494 tons, valued at £528,903, an increase of 2,000 tons over the previous year. The total consumption of pyritic ores, including imports, was about 960,000 tons in 1918.—(*U.S. Geol. Surv., Dec.* 11, 1919.)

Cement Tile-Drains.—Much of the peace-time work of the Bureau of Standards was interrupted owing to the pressure of war work, but some of the more important projects have now been resumed. One of these is the field inspection and testing in connexion with tile-drains used in alkali soils. The Minnesota tiles, which have been embedded in the ground since the last inspection, have been removed, and the concrete found to be unimpaired. The committee in charge of the investigation proposes to make definite recommendations relative to the manufacture and use of these drains in alkali soils.

FRANCE.

Industrial Notes.—*Metallurgy.*—The constant rise in the price of metallurgical products is attributed mainly to the increase in price of British coal consequent on the steady depreciation of the franc. As a possible solution of this difficulty, it is suggested that less coal should be imported from Britain and more from Westphalia and Rhineland. In addition to the Ruhr deposits, there exist on the left bank of the Rhine the coalfields of Aix-la-Chapelle and of Erkelenz, as well as the coalpits of Rhenish Prussia which have been considerably developed since 1914. The production of these fields, added to that of the Ruhr, would supply France with the quantity of coal due to her from Germany.

Statistics published by the Ministry of Public Works show that in 1919 Westphalia and the Rhenish provinces exported 1,382,845 tons and 342,498 tons respectively of coke and coal to Lorraine, and received from the latter province a total of 1,147,947 tons of iron ore.

Chemical Industry.—The recent disturbances in Germany have naturally reduced the supply of coal and dyes due to France under the Peace Treaty. The restricted railway service occasioned by the coal shortage has caused a great reduction in stocks of raw materials; on the other hand, it is stated that there are large quantities of finished products awaiting transportation. Complaint is rife concerning Germany's apparent disregard of her Treaty obligations, even before the recent troubles. Thus an order for 3000 tons of intermediates placed in Germany last June by a syndicate of French dye-producers has been only fulfilled to the extent of 700 tons. The shortage of intermediates has been partly made good by the efforts of the very greatly extended dye industry in France, of its branches in Switzerland, and also by importation. The French production increased from 175 tons in June to 602 tons in December, the figures for sulphur colours being 68 and 175 tons respectively for these two months. The immediate future is uncertain, particularly in view of the fact that compulsory dilution of coal gas with water gas is diminishing the amount of coal distilled and of tar produced by nearly 50 per cent. The shortage of tar has become so acute that exportation and re-exportation of coal tar and derivatives have been prohibited. Further, no coal tar may now be used as fuel.

Petroleum.—Owing to deficient supply the prices of petroleum, motor spirit and fuel oil (*mazout*) have been rising rapidly. Hope is now being turned towards Poland as a future source of supply. Much French capital has been invested in the Boryslav oilfields, where oil has been struck. The company *Goldman Frères* is chiefly interested, and production is progressing favourably.

GENERAL.

Camphor Growing in the British Empire.—Owing to the present high price of camphor and the ever increasing demand—the world's requirements are now estimated at about 10 million lb. per annum—the possibility of producing camphor within the Empire requires consideration. Commercial camphor is obtained chiefly from Formosa, but the Fukien province of China, the islands of Shikoku and Kioshiu in Japan, Cochin China, Sumatra, Java and Borneo also contribute supplies.

Attempts have been made to grow camphor in Ceylon, where its cultivation was found to be possible at altitudes of 250—6000 feet above sea level, with a net profit of £74 per acre per annum. However, in 1906, only some 100 acres were under cultivation, and the production was very small. Promising experiments are being carried out in the Federated Malay States. In Mauritius the tree grows satisfactorily, but yields an oil which differs from the camphor oils of commerce, and, moreover, the distillate contains no solid camphor. Similar observations have been made in Trinidad, Dominica, and St. Kilda, but in spite of this good results have been obtained in the West Indies. With the present price of camphor (£31 per cwt. in Formosa), and the reported depletion of the native forests, successful cultivation in the British Empire should be possible, provided scientific methods be employed.—(*Prof. P. Carmody, The Times Tr. Suppl., Apr.* 10, 1920.)

Metallurgical Industries in Belgium.—Towards the end of 1919 the Belgian coal production was almost equal to the pre-war output, but transportation difficulties have hindered shipments. The failure to receive promised deliveries of industrial coal from the Ruhr region, and the great difficulty in obtaining coking coal from other foreign sources, are very unfortunate for the reviving Belgian industries. For instance, the re-lighting of the four furnaces of the important Société de Sambre-et-Moselle is still delayed by the shortage of coke and ore. Normal production of steel would require 80,000 tons of coke monthly, and present production is far below this figure.

Systematic *sabotage* by the occupying forces was carried further in the steel industry than in any other. Thus, at the time of the armistice, out of 54 blast furnaces in existence in Belgium in 1914, about 30 had been extensively damaged or destroyed. In the Provinces of Liége and Hainaut only about 16 rolling mills are in operation out of the original 101, and only 17 puddling furnaces out of the 91 that were operating before the war. At the Ougrée-Marihaye steel works, which produced 50,000 tons of steel monthly before hostilities commenced, the value of the plant destroyed was estimated at 45 million francs, and it will cost much more than this to replace it. Satisfactory progress is being made in the recovery of stolen machinery taken into Germany. The steel production has now reached about 17 per cent. of the pre-war output. Iron and steel prices continue to advance steadily, and there is a good export demand. The whole trade, however, is hampered by the shortage of fuel and raw materials.

Zinc production continues to increase slowly, and several new foundries are ready to open on receipt of regular supplies of oil and fuel. In 1913, Belgian zinc ore imports averaged about 46,000 tons monthly, while up to November 1, 1919, only 107,047 tons had been received. Shipments were improving, however, and the prospects of the industry are good. The erection of new, thoroughly modern plants to replace those destroyed will partially compensate for the present subnormal production, and Belgium will resume its place as one of the leading steel-producing countries of the world.—(*U.S. Com. Rep., Jan.* 27, *Feb.* 6, 1920.)

Conversion of War Factories in Germany.—The *Deutsche Werke A.-G.* has been founded to take over various factories which formerly supplied the Army and Navy with material. The capital was fixed originally at 100 million marks, but as a number of works is to be taken over, instead of one, it will probably be increased. The State will own the whole capital and the company will issue bonds up to 350 million marks, which will be entitled to one-third of the profit remaining after payment of 5 per cent. on the share capital. Government control is ensured through the Controlling Council, composed of members of the Reichstag, representatives from the Finance Ministry and the Treasury, as well as prominent industrial and financial magnates. The works taken over are distributed all over Germany, except in Saxony, and will make the "Deutsche Werke" one of the biggest firms in the country. Among the works taken over are the munition factories at Spandau, Sieberg, and Ingolstadt, the artillery works at Spandau, Lippstadt and Munich, the armament factories at Spandau, Amberg and Erfurt, and the munition works at Spandau and Cassel, all of which will be converted. As it would be difficult to convert the powder factories, they will not be taken over.—(*Bd. of Trade J., Mar.* 25, 1920.)

The Rubber Industry in the Netherlands.—This industry was expanding just before 1914, and during the war progress was well maintained. Many of the factories were enlarged during this period, and the "Hevea" and "Pombe" firms united, together with some other firms, to form the "N.V. Vereenigte Nederlandsche Rubberfabrieken," which acquired extensive premises in Doorweerth. At the present time Holland has at least twenty-nine factories, the products of which cover the whole range of rubber goods. During the past few years the supplies existing in the country were sufficient to provide for the internal requirements, but against this must be mentioned the shortage in certain other raw materials, such as canvas, solvents, including benzene, benzol, carbon disulphide, rubber substitute and reclaimed rubber. Substitutes could not be employed owing to the lack of oil and fat, and separate factories for the preparation of reclaimed did not exist; in 1918 a factory was started in Amsterdam for their preparation, but up till then none was being made. Accordingly, the rubber factories prepared what reclaimed rubbers were necessary by secret processes, but this branch of the trade has been little developed. On the other hand, the use of catalysts has become firmly established.

Before the war the industry obtained its machinery chiefly from England or Germany, but during the period of the war it was dependent on internal resources.

The future is difficult to forecast, but there is no doubt that the organisation of the larger factories has very much improved. In particular, chemists are in many cases being employed by separate factories, whilst in 1910 a department was founded in Delft for scientific research in connexion with the industry.—(*In-en Uitvoer, Dec.*, 1919.)

Proposed Nitrogen Fixation Plant in the Dutch East Indies.—H.M. Consul-General in Batavia states that a 40-years' concession has been granted to a Norwegian, allowing him to utilise the river Moesi, above Bankoelen, for the sole purpose of manufacturing synthetic nitrogen compounds—fertilisers, etc. Some 22,000 to 70,000 h.p. are theoretically available, and a royalty of 1 gulden (=1s. 8d.) per theoretical h.p. is to be paid to the Government as from November, 1926, the rate being then subject to revision every fifth year. A minimum head of 350 metres of water is available. The concession includes the right to mine the necessary coal and limestone from the adjacent land and to build a railway from the works to the port.—(*Bd. of Trade J., Mar.* 18, 1920.)

Discovery of Copper in the Dutch East Indies.—Rich copper deposits, states H.M. Consul-General, have been discovered in South Timor, about 20 miles distant from Tjamplong. The ore is reported to be extremely rich and to be worth 250—400 gulden (£25—£40) a ton. A road will have to be constructed from Tjamplong to the deposits before the latter can be worked.—(*Bd. of Trade J., Mar.* 25, 1920.)

The Institute of Metals.—The position of students whose course of studies was interrupted by the war, or by special circumstances arising from the war, has been sympathetically considered by the Council of the Institute of Metals. It has been decided to admit to the "student membership" students of metallurgy who have passed the age limit of 25 years, and to allow them to continue as such up to June 30, 1923, so long as they remain at a recognised school of metallurgy. This concession represents an appreciable financial saving, as a student member pays only the guinea entrance fee and guinea subscription of pre-war days. By a further concession, members and students elected at the forthcoming ballot on May 31 will not only have the privilege of membership for thirteen months instead of the usual twelve, but will receive an extra copy of the Institute's *Journal*.

The Institute of Brewing.—The report of the Council for 1919 states that the number of subscribing members was 1136 on December 31 last, or nine members more than on the last day of 1918. An employment bureau has been organised which is being conducted on strictly confidential lines. It has been decided to form a Research Association under the auspices of the Institute, to proceed on independent lines without the help of a Government grant. A scheme to encourage investigation in the brewing and allied industries has now been drawn up, and a research fund is being created. The *Journal of the Institute of Brewing* is shortly to appear monthly, instead of seven times a year. The late Prof. A. R. Brown and Mr. A. R. Ling were appointed representatives of the Institute to attend the conferences of chemical and allied societies held under the auspices of the Chemical Society during 1918 and 1919; and Mr. Ling is the Institute's representative on the Conjoint Board of Scientific Societies. Mr. S. O. Neville has been re-elected president of the Institute for the current year.

New German Research Institute.—The sum of 500,000 marks has been presented by F. Behringer to the University of Heidelberg for the establishment of an institute for research on the chemistry of the proteins. The new institute will be initially conducted in connexion with the Physiological Institute of the University, under the direction of Prof. A. Kossel.—(*Chem.-Z., Mar.* 27, 1920.)

The German Chemical Society.—The report of the *Deutsche Chemische Gesellschaft*, to be presented at the general meeting on April 19, states that the membership number, which was 3350 before the war, is now again in the neighbourhood of 3000. During the past year the publication of the "Chemische Zentralblatt" showed a loss of about 180,000 marks, and in consequence the price will now be raised. The fourth collective index of the Zentralblatt will be issued this summer, and the third volume of the "Index to the Literature of Organic Chemistry" at the end of the year. The second volume of the new (fourth) edition of "Beilstein" was printed at the end of last year. The issue of the "Lexicon of Inorganic Compounds," in 3 volumes, has been definitely decided upon; work on the MSS. of the supplementary volume, covering the period 1911—1916, will be finished by the middle of the year. Prof. C. Harries has been nominated president of the Society and Prof. W. Wislicenus, foreign secretary.—(*Chem.-Z., Mar.* 27, 1919.)

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

Protection of Special Industries Bill.

The second reading, moved by Lord Balfour, was rejected on an amendment by Earl Beauchamp, which was carried by 23 votes to 22 (this J., 1920, 13 R).—(April 22.)

HOUSE OF COMMONS.

Home-Grown Sugar, Ltd.

Sir A. Boscawen, replying to Mr. Macquisten, said that it was a fact that Home-Grown Sugar, Ltd., half the issued capital of which is held by the Government, was about to place a contract for sugar factory machinery with a French firm, as that firm's tender was the lowest. It was desirable to benefit from the special knowledge of French manufacturers, as the chief competitors in this country had had no experience of beet-sugar factories. Mr. Macquisten pointed out that a large part of the machinery required was similar to that used in cane-sugar manufacture, and could therefore be made in this country; also that the home firms have the best French experts in their employ. Sir A. Boscawen replied that it was advisable to have the benefit of French experts, so that the industry could be started under the best possible conditions. He was, however, willing to receive a deputation from a firm or firms in this country capable of making the machinery.—(April 15.)

The Budget.

Exchequer issues in the financial year ended March 31 last amounted to £1,665,773,000, and revenue was £1,339,571,000, leaving a deficit of £326,202,000. During this period the floating debt was reduced by 100 millions to £1,312,205,000. On the present basis of taxation the revenue for the present year is estimated at £1,341,650,000 and the expenditure at £1,177,452,000. As the balance would not suffice to reduce adequately the national indebtedness, the Chancellor of the Exchequer proposes to raise a total revenue of £1,418,300,000, and thus provide for a surplus of £234,198,000 for the redemption of debt. Among the proposed changes in taxation are:—Increases in the postal rates for letters, newspapers, and for telegrams. As from January 1, 1920, motor vehicles used for trade purposes to be taxed by weight, and motor cars at £1 per h.p. unit; the existing motor-car tax and motor-spirit duty to be repealed on that date. The duty on spirits to be raised by 22s. 6d. per proof gallon to 72s. 6d., and that on beer from 70s. to 100s. per standard barrel. The duties on wines to be doubled, and in addition a 50 per cent. *ad valorem* duty to be levied on imported sparkling wines. The duty on stock and share transactions to be increased from 0·5 to 1 per cent. Share capital duty to be raised from 5s. to £1 per cent., and receipts and scrip certificates duty from 1d. to 2d. Although no change is proposed in the standard rate of income-tax, now 6s., the system of assessment will be altered in accordance with the recommendations of the Royal Commission. The excess profits duty to be raised from 40 to 60 per cent., but to be again lowered to 40 per cent. in the event of a levy on war wealth increase. A new tax (Corporation Tax) of 1s. in the £ on profit income of limited liability companies engaged in trade. This tax will run concurrently with the excess profits duty until the latter is repealed. In arriving at the profits for the purpose of the new tax, excess profits duty will be treated as a working expense, and both excess profits duty and corporation tax will be deducted before assessment of profits to income-tax. The new tax will not exceed 2s. in the £ on the profits which remain after payment of interest and dividend on existing debenture and preference issues.—(April 19.)

Benzol Production.

In answer to Captain Moreing, Sir R. Horne stated that the total production of refined benzol at coke ovens and gas works in 1919 was approximately 20 million gallons.—(April 19.)

REPORT.

Report of the Fuel Research Board for the Years 1918, 1919. *Published for the Department of Scientific and Industrial Research by H.M. Stationery Office. Pp. 57. Price* 1s. 6d. *net.*

An introductory section of this report reviews briefly the considerations which led to the establishment of a Fuel Research Station of a new type. Dealing with the question of the immediate importance of fuel economy, it is remarked that, whilst a widespread knowledge of means of fuel economy exists among experts, owing to inertia on the part of consumers even the simplest and most obvious steps towards improvement are not taken. The Research Board is at present considering how these obvious facts may be kept before industrial consumers of fuel. It cannot be too strongly urged that in every large works the establishment of an organised fuel control is essential. It appears that in the majority of industrial undertakings a reduction of from 5 to 20 per cent. in the fuel bill could be secured within a year at comparatively little cost.

The history of the movement for the development of home sources of fuel oil is briefly sketched. It is concluded that no development of the gas industry on the lines of the present process of carbonisation at 1000°—1300° C. will help towards the production of fuel oil for the Navy. In this connexion it is essential that the question of carbonisation at temperatures much lower than those customary in gas-making and coke-making should be exhaustively examined. Such an investigation is now being carried on at the Research Station, and it is of interest to note that encouraging results have already been obtained in the direction of the preparation of coke in the form of a smokeless domestic fuel, sufficiently strong to stand the rough handling of transport.

A description of the Research Station is illustrated by plans and photographs. The lay-out and equipment of the Station enable the fundamental conditions for accurate scientific experiments on an industrial scale to be secured. The experimental work of the Station can be carried on night and day and independently of external weather conditions. Water-gas has been adopted as the fundamental fuel of the Station, but can at any time be replaced by other fuel gases. It is intended that the Station shall supply those in charge of industrial operations with trustworthy data on the production and utilisation of heat energy. The maximum unit scale of operations at the Station contemplates the treatment of 20—30 tons of coal or coke per day. An apparatus for the carbonisation of coal at temperatures between 500° and 600° C. is already installed, also a setting of four Glover-West continuous vertical retorts capable of carbonising 10 tons of coal per day. The apparatus for the collection and measurement of the volatile products of carbonisation is capable of dealing with the gases and products from the high temperature carbonisation of 10 tons of coal per day or the low temperature carbonisation of 20 tons per day. The laboratories comprise a routine laboratory, a research laboratory, a liquid-air room, and a physics laboratory with dark rooms for photometry and photography. A Survey Department has been established with a view to the reception, sifting, classification, and registration of information concerning the national coal resources from the physical and chemical standpoints.

Preliminary experimental work on low temperature carbonisation has been carried out since September, 1919, in a setting of nine steel retorts each taking a charge of from 2 to 3 cwt. Grants have been made to the Manchester Air Pollution Board to further inquiries in connexion with domestic heating. The important result has been established that coke fires possess radiating efficiencies superior to those of coal fires, particularly when the coke employed is derived from a process of low temperature carbonisation. The radiant efficiency of coal fires varies from 19·5 to 25 per cent. With fires of low temperature coke the efficiency amounts to between 31 and 34 per cent. If the fire is credited with heat conducted, radiated, and converted from the surroundings, then the thermal efficiency of the low-temperature coke fire is between 60 and 70 per cent. Provided a smokeless form of fuel were available in large residential centres, the abolition of raw coal as a fuel would permanently raise the efficiency of the open fire.

A grant of £500 was made in 1917 to the Atmospheric Pollution Committee of the Meteorological Office. A plant capable of pulverising 1000 lb. of coal per hour is to be installed at the Station with a view to the investigation of the possibilities of pulverised coal as a fuel. The Board has assisted the Irish Peat Inquiry Committee in its investigation, and a Peat Investigation Officer to the Board has been appointed. A Power Alcohol Investigation officer has likewise been appointed. The section on Gas Standards reviews and supplements the recommendations of the Board concerning the sale of gas on a thermal basis (this J., 1919, 407 R, 414 R). Evidence is derived from the experience at a large industrial centre that the present system of charging affords no real security to the consumer. The great gain to the gas industry under the proposed basis of sale will be that no undue legislative restrictions will limit them in their development of the most economical production of thermal units in the form of gas.

Appendices to the report are devoted to "Fuel Economy and Low Temperature Carbonisation" by Sir George Beilby, and a "Summary of Reports on the Efficiency of Cooking Ranges," by A. H. Barker.

GOVERNMENT ORDERS AND NOTICES.

PROHIBITED EXPORTS.

The Board of Trade (Licensing Section) has announced the removal of the following goods from List A of Prohibited Exports as from April 15:—Barley, maize, oats, rye, dari, with their relative flours and meals; brewers' and distillers' grains; malt dust, culms, sprouts, and combings; rice meal or bran.

The Open General Licence for the export of industrial explosives has been withdrawn (April 1), and the prohibition on the export of explosives has been amended as follows:—(A) Explosives, except the following: Blasting gelatine, gelignite, gelatine dynamite, viking powder, detonators, electric detonators, monobel, safety fuses, dynamite.

Munitions for smooth-bore guns may now be sent under the Open General Licence to:—Czecho-Slovakia, Panama, Nicaragua, Honduras, Guatemala, Costa Rica, Cuba, San Salvador, San Domingo, and Hayti.

COMPANY NEWS.

SOUTHALL BROS. AND BARCLAY, LTD.

The annual meeting was held at Birmingham on March 31. Sir Thomas Barclay, who presided, said that the outstanding features of the year's trading had been the enormous rise in the price of drugs of Japanese origin, and the increased scarcity of many crude drugs, particularly those mainly supplied by the United States. The increased prices were mainly due to lack of supplies and the large demands from the Continent, but market manipulation was also a contributory factor. The present price of turpentine was nearly ten times the normal pre-war price (27s. per cwt.). In regard to German competition, recent examination of German quotations had shown that out of 31 articles offered, in 26 cases the prices were much higher than those ruling here, and where the prices were lower, the articles were either of minor importance, or were protected by a natural monopoly, *e.g.*, caustic potash. This country was gradually acquiring the export trade which was formerly held by Germany. Up to the present little, if any, German competition had been felt in this country, and the rate of exchange had handicapped American efforts to undercut this market. The demand for chemical products had been very great, and the plants for chloroform, salicylates, iodides, etc., had been working full-time. There was increased demand for phenylquinolinecarboxylic acid, hippuric acid and its salts, etc. The net profit for the past year was £6,395 higher at £32,159 (issued capital £196,000). The ordinary shares receive 10 per cent. and a bonus of 5 per cent., both free of tax.

ENGLISH CHINA CLAYS, LTD.

In his address to the first annual meeting, on April 15, Mr. R. Martin, chairman, stated that the potential annual production of the company was, approximately, 500,000 tons of clay, but owing to difficulties connected with production costs, transport, freights, fuel, and the chaotic state of the foreign exchanges, the turnover was one-half of what it should have been. Contracts booked for 1920 indicated a generally increased demand for china clay. There was a serious menace to the English industry from those countries, like America, Germany, Sweden and Denmark, which had developed their own domestic clays to an enormous extent during the war, but so far the competition had been small as the bulk of the company's clay was confined to the best qualities. The immediate outlook for the trade was good. A dividend of 5 per cent. on the ordinary shares was declared.

This company has recently been formed with an authorised capital of £2,000,000, and an issued capital of £1,480,686, all of which has been taken up by the amalgamating companies, viz., Messrs. Martin Bros, Ltd., The West of England and Great Beam Clay Co., Ltd., the North Cornwall China Clay Co., Ltd., and the China Clay Works of Messrs. John Nicholls and Co., Ltd., have also been acquired. The new company owns twenty-one china clay works in Devon and Cornwall, seven china stone quarries, ground stone mills, brick works and cooperages.

ASSOCIATED PORTLAND CEMENT MANUFACTURERS, LTD.

At the twenty-first general meeting held in London on April 19, the Hon. F. C. Stanley, chairman, said that the satisfactory trading of the past half-year permitted of a dividend at the rate of 8 per cent. per annum—the second time in the company's history that the ordinary shareholders had received a dividend. The whole of the holding of preference shares, viz., £350,000, in the British Portland Cement Manufacturers, Ltd., had been sold to a group, which was also given the option to purchase all the unissued ordinary share capital at par; 250,000 of these shares had been or are being taken up. Hence the company has now ample funds for developmental purposes. Jointly with the British company, it was establishing works in India, and also substantially enlarging its fleet of lighters for river transport. As a corollary to the closer fusion of the Associated and British companies, a joint selling and distributing agency—the Cement Marketing Co.—had been formed, which includes several of the allied companies. Many of the difficulties of manufacture and distribution remained, and the company had a much larger capacity for production than it is able to utilise. Plant and raw materials and, to a large extent, the necessary labour were now available, but the supply of fuel, and particularly that of coke, was a matter of great concern. Net profits on home sales were now smaller than before the war, but advantage had been taken of the high prices ruling in the chief export markets.

Carboil Syndicate, Ltd.—This company was formed in 1913, with the object of perfecting methods of oil recovery by means of low-temperature carbonisation. It has now acquired the patent rights in a new type of producer, in which low-grade coal and colliery waste can be distilled to yield motor spirit, oil, and ammonium sulphate, but no coke. The producer plants will be made by the Vulcan Steel Products Co., Inc., of the United States, but the syndicate will carry out the work of erection. The capital is £500,000, divided into 499,475 ordinary shares of £1 each and 10,500 deferred shares of 1s. each. An issue of 245,000 ordinary and 4,900 deferred shares was recently offered for public subscription, at par and £1 respectively, and over-subscribed.

TRADE NOTES.

BRITISH.

Cyprus in 1918-19.—The mining industry in Cyprus has been much restricted during the war, but developments are hoped for, as there are copper and other minerals occurring which might be profitably developed. Very little copper mining was carried out in 1918 owing to the shortage of explosives, but the asbestos mine at Annando was worked throughout the year.

Among other home-produced articles, shinia and sumac leaves were exported. There was a fair carob crop, the use of which, when crushed, as cattle food, is increasing. The olive crop was better than that of 1917, but the yield of oil was small. Arrangements have been made to carry out experimental cultivation of sugar-cane and sugar-beet.—(*Col. Rep.-Ann. No.* 1025, *Feb.*, 1920.)

Trinidad and Tobago in 1918.—The value of imported products in 1918 amounted to £4,534,585, and that of the exports to £4,575,204. The United Kingdom provided 15·3 per cent. of the total imports, the United States 36·9, Canada 18·6, and other British Possessions 11·2 per cent. The exports included the following items, the values being given in brackets: — Asphalt, 56,799 tons (£88,825); 22,200,385 coconuts (£145,721); copra, 5,231,991 lb. (£77,947); sugar, 35,104 tons (£811,068); crude petroleum, 40,856,298 galls. (£400,610); and petrol spirit, 2,741,622 galls. (£141,968). The United States took exports valued at £2,085,726, or 45·6 per cent. of the total. The cocoa exported amounted to 58,638,562 lb., a decrease on the 1917 figures. The sugar crop was the lowest recorded for many years, the exports amounting to 35,104 tons, as against 62,654 tons in 1917. The coconut industry continued to make rapid progress, and considerable areas have been planted. The cultivation of rubber is increasing, and the exports in 1918, 37,517 lb., were nearly twice those of 1917. The output of asphalt has been much reduced owing to the war, the exports in 1918 amounting to 56,799 tons, as against 206,416 tons in 1913. (For petroleum situation, see this J., 1920, 95 R.)—(*Col. Rep.-Ann., No.* 1018, *Jan.*, 1920.)

FOREIGN.

The Chemical Market in Sweden.—Since the armistice imports of chemicals into Sweden have been on a large scale. Heavy chemicals have been obtained from England and dyestuffs from America, since Germany, which formerly held this market, has been unable to export. The heavy chemical market is at present over-stocked, but good opportunities should occur as the demands increase. In working up new business, sellers are recommended to take special care to supply the goods packed to suit buyers' requirements. The chief imports of chemicals and dyes in 1917 were as follows:—

Product.	Chief sources and percentage amounts.	Approx. value in £ sterling.
Ammonium nitrate	Norway all	21,000
Prussiate of potash	Germany all	18,000
Sodium chromate	U.S.A. 96%	21,000
Carborundum	Norway 92%	14,000
Caustic soda	Germany 95%	32,000
Potass. chloride	Germany all	19,000
Chloride of lime	U.S.A. 62%	74,000
Salt	Germany 87%	310,000
Fertilisers	Germany 70% U.S.A. 27%	480,000
Sulphate of soda	Germany 90%	200,000
Oxalic acid	Germany all	19,000
Potash	Germany all	60,000
Nitric acid	Norway all	76,000
Soda	Germany 68% U.S.A. 27%	65,000
Sulphur	U.S.A. all	158,000
Soluble glass	Germany 92%	19,000
Alizarin	Germany all	10,000
Coal-tar colours	Germany 99%	312,000
Vegetable colours	West Ind. all	13,000
Indigo	Germany all	6,500

—(*U.S. Com. Rep., Jan.* 31, 1920.)

Swedish Imports of Chemicals and Metals.—The following figures show the Swedish imports, in tons, of various chemicals and metals during 1919, together with the corresponding amounts for 1913:—Coal (1000 tons), 1943 (4879); coke (1000 tons), 279 (496); crude phosphate, 69,320 (123,250); saltpetre, 23,212 (33,892); potash salts, 124,902 (80,121); raw copper, 14,639 (9182); zinc, 9295 (3674); tin, 998 (1083); pig-iron, 26,640 (99,972). It will be seen that potash salts and crude phosphates are the chief items.—(*Chem. Ind., Mar.* 3, 1920.)

Chemical Trade in Holland.—Supplies of sulphuric acid during the first six weeks of 1920 did not compare unfavourably with those of the first half of 1919. Even when sulphuric acid can be imported from Germany and Belgium, Dutch requirements have so increased that the whole home output would find buyers. The industry is hampered by labour difficulties, particularly in regard to shortened hours of work. The artificial fertiliser industry has still to contend with difficulties in obtaining raw materials. Phosphate and pyrites were imported in small quantities and irregularly. The trade in pharmaceutical chemicals is moderately prosperous, although a normal output is impossible; there is, however, a brisk demand for pharmaceutical products both at home and from abroad. Trade in essential oils continues favourable. The imports of raw materials for the varnish, colour and lacquer industries were satisfactory during the last three months of 1919. Home demands, particularly for dyestuffs, were such that most Dutch factories could be kept in full employ. In the absence of difficulties connected with the importation from Germany of such raw materials as lithopone, zinc white, etc., the future of this industry should be good. Deliveries of raw material from England are, at present, very uncertain. The manufacture of writing and printers' inks was brisk, the one drawback being the irregularity of imports of raw material. The export trade has been hampered by the depreciated exchange of foreign countries.—(*Z. angew. Chem.*, *Mar.* 2, 1920.)

Algerian Minerals.—The exportation of phosphates and mineral ore from Algeria in 1919 has been greatly handicapped by difficulties of transport and freights. Exports of phosphates and iron ore exceed those of 1918, but there has been a considerable diminution in the exports of lead, zinc, and antimony ores. Mining, however, has not been affected. The figures given by the Algerian Customs indicate that the colony exported half its output of phosphates, all the iron ore, three-quarters of the zinc ore, but sent all the lead and antimony ores produced to France. To assist the development of the mining industry in the country the French company "Minerais et Métaux" has set up branches at Constantine and Tunis, whose functions will be similar to those of the branches of the Metallgesellschaft and the De Beer, Sondheimer Co., which operated in Algeria before the war.

The Italian Iron and Steel Industry.—Practically all the iron ore produced in the kingdom of Italy comes from the island of Elba, which supplies the steel plants at Portoferraio, Piombino, and Bagnoli, the yearly capacity of which exceeds 400,000 tons of steel. Almost all the other steel plants in Italy are engaged in the re-melting of pig-iron and scrap. As practically all the coal required had to be imported, the war led to a greater use of domestic fuel, especially lignite, and to an extended use of electric furnaces. The growth of the Italian iron and steel industry is shown by the increase from an output of 911,000 tons of steel in 1914 to 1,304,000 tons in 1918.—(*U.S. Com. Rep., Feb.* 13, 1920.)

Tin, Gold, and Tungsten Production in the Federated Malay States.—In 1919 the output of tin and tin ore was 36,394 tons, valued at £8,736,474, against 37,370 tons, worth £11,032,234, in 1918. In the same year the gold production was 16,402 oz., worth £63,559, compared with 18,309 oz., valued at £70,948, in 1918. The output of tungsten ores amounted to 436 tons, an increase of 70½ tons over 1918. The ores consisted of almost equal quantities of wolfram and scheelite. To encourage the winning of tungsten ores, the export duty is remitted at present.—(*Bd of Trade J., Mar.* 11, 1920.)

Market for Cement in Brazil.—In 1913 the amount of cement imported into Brazil was 465,000 metric tons, of which 40 per cent. came from Germany and 28 and 11 per cent. from Great Britain and the United States respectively. Owing to war conditions the United States had little competition to face, and consequently its contribution during the war rose to an average of 30 per cent., whilst Great Britain's contribution rose to 29 per cent. and Germany's fell to 14 per cent.—(*Bull. Dept. Trade and Com., Canada, Mar.* 8, 1920.)

Oil Seeds and Nuts in Guatemala.—Except for a small production of castor oil, there is no vegetable oil industry in Guatemala, although there are abundant supplies of seeds and nuts from which oil might be extracted. Besides castor beans, sesame, and coconuts, the nuts of the royal palm (corozo and cohune nuts) and avocada must be mentioned. The corozo nut, which grows on the Pacific slope, could be obtained in quantities amounting to 100,000 tons per annum, and it has been ascertained that 12 tons of nuts yield 1 ton of kernels, containing 52 per cent. of oil. The cohune nut is similar to the corozo, but grows on the Atlantic slope, where 60,000 tons per annum could be collected; 10 tons of these nuts yield about 1 ton of kernels containing 65% of oil. The chief obstacle to the exploitation of these nuts is the difficulty of collection and transport over wide areas of swamp and jungle. Special machinery would be needed for cracking the nuts.—(*U.S. Com. Rep., Feb.* 7, 1920.)

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for April* 8 *and* 15.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
Australia ..	Paper	504
"	Glass, china, pottery	505
"	Steel, alloys	*172/9/28
Canada ..	Druggists sundries	468
" ..	Cutch, spun hemp, cordage ..	470
" ..	Chemicals for rubber, paint, textile, fur-dyeing, and leather tanning industries	471
" ..	Plumbers' pottery, twine	473
" ..	Perfumery, soap, talcum	475a
" ..	Sanitary ware, tool steel	509
" ..	Sheet brass, nickel silver, copper, bronze, aluminium	512
" ..	Paper, vegetable parchment ..	516
" ..	Magnesia sectional pipe coverings .	519
" ..	Steel balls, ball-mill liners, steel plates, standard pipe, borax glass	520
" ..	Steel sheets	†
" ..	Thermometers	†
New Zealand ..	Potassium sulphate, ammonium sulphate, sodium nitrate, sodium and potassium cyanides	521
South Africa .	Bottles	477
" ..	Glass, china, iron and aluminium ware	479
" ..	Paper	522
Egypt ..	Palm oil and vegetable oils for soap making, degras, fish oil, tanners' requisites, white tallow, margarine	526
Belgium ..	Steel tubes, cables, industrial oils and greases, refractory products	482
Greece & Serbia	Galvanised sheets, cement ..	485
Hungary ..	Lubricants, belting	531
" ..	Condensed milk, soap, candles, olive oil, matches (tender for) .	532
Italy	Pharmaceutical products	486
"	Chemicals for soap making ..	533
"	Chemicals for soap making, stearin, paper, textile, glass and tanning factories	534
Netherlands ..	Leather	489
Argentina, Uraguay, Brazil	Paper, leather	494a
Colombia ..	Galvanised iron, tinplate, rubber, soap, perfumes	495
Morocco ..	Candles, tinplate	544

*Official Secretary, Commonwealth of Australia, Commercial Information Bureau, Australia House, Strand, London, W.C. 2.
†The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

MARKET SOUGHT.

A firm in Canada desires to get into touch with U.K. importers of polishing oil. [Inquiries to the Canadian Government Trade Commissioner.]

TARIFF. CUSTOMS. EXCISE.

Australia.—The import of calcium carbide is prohibited, except under licence, as from February 10.

A copy of the Bill for the revision of the Customs Tariff may be seen at the Department of Overseas Trade.

Bahamas.—A drawback of 50 per cent. is allowed on imports upon the duties leviable under the Tariff Act, 1919, with some exceptions, including alcoholic beverages.

Belgium.—An import licence is required for sulphuric ether as from March 12.

The export of chemical manures, sodium carbonate, natural phosphate, pitch, tar and tar distillates is prohibited except under licence.

Brazil.—The sale price of the gold "vales" for the payment of customs duties is to be calculated as from December 8, 1919, on the basis of the New York exchange instead of on the sterling rate. This ruling means an increase of about 12 per cent. in the total duty payable.

British India.—The import of ammonium nitrate is duty free.

The prohibition of the import of dyes has been cancelled as from March 13.

Canada.—The form of the certificate of value and origin for imports under the British preferential tariff is set out in the issue for April 15. This certificate must be written, printed or stamped on the back of the invoices.

Ecuador.—A surtax of 2 per cent. *ad valorem* has been levied on most classes of goods as from January 1.

Esthonia.—All imports are now subject to permits.

Finland.—The proposed temporary increases of customs duties became law on March 10.

France.—The export of gold and silver to the French Colonies is subject to the previous consent of the Minister of Finance.

France (Madagascar).—The modified classification and rates of duty on chemical products dealt with under the customs *régime* for German dyestuffs applicable to France is now applicable to Madagascar.

France and Algeria.—Modifications of the "coefficients of increase" affect, *inter alia*, white wax, wares of nickel, tin and German silver.

French Colonies.—The Decree prohibiting the import of foreign sugar, molasses and alcohol into French colonies has been modified and the import of the goods is now permitted in certain cases.

Germany.—The conditions controlling imports are set out in the issue for April 15.

Among the articles for which no export licence is required are slate, alabaster, certain stones, spring salts, emery cloth, wax cloth, certain wares of leather and rubber, imitation ivory (except celluloid), carbons for arc lamps, carborundum wares (with some exceptions), certain glass wares, gold leaf, spun silver and aluminium, threads of imitation gold and silver and threads of common metals.

Italy.—A stamp duty varying from 0·1 to 10 lire has been levied on the sale price of all "articles of luxury."

Malta.—The provisions of a Bill to confer a tariff preference on British Empire products is given in the issue for April 15.

Mexico.—The export of goat skins, ox and cow hides is prohibited as from May 1.

The import of gasoline and other petroleum ethers is now duty free.

Portugal.—Recent customs decisions affect gasoline, olive oil, coined silver, rolled tin sheets, bricks, tiles, and ceramic products.

Switzerland.—An import licence must be obtained for certain milk products, including condensed milk.

REVIEWS.

"The Chemistry and Technology of the Diazo-Compounds." *By J. C. Cain. Second edition. Pp. xii. + 199. (London: Edward Arnold. 1920.) Price 12s. 6d. net.*

The second edition of this monograph supplies important confirmation of the view that the pure chemistry of to-day is the applied chemistry of to-morrow. Moreover, this treatise emphasises the fact that there is no near cut or short circuit to advance in chemical industry without a persistent and ungrudging devotion to the pursuit of academic research. Johann Peter Griess, the discoverer of the diazo-reaction, and his teacher, Kolbe, under whose inspiration the initial step was taken, were chemists pure and simple without any of the dubiously attractive labels—such as industrial, engineering, physical, or colloidal—which are so popular to-day. Nevertheless this discovery of the diazo-compounds and the azo-colours, also produced in the first instance by Griess, has possibly found more work for the chemical engineer than any other organic synthesis in existence. The diazo-reaction is the fundamental operation required in the manufacture of the azo-dyes, the largest and certainly one of the most important group of colouring matters. It is also an essential step in the production of many coal-tar intermediates required in the synthesis of drugs, photographic materials and dyewares of all descriptions. This chemical change has played a most important part in the elucidation of the chemical constitution of many technically important aromatic derivatives, and is constantly receiving fresh applications, as, for instance, in its extension to the manufacture of organic arsenicals employed as drugs or as toxic agents in chemical warfare. Improvements and modifications in the process of diazotisation are constantly being introduced, and since the discovery of the first diazo-compound in 1858 until the present time the synthetic applications of diazo-derivatives have been extending. The seven chapters of the monograph devoted to the reactions of diazo-compounds are a valuable testimony to the adaptability of the diazo-reaction to the most varied syntheses occurring among aromatic compounds. Copious references relating to these reactions are supplied from which it will be seen that some of these extensions are of very recent date. Among other promising developments in the aromatic series may be mentioned the synthesis of complex dianthraquinonyl derivatives from diazo-anthraquinone salts and the application of orthodiazophenols to the production of mordant hydroxyazo-dyes.

There is no indication that the diazo-reaction is becoming played out. A new chapter introduced into the second edition of this treatise suggests on the contrary that the chemical change under consideration is entering on a new phase of usefulness as regards the production of heterocyclic diazo-compounds. The existence of this more recently discovered group of diazo-derivatives offers fresh synthetic possibilities.

The sections dealing with diazo-compounds of the aliphatic series also show that significant discoveries have been made recently among this group of diazo-derivatives.

The intimate relationship between theory and practice which subsists in this branch of organic chemistry is demonstrated by the fact that the classical controversy on the constitution of diazo-derivatives was ushered in by Schraube and Schmidt's industrially important discovery of sodium iso-*p*-nitrobenzenediazooxide ("Nitrosamine red in paste"). This invention was exploited promptly, and the writer recollects very vividly the circumstance that sample bottles of the commercial diazo-oxide were received in 1894 by the same post as the *Berichte*, in which the new product was first described.

The author devotes the last six chapters of the work to a discussion and review of the various theories of the constitution of diazo-derivatives from Griess's time down to the present day. This monograph is an indispensable guide to the chemistry and technology of the diazo-reaction and its products. The bibliographic data are very complete, and further aid to the reader is supplied by the full subject and name indexes.

G. T. MORGAN.

CHLORINATION OF WATER. *By* JOSEPH RACE. *Pp.* 158. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1918.) *Price* $1.50, or 7*s. net.*

At the present time no method of water purification is so popular as that based on the germicidal value of chlorine and the hypochlorites. Although this property of free chlorine was known early in the last century, and long before the germ theory of disease was established, it was not until the 'nineties that bacteriological examinations, in conjunction with the trials of the Hermite fluid for disinfection of the Worthing sewage in this country, demonstrated its extraordinary value as compared with other disinfectants. Ten years ago the Boonton supply of Jersey City, in America, was sterilised by the addition of bleach, and now more than a thousand cities, principally in America, use it or liquid chlorine for water purification. The author estimates that 3,000 million gallons of water per day is being chlorinated in North America, and in this country the method is now recognised as a safe and economical one, worthy to form a permanent part of a public water service. In these 150 pages Mr. Race has given a very good historical *résumé* of the subject, together with a description of the practical methods which have been developed in America and the results which are obtainable by their use. At Ottawa the author has found that, as originally pointed out by the reviewer, the addition of ammonia to hypochlorite, owing to the formation of chloramine, increases the velocity of the germicidal action of the solution, and thus renders the chloramine treatment more economical. This modification of the original method was distinctly advantageous during the war, when bleach rose to a very high price in the States owing to the cessation of exports from Europe..

S. RIDEAL.

MANUAL OF THE CHEMICAL ANALYSIS OF ROCKS. *By H. T. Washington. Third edition, revised and enlarged. Pp. xii. + 271. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1919.) *Price* 11*s.* 6*d. net.*

The third edition of this well-known handbook by one of the American authorities on rock analysis does not contain anything altogether new, but the analytical methods have been described with a greater wealth of detail, and more stress has been laid on the sources of error both in operations and in methods. The text-matter is subdivided into five parts:—(1) An introductory discussion (pp. 26) on the importance and general character of analyses and on the various constituents which enter into the composition of rocks; (2) apparatus and reagents (pp. 30); (3) sampling and crushing (pp. 16); (4) analytical operations (pp. 36); and (5) methods of rock analysis (pp. 132). An appendix contains factors, a bibliography, an authors' and a subject index.

While sections (2) and (4) would seem to be written rather for the guidance of beginners in quantitative analysis, sections (3) and (5) form a most valuable guide for all practised chemists who do not carry out rock analyses as an ordinary pursuit. Indeed, in the writer's opinion, the book is of such general excellence that criticism, if at all called for, can only be levelled at one or two minor points. Thus, on p. 138, in describing the decomposition of the rock powder by fusion with sodium carbonate, the author advises rubbing the clean platinum crucible in which the operation has been carried out, with a small piece of moist filter paper to remove the last of the silica, and throwing the paper into the acid liquid where it disintegrates during the evaporation to dryness. The writer would prefer to reserve this piece of paper between watchglasses and add it to the weighed crucible before igniting the silica, to prevent any possible contamination with soluble organic matter formed during the final stage of the evaporation, when the acid becomes concentrated. Again, in contrast with all other directions aiming at work of the highest possible degree of accuracy, it is perhaps rather surprising to find the following statement (p. 151): "If the rock is high in silica or is low in manganese (less than 0·20 per cent.), as is true of nearly all rocks, the analyst may advantageously dispense with the addition of the persulphate [when precipitating alumina, etc., with ammonia], and disregard the slight error involved in the distribution of the manganese among the alumina, lime and magnesia." One would have expected the author to advocate the co-precipitation of manganese with the alumina as a regular practice.

Apart from a few debatable technicalities, the new edition of this admirable little book offers no ground for criticism; its merits have long since made it a standard work on the subject of rock analysis.

W. R. SCHOELLER.

PUBLICATIONS RECEIVED.

THE USE OF COLLOIDS IN HEALTH AND DISEASE. *By* A. B. SEARLE, *with foreword by* SIR M. MORRIS. *Pp.* 120. (*London: Constable and Co., Ltd.* 1920.) *Price* 8*s.*

TRATTATO DI CHIMICA GENERALE ED APPLICATA ALL' INDUSTRIA. *Vol. II.—Chimica Organica. Parte Prima. Third revised and enlarged edition. By* DR. E. MOLINARI. *Pp.* 624. (*Milan: Ulrico Hoepli.* 1920.) *Price* 28 *lire.*

UTILISATION DES ALGUES MARINES. *Par* C. SAUVAGEAU. *Encyclopédie Scientifique, publiée sous la direction du Dr. Toulouse. Pp.* 390. (*Paris: Gaston Doin.* 1920.) *Price* 7 *fr.* 50.

THE PRODUCTION OF IRON AND STEEL IN CANADA IN 1918. *Canada, Department of Mines. By* J. MCLEISH. (*Ottawa: J. de Labroquerie Taché.* 1920.)

PUBLICATIONS OF THE UNITED STATES BUREAU OF MINES. DEPARTMENT OF THE INTERIOR. (*Washington: Government Printing Office.* 1919, 1920.)

- DANGEROUS AND SAFE PRACTICES IN BITUMINOUS COAL MINES. *By* E. STEIDLE.
- PRODUCTION OF EXPLOSIVES IN THE UNITED STATES DURING 1918. *By* A. H. FAY.
- GOLD, SILVER, COPPER, LEAD AND ZINC IN NEVADA IN 1918. *By* V. C. HEIKES.
- GOLD, SILVER, COPPER, LEAD AND ZINC IN ARIZONA IN 1918. *By* V. C. HEIKES.
- GOLD, SILVER, COPPER, LEAD AND ZINC IN NEW MEXICO AND TEXAS IN 1918. *By* C. W. HENDERSON.
- GOLD, SILVER, COPPER, LEAD AND ZINC IN IDAHO AND WASHINGTON IN 1918. *By* C. N. GERRY.
- GOLD, SILVER, COPPER, LEAD AND ZINC IN THE EASTERN STATES IN 1918. *By* J. M. HILL.

SOCIETY OF CHEMICAL INDUSTRY.

AWARD OF THE SOCIETY'S MEDAL.

The Council of the Society has awarded its Medal for the year 1920 to Monsieur Paul Kestner in recognition of his distinguished services to chemical industry.

Monsieur Kestner was born in Alsace prior to the German occupation in 1871, and although most of his life has been spent in France he lived for several years in this country, and has been a member of the Society since 1893. He was one of the chief founders and the first president of the Société de Chemie Industrielle in France, which was established in 1917. He has been connected with engineering as applied to chemical industry throughout his career, and among his more notable achievements are the use of forced draught in acid towers, automatic acid elevators, the climbing film evaporator, the scale-less water-tube boiler, and several inventions in connexion with beet-sugar manufacture.

Very shortly before the armistice M. Kestner gave an address of outstanding interest and importance to the London Section of the Society on "The Alsace Potash Deposits and their Economic Significance in relation to Terms of Peace" (*cf.* J., 1918, 291 T).

The previous recipients of the Society's Medal have been:—

1896, Mr. John Glover; 1898, Dr. W. H. Perkin; 1900, Dr. Edward Schunck; 1902, Sir J. W. Swan; 1904, Prof. Ira Remsen; 1906, Dr. Ludwig Mond; 1908, Sir Andrew Noble; 1910, Mr. Thomas Tyrer; 1912, Sir William Crookes; 1914, Right Hon. Sir H. Roscoe; 1916, Mr. C. F. Cross; 1918, Sir James Dewar.

ECONOMIC BOTANY AND CHEMICAL INDUSTRY.

J. B. FARMER.

The events of the last few years have served to emphasise the need of looking more fully than heretofore into the best means of utilising vegetable products as raw materials for industry, or of investigating their amenability to chemical treatment. We are mainly dependent on plants for the great sources of our material wealth, and, indeed, plants (and in a secondary sense animals also) represent the main real revenue of the world, inasmuch as they are practically the chief storers of the energy that reaches us from the sun.

Few people sufficiently visualise our absolute dependence on the plants for the sheer necessities of life, or realise how urgent is the demand for investigations which will enable us not only to increase our wealth, but also give us a further measure of control over the sources of, and the conditions that affect, this plant revenue. The need for such investigation begins at the bottom. We have much need for stocktaking. At home there is, for example, a problem why some grass fields will fatten stock, and others not. Such fields are known in most grazing districts, but no really satisfactory explanation of their excellence is forthcoming. Superficial reasons, so-called, are common enough, but the fact that such fields are often surrounded by others apparently similar but of greatly inferior value should give pause enough to those who are ready with facile solutions of a difficult problem—or, rather, congeries of problems. Indeed, the soil and the grass that grows on it still constitute a relatively open field of research. Chemical analyses of soil go a little, but only a little, way. The complex physical and physico-chemical conditions and the relation of the plant roots to the substratum, and the changes that may be induced in the herbage itself, are very little understood; indeed, it would be almost true to say that the real problems have as yet scarcely been formulated. Hall and Russell in this country have emphasised the importance of the physical texture of the land. Russell and his collaborators at Rothamsted have done first-rate pioneer work in investigating the importance of the inter-relations of protozoa and bacteria in connexion with soil fertility, and during the last three or four decades we have come to recognise that the problems of fertility are not likely to be elucidated by the older test-tube chemistry. They demand for their analysis chemists with a biological training and outlook, as well as biologists with a corresponding equipment in chemistry and physics. At present the two branches of science are often undesirably divorced although, largely owing to pestilent systems of examinations, a lack of biological training among chemists is far more common than is a corresponding ignorance of "physical" science with biologists, at any rate those on the physiological side. It is not, of course, suggested that every student should attempt to *specialise* in both of these great branches of science, but it is certainly a bar to progress that a student of the one should continue to be entirely ignorant of the more fundamental principles of the other. Those who are cognisant of the facts will be able of their own knowledge to supply examples enough during the late war—examples that would have been humorous, had the consequences not been fraught with too much gravity at the time.

One of the happier developments arising out of the war consists in the greatly increased recognition in this country of the value of science to industrial enterprise, and this is becoming as prominent in the biological as in the chemical and engineering worlds. Botany in its various branches is in a position to render very important services at the present time, and the supply of properly trained young men is as yet quite inadequate to take advantage of the new situation that has arisen. The exploitation of oil, rubber and other tropical products, the fermentation industries—indeed, all connected with the utilisation of plants and plant products, afford large and profitable scope for scientifically directed industrialism. It is the business of the botanist not merely to find the raw material, but to improve it by careful breeding, to defend it from the attacks of enemies, both animal and vegetable, and to investigate the conditions under which the yield of the desired product can be improved, whether by appropriate modification of the environment or by breeding. As the nature of the problems becomes more clearly recognised the methods of cultivation, selection, and dealing with the raw material improve. Breeding, which used to be a sort of hit-and-miss business, is now becoming more and more an exact science, and although, owing to the tangled mass of factors involved, immediate success in a particular direction cannot always be predicted, at any rate we do know how to attack the matter. Thus it is that in the more direct cases it is now possible with comparative certainty and rapidity to achieve results which formerly could only be secured by an immense waste of time, material and, of course, expense. Intelligent breeding demands a wide outlook over the many aspects presented by any single organism, but this fact is still unappreciated by too many business men. To give but one example, one often hears of high expectations being entertained that races of rubber trees can easily be produced which shall give high yields of caoutchouc, shall be immune to the attacks of disease, and, in short, shall possess all sorts of desirable qualities that, unfortunately, are but seldom combined in a single individual. Such expectations are entirely unreasonable, at any rate for so long as we continue to remain ignorant of the physiological significance of latex in the tree, of the origin and significance of caoutchouc formation, as well as of the other substances that occur along with it. Possibly it may turn out that there exists a significant connexion between the caoutchouc and the troublesome resin which seems invariably to accompany it in all rubber yielding latices. The destiny of the oxygen during the transformation from carbohydrate to rubber is in itself an attractive, and perhaps a very fundamental, problem.

The matter of immunity to fungal and other disease-producing organisms is of the widest possible interest. In our own cultivated crops the problem is ever arising. Why do Victoria plums suffer so badly from silver leaf (due to the fungus *Stereum*), and why do certain otherwise desirable varieties of potatoes fall victims to the attack of wart disease so that they cannot be grown at all in districts where the disease is present? It is plain that there is joint work here for the plant physiologist and the chemist. There will have to be "many knots unravelled by the road" before the secrets of immunity are disclosed, and even if the final goal be distant the knowledge gained on the way thereto cannot fail to be very productive in all sorts of ways as yet entirely unsuspected.

Fortunately, however, there are many problems of far more simple type, some of which are being solved, and others seem ripe for solution. For example, both in the field and in the laboratory the amount of scientific work that is urgently needed in connexion with cotton is stupendous, and the results will have an imperial no less than a national influence and significance.

The vast sums of money which the great cotton industry is setting aside for scientific research is proof enough that the leaders are alive to the issues at stake. It is with special pleasure that reference is here made to the prize offered by Messrs. Cross and Bevan for an essay on "The Interconnexion of Economic Botany and Chemical Industry." In the pages of this journal it would be superfluous to dwell on the advances in our knowledge of cellulose and its products which we owe to these investigators, but what they have done for cellulose can be repeated by others for many other raw products, to the great advantage of commerce, industry, and also, it may be hoped, to the investigators themselves. To the successful essayist who, in the opinion of the Council of the Society of Chemical Industry, has shown conspicuous merit there will further be awarded a research fellowship of £300 per annum tenable at the discretion of the Council for two or three years. This fellowship, the gift of Sir T. P. Latham, Bart., is particularly intended to promote the study of economic botany, especially in its bearings on chemical industry; but the founder has with great wisdom and foresight allowed great latitude as to the nature of the researches on which the recipient of the scholarship may engage. This enlightened action ought to serve to stimulate some of the best among the younger men and to direct their attention to the rich fields of investigation that are awaiting them. Rubber, indigo, tea, oils, vegetable proteins, bamboo and forest refuse, especially abroad, and a host of other products at once suggest themselves as suitable subjects, and it must not be forgotten that investigations not only of the main substances, but of the by-products also, as all experience abundantly proves, are of immense value from a material and scientific point of view. The foregoing are, however, only a very few of those that might be quoted. The large and increasing lines of production that depend on vegetable organisms and fermentation only call for a passing mention, inasmuch as they have recently been so ably dealt with in this journal by Mr. Chaston Chapman. The demand for vegetable oils and fats is a growing one, and the sources of supply are likewise increasing, whilst chemical investigation has already shown how much can be done in rendering the raw oils suitable for foods and other purposes. But we are really only on the threshold of the wealth which the vegetable kingdom holds out to those who know how to grasp it. And in utilising these things we are increasing the revenue, without, as in some of our large industries, depleting the capital of the world.

COAL CONSERVATION IN THE UNITED KINGDOM.

In the "James Forrest" Lecture, delivered before the Institution of Civil Engineers, on April 20, Sir Dugald Clerk critically examines the conclusions of the Coal Conservation Committee and their recommendations relating to "super" electrical generating stations (see this J., 1918, 40 R). It is considered that the coal at present consumed for purely power purposes, including railways, is only 48·7 million tons, or 31·3 million tons less than the Committee's estimate, and that the average coal consumption per b.h.p. hour is 4·05 lb., rather than 5 lb., as assumed by the Committee. Allowing for a reduction in the coal consumption to 1·56 lb. per e.h.p. hour by the introduction of super-stations, which will give a saving of 30 million tons of coal on stationary power, and for a further saving of 7·5 million tons by the electrification of railways there is a possible saving of 37·5 million tons of coal per annum in the production of power compared with the 55 million tons saving anticipated by the Committee. It is shown that, although small fuel savings are possible in the application of electricity for lighting and power purposes, the general substitution of electricity for gas and for coal used for domestic purposes, as contemplated in the Committee's report, would result in a loss of the whole saving on stationary power assumed above. It would require the consumption of 2·65 times as much coal in the super-stations to provide electrically the heat, light and power at present supplied by the gas industry, or the extra coal consumption would be 31 million tons; no coal could be saved by substituting electricity for the coal used for domestic consumption (see this J., 1919, 104 R).

With improved thermal efficiencies of gas manufacture resulting from the distribution of 75 per cent. of the whole heat of the coal in gaseous form, and with improvements in the design of gas apparatus, an annual saving of 6 million tons of coal per annum on the gas industry may be anticipated. The displacement of all household coal by gas would save a further 17·5 million tons. If the efficiency of all boiler plant could be raised to 75 per cent. there would be a saving of 4·4 million tons on colliery power plants and of a further 4 million tons on coal used for purposes of manufacture other than producing power. By using our water power we could obtain an additional three million h..p. without consuming any more coal.

It is erroneous to suppose that very large units are necessary for reducing the fuel consumption in the generation of electrical power or that great gain is to be obtained from very large steam turbines. The limiting efficiency of the turbine is 28 per cent., whereas 45 per cent. b.h.p. may be obtained from gas and oil engines in the near future; the saving of coal in the production of power may as well be claimed for gas engines as for super-stations. Any large saving of coal on power is dependent upon the replacement of capital sunk in present installations which normally takes place as a result of the development of industry. In competition with steam the efficiency of the internal combustion engine increased from 16 per cent. in 1876 to 30—35 per cent. in 1920; during the same period the efficiency of steam rose from 8 to 20 per cent.

As a result of healthy competition between the various modes of generating power it is anticipated that the consumption of coal will fall to under 2 lb. per b.h.p.-hour within ten years, but this will be by the development of the internal combustion engine and by improvement in steam boiler, town gas, and gas producer efficiencies in addition to the extended application of electricity.

It is concluded that if the supply of heat is to be included in the electricians' programme the present high-efficiency turbine must be abandoned since the use of electricity for heating involves great loss of coal; use must rather be made of the heat of steam discharged from engines at a pressure slightly above atmospheric. By this means the thermodynamic efficiency of the engine is reduced from 19 to 10 per cent., but if all the exhaust steam could be utilised for industrial or city heating purposes, the only thermal losses in the system are those due to radiation and condensation. The use of high-pressure steam turbines without vacuum would be a further advantage in connexion with the choice of position of central power stations, inasmuch as problems of water supply are considerably reduced.

It is shown that with a reversed Carnot cycle engine, advocated by Lord Kelvin for heating and ventilating rooms, it would be possible to heat large volumes of air with great thermal economy, using either gas or electricity as the source of motive power. The difficulties of application of this principle are purely practical and can be overcome, but such schemes are not likely to be developed immediately owing to the present high overall efficiency of gas for light, heat, and power. Still higher efficiencies are anticipated in the gas industry, and neither gas nor electricity should be artificially displaced by the uninformed decision of a Government Committee.

THE POTTERY INDUSTRY IN JAPAN.*

Japanese ceramic products have always been distinguished geographically rather than technically, as Satsuma ware, Imari ware, Awata ware, etc. Even the common Japanese word for pottery, "Seto-mono," is derived from the town of Seto, the most famous manufacturing centre.

Japanese ceramic wares may be classed roughly in three groups:—

1. Stoneware, including tiles etc., usually glazed and ornamented only by stamping or scoring, made in many parts of Japan and chiefly used locally.
2. Faience (earthenware), as Satsuma and Awata ware, mostly with a crackle glaze, and highly decorated. It has easier firing than porcelain, and therefore is softer and more fragile, but also can be decorated with more delicate colours. Much of this ware has gone abroad in the form of curios.
3. Hard porcelain and semi-porcelain, as Seto, Imari, and Kiyo Midzu among the finer wares, and Kutani among the coarser.

* Abstract of Report sent to the Department of Commerce at Washington by the U.S. representative at Tokyo.

Japanese porcelain—unlike that of China—after being shaped is fired biscuit, is painted with hard fire colours, then glazed, and fired again at a much higher temperature; in case of enamel colour decoration or gilding, the ware is afterwards fired in a muffle kiln.

The values in £'s sterling (at normal exchange) of the total annual production and exports of Japanese earthenware and porcelain for the period 1909-1918 were as follows:—

Year.		Production.	Exports.
1909	...	£1,261,600	£537,560
1910	...	1,354,700	562,900
1911	...	1,521,000	558,000
1912	...	1,689,000	556,560
1913	...	1,804,600	683,700
1914	...	1,491,600	603,500
1915	...	1,789,800	709,790
1916	...	2,574,500	1,235,600
1917	...	2,995,000	1,478,000
1918	...	4,513,500	2,037,000

It may be noted that since the beginning of the great war the annual value of the exports has more than trebled. Before the war nearly half the Japanese production went to the United States, but less than one-fourth in 1918. Nearly two-thirds of the total imports of decorated china, Parian, porcelain, and bisque, into the States come from Japan, but the United Kingdom supplies the greater part of the decorated earthenware and crockery imports. The porcelain and semi-porcelain products of which Japanese ceramic exports largely consist, and for which they are mainly manufactured, are table ware, sanitary ware (wash-bowls and other bathroom fixtures), electrical porcelain, toys and novelties.

Kaolin is mined in Japan by tunneling into the hills where the deposits are found, and the finer material is separated by washing and settling, iron filter presses being used to separate most of the remaining water (after running off the surface portion) from the kaolin. The drying is completed in open sheds or (in good weather) by direct exposure to the sun. The present laid-down cost of dried kaolin is 18 dollars per ton. In the Yamaguchi district only 16 per cent. of the mined material is usable kaolin, the remainder being left unused, excepting a limited amount of sand washings utilised in the steel mills and for making fire-bricks.

The following analyses indicate the nature of Japanese kaolins, clays, and "porcelain stones":

	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	K_2O	Na_2O	H_2O
Shiga-raki (Kyoto)	56·87	28·56	0·98	0·69	0·47	2·08	0·06	10·16
Owari (Seto) ..	54·65	32·35	—	0·90	0·37	3·27	2·22	6·30
Hizen (Arita)	49·25	38·89	1·14	0·15	0·36	2·01	0·39	5·90
Arita Stone I.	78·70	14·27	1·16	0·45	—	2·24	—	3·29
Arita Stone II.	83·00	11·60	0·70	0·18	—	1·90	0·29	2·49
Amakusa Stone	73·87	15·25	0·73	0·43	—	5·46	1·07	2·23
Kutani Stone ..	76·60	14·75	0·86	0·29	—	3·91	0·65	2·68

The "porcelain stone" or "rock clay" is somewhat similar to Cornish stone.

It has been found that English kaolin or china clay must be used to obtain the whitest and finest china, and it costs the Japanese manufacturers about 40 dollars per ton. The wages of the men employed in preparing the materials are 60 cents per day of 12 hours. Felspar occurs in Japan, the best being from Fukushima. The saggar clays of Japan are inferior, and about 40 per cent. of the saggars break in each firing. To counteract the excessive contraction of the saggar clay it is mixed (as in other countries) with old saggars broken up and coarsely ground to the size of a small pea as a maximum.

In the modern factories using circular down-draught ovens good coal is required, which is difficult to secure in Japan, and costs the manufacturer in Nagoya about 17 dollars per ton (of 2000 lb.), as compared with 4 dollars in 1914.

Plaster for the best work is imported from America, and costs nearly 10 dollars per barrel of 224 lb. Native plaster is inferior. Colours for decoration are largely obtained from England, instead of as formerly from Germany, but the decalcomania sheets are chiefly supplied from America.

The old type of Japanese kiln or oven is unique. A single oven is built at the bottom of a hill. Another is added as required to the side of the first and at a higher level, being also larger in size. The kiln or oven resembles in shape the inside of the ordinary muffle or decorating kiln in the United States. The floor is usually covered with sand, and the firing is not begun until all the ovens have been filled with ware. The fire is started in the oven at the bottom of the hill, the heat entering from fire boxes which extend the entire width of the oven near the boundary between the two arches. Each oven has a draught-hole halfway up the side, above the hole where the fire is fed. The direct brunt of the heat is taken by a firebrick wall. The flame and heat, circulating about the rounded roof of the oven, pass into the oven next above through a series of openings on the level of the floor of that oven. The heat passes from one oven to the other, the surplus from one drying and warming the contents of the following oven. Wood is used entirely in firing the ovens, in sticks about 15 inches long and about as thick as a man's wrist. The ovens are fed from either side through a small hole less than 1 foot in diameter, one stick at a time being put in continuously during the firing. The wood costs about four times the pre-war cost, and the firing of each furnace costs about 250 dollars. The heat is intense, approximating to cone 16. As each oven reaches the desired heat the feeding is discontinued and the firemen proceed to the next oven above, which by this time is hot enough to ignite the wood. By the time the third oven is fired the first is ready to be drawn or discharged. These ovens are a crude form of the German Hoffmann kiln.

In a modern pottery at Nagoya, the centre of the industry in Japan, it is a striking fact that labour is still by no means considered the first and greatest factor in costs. All the materials are carted in small one-horse wagons, each horse being led by a man, and the materials are piled on the wagon in shallow tray-like baskets, each containing as much as a man can carry conveniently. A second striking fact is the large amount of hand labour used in the breaking up and sorting of the raw materials, and also in removing foreign matter from them. In the Nagoya factory the saggars and setters are made in machines consisting of steel dies which squeeze the clay into the desired shape, the pressure being applied by a screw press. The same method is used for shaping the ware in this factory as in other countries, but casting is more largely used than pressing.

The ware from the first fire (in the upper chamber of the oven) can easily be broken between the thumb and finger. For the second firing (after glazing) the French methods of placing the ware are used, plates, dishes, and flatware being placed in separate setters. All cups and bowls are put on rings, which are placed on the bottom of the saggar, and are not boxed as is customary in France. The plate setters are so evenly made that it is not necessary to fill in the edges with clay when fired. The glost heat reaches cone 17, the cones being made at Tokyo. The ware is drawn from the kiln very carefully and rapidly, the man in charge getting a bonus for every hour saved.

Every piece of ware is carefully inspected and sorted in the Nagoya factory—10 to 15 per cent. firsts, 25 per cent. seconds, 35 to 40 per cent. thirds, the rest being job lots. Only firsts are exported. About 50 or 60 persons (mostly girls) are employed in the polishing room.

The decorating processes are similar to those in use in America and elsewhere. The dinner ware is decorated largely by mechanical processes, but very large quantities of decorative ornamental wares are hand painted.

A recent development in Japan is the manufacture of electrical porcelain, including large high-tension insulators, made both in large factories (like the great Morimura plant at Nagoya) and in small village workshops. One man will throw, turn, and finish 400 large pole insulators in a day, for which he gets about 90 cents (or a little less).

Dolls and toys are made in nearly all the pottery centres of Japan, along with other porcelain wares of every description.

OBITUARY.

RUDOLPH MESSEL.

With the death of Dr. Messel on April 18, 1920, there passed away a striking figure which had been familiar to chemists of this country for close on half a century.

Rudolph Messel was born on January 14, 1848, as the second son of S. Messel, a Darmstadt banker, four of whose children migrated to England in their youth, the fifth remaining in Germany to establish a world-wide reputation in architecture. Messel lost his father at the early age of 11, and shortly after was sent to a Huguenot school at Friedrichsdorf, near Frankfort, where his general education was completed. On leaving school he at once entered the employment of Meister, Lucius and Co., where he gained his first contact with chemical industry, in which he was destined to play so important a part. After leaving Frankfort he visited in turn the Universities of Zürich, Heidelberg and Tübingen, at the last of which he took his degree. At Heidelberg he had Bunsen and Kirchhoff as his teachers, whilst at Tübingen he came under Strecker, by whom his attention was first drawn to the problem of converting Peregrine Philips' discovery of the fact that sulphur trioxide could be produced by catalysis into a commercial process; a problem he was later to solve and with which his name will be connected indissolubly in the annals of chemical technology.

On leaving college early in 1870, Messel came to London, and after a short stay proceeded to Manchester, where he remained for a few months as assistant to Calvert and to Roscoe. On the outbreak of war he went back to Germany, became a stretcher bearer in the Army of the Loire and was wounded. When he returned to England a college life no longer afforded him sufficient scope for his activities, and instead of going back to Manchester he obtained employment with Messrs. Dunn, Squire and Co., of Stratford. Squire shortly after formed with Spencer Chapman the firm of Squire, Chapman and Co., and took Messel with him to his new venture. This change occurred at a time when the growth of the synthetic dyestuff industry, which until then had made rapid strides, was threatened by the excessive price charged for fuming sulphuric acid, then virtually a monopoly of Stark, who produced it by the old Nordhausen process near Pilsen in Bohemia. Squire, deciding to commence the manufacture of the fuming acid, learned from Messel of his early experiments with Strecker, and they resolved to explore the commercial possibilities of the catalytic process. Of the work that followed no permanent record has hitherto been published except in the form of a patent taken out by Squire in 1875. A year later, however, Squire and Messel read a paper before a meeting of chemists which, although never printed, was, amongst the records of his great achievements, treasured by Messel until his last days.

This document, from which the following extracts have been taken, bears eloquent testimony to Messel's exceptional powers of accurate observation and reasoned generalisation, as well as to the courage and perseverance which enabled him to surmount the innumerable difficulties he had to face in converting his early experiments into a commercial process, the success of which was proved shortly after on a large scale at Silvertown:—

"It occurred to us that the catalytic process, which had been found impractical for the production of ordinary sulphuric acid, might possibly be available for the production of the anhydrous acid. For many reasons we considered spongy platinum the most promising substance to begin with.

"Carefully washed pieces of pumice stone were soaked in a solution of platinum chloride and ammonium chloride and heated to dull redness. In this way the platinum was obtained finely divided and distributed over the surface of the pumice stone.

"We then passed pure sulphurous acid and oxygen, mixed in the requisite proportions, over the spongy platinum. The result was in the highest degree satisfactory.

"From the cool end of the reaction tube the liquid anhydride fell, drop by drop, into a flask placed to receive it, and in the absence of foreign gases the condensation was extremely perfect. . . .

"The next step was to prepare the sulphurous and oxygen gases economically on a large scale. After a number of experiments we remembered that Deville had, some years ago, proposed to prepare oxygen gas by subjecting sulphuric acid to a high temperature.

"Under these circumstances it splits up into sulphurous acid and oxygen, the former of which is easily removed. This was the very thing required. The decomposition of ordinary sulphuric acid in this way furnished us with the two gases required in any quantity and always precisely in the proportion required. The constituent water of the sulphuric acid is easily and readily removed.

"It is only necessary to break up the sulphuric acid, take out the water, and put together again what is left. The agent employed in breaking up the sulphuric acid is platinum and much heat; the agent employed in putting it together again is platinum and little heat."

In the same paper Squire and Messel described in some detail experiments they had made with other catalysts, including various metallic oxides, and notably those of copper and chromium, with which Wöhler and Mahla had experimented in 1852. In discussing their results, Squire and Messel say:—

"Whether in the case of metallic oxides the combination is effected directly, as is the case with platinum, or by the formation and subsequent decomposition of a sulphate, still remains to be seen. The whole subject requires more investigation; for this reason we have in practice confined ourselves to spongy platinum. . . . After arriving at the results which we have described, we learnt that Professor Winkler, of Freiberg, has been working contemporaneously in the same direction, and has obtained precisely similar results, as far as the decomposition of sulphuric acid and its re-composition by spongy platinum are concerned, but he prefers to use asbestos, prepared with platinum, and he does not employ a platinum, but an iron apparatus for decomposing the sulphuric acid."

Squire and Messel also discussed the poisoning of the contact mass due to impurities in the gases, thus drawing attention at that early date to one of the main difficulties of the process, which was described by Knietsch in such detail twenty-five years later.

In 1878 Messel succeeded Squire as managing director of the firm which subsequently became Spencer Chapman and Messel, Ltd., and under him the factory at Silvertown grew in size and importance, finally attaining an output of 1000 tons per week. Messel was himself an indefatigable worker, and he expected all those who served under him to keep to the standard he set. However, sympathy with those who worked for him and an innate sense of justice gained for him their ready acquiescence, and on his withdrawal from active management, partially crippled by a stroke, he was followed into retirement by the love and respect of all the employees of his firm.

Force of circumstances had converted the young scientist of 1870 into the technologist of later years, yet Messel remained throughout a scientist, and his interest in pure science never failed even in his last days. He rejoiced in the friendship of most of the distinguished chemists of his day, not only in this country but throughout the world, and his extraordinary memory, which only became dimmed towards the end, enabled him to regale his colleagues, young and old, who were at all times free to his advice and sympathetic encouragement, with anecdotes concerning the great men of their profession culled from his meetings with them, whatever the interval which had elapsed.

Messel played an active part in many scientific societies and institutions. He was an original member of the Society of Chemical Industry, of which he was honorary foreign secretary in 1910—1911 and from 1914—1920. He was elected president for 1911—1912, and accompanied the Delegation of that year to America, where his exertions hastened the outbreak of a malady, the combating of which was in itself a remarkable demonstration of his will power and scientific knowledge. Vice-president in 1912—1913, he became president again for a short term in 1914. He was also a member of the Publications Committee from 1911 to his death. In addition, Messel served twice on the Council of the Chemical Society and once as vice-president of that body. He was a fellow of the Institute of Chemistry, a life member and generous patron of the Royal Institution, a member of the Governing Body of the Imperial College of Science and Technology, and in 1912 was elected a fellow of the Royal Society.

Gifted with his full share of enjoyment of the good things of this world, Messel nevertheless led a life of great simplicity, bent upon his task, which at the end became almost an obsession, of accumulating those funds with which it was his dearest wish to endow the science and education of his adopted country.

On April 11 a second stroke left him completely paralysed, and on April 18 he passed on peacefully to his rest.

J. S. MacARTHUR.

John Stewart MacArthur, the inventor of the cyanide process of gold extraction, died on March 16, in Pollokshields, Glasgow. Born in Glasgow sixty-three years ago, he entered the laboratory of the Tharsis Sulphur and Copper Co. in 1871 as an apprentice chemist. In 1881 his work in connexion with the recovery of precious metals from the Tharsis copper liquors directed his attention to the extraction of gold from ores, and in 1885 he entered into partnership with the Drs. Forrest, who placed at his disposal a small room in their surgery for conducting his researches. In the same year the Cassel Gold Extracting Co. was formed to work the Cassel patents. About this time an article by

MacArthur on the Cassel process was published in *Industries*, and arrested the attention of many interested in gold extraction processes. The directors of the Cassel Company, unable to get results from their process, asked MacArthur's help, and in 1886 he joined the company as technical manager, when determined efforts were made by him to render the Cassel process operative. In the meantime, MacArthur and his partners had made the wonderful discovery that a weak solution of plain potassium cyanide dissolved the gold from ores, and this discovery was disclosed to the directors of the Cassel Co., at whose works the process was thoroughly tested. The results from the treatment of 15 tons of ore from the New Zealand Crown Mines proved the process a commercial proposition, and a contract was made with this company to erect a plant in New Zealand. South Africa was the next field exploited, and here the success of the process opened a new era for the Rand and a new chapter in the history of the world's gold production. From this beginning the cyanide process spread all over the world, and may be truly said to have created a new source of wealth.

In 1911, MacArthur took up the manufacture of radium compounds in Runcorn, and afterwards moved his works to Balloch on Loch Lomond side. During the war he produced radium for medicinal use and for making luminous paint for military purposes, the whole output being taken by the Government.

In 1892 he became a member of the Institution of Mining and Metallurgy, and in 1902 was the recipient of the gold medal of the Institution in recognition of his work in the introduction and development of the cyanide process. He was an original member of the Society of Chemical Industry.

BERTRAM HUNT.

A. K. HUNTINGTON.

The late Alfred Kirby Huntington, whose death took place on April 17, became an Associate of the Royal School of Mines in Mining and Metallurgy in 1877, and afterwards assisted Prof. W. N. Hartley in his work on ultra-violet absorption spectra. He was appointed to the newly-established chair of metallurgy at King's College, London, in 1879, and continued to fill the post until his resignation last autumn. He was well known in metallurgical circles as a teacher and as a consultant, and gained a wide experience of metals, chiefly non-ferrous, during his long tenure of the chair. He collaborated with Prof. Bloxam in the preparation of a text-book of metallurgy, and this work, subsequently revised and published under the names of Huntington and MacMillan, long enjoyed a deserved popularity. Much research work was carried out in the laboratories of King's College under his direction, and papers dealing with non-ferrous metallurgy were issued from time to time. Prof. Huntington also took an interest in general chemistry; he was an original member of this Society, and served on the councils of several other technical societies, especially the Institute of Metals, of which he was president in 1913–14, and the Faraday Society. During the war he served on several important technical committees, including the Nitrogen Products Committee, to which he devoted much time. Any account of his life would be incomplete without a reference to his connexion with aviation. Becoming an expert pilot in the days of spherical balloons, he gave early attention to the problem of flight, and was an active member of aeronautical societies. Shortly before the war he turned his attention to the construction of an aeroplane, which he successfully flew, although at an age when such a feat was scarcely to be expected. Prof. Huntington took the keenest interest in the subject of flying, and brought his metallurgical experience to bear on the problems of construction which it involves.

CECIL H. DESCH.

NEWS FROM THE SECTIONS.

CANADA.

Ottawa Branch.

At the meeting held on April 15 in the Carnegie Library, Ottawa, two reports were presented to the Branch and adopted. The first expressed the approval of the invitation by the Canadian Section to the Society to hold the annual general meeting in 1921 in Canada. The second approved the suggestion of forming the various Canadian Branches of the Society into independent Sections, having direct communication with London, provided that the by-laws of the Society be so amended as to permit recognition of the Canadian "associate" members in computing the number of members available in any locality for the formation of a Section.

Dr. J. A. Amyot, Deputy Minister of Health, then gave an address on "The Procedure Used in the Examination of the Waters of the Great Lakes during the Pollution Investigations in 1913," in which he reviewed the work of the International Joint Commission appointed to determine to what extent and in what localities the waters of the Great Lakes had been polluted and rendered unfit for domestic use. Dr. Amyot first drew attention to the various kinds of water supplies in Europe and America. He pointed out that many of the streams of Europe from which water supplies were drawn were turbid, but that the typhoid rate was low. The waters of the central and southern states are also turbid, and the waters in the rivers to the north of the Great Lakes are brown. In spite of the fact that the water of Lake Erie is very clear and cold, the typhoid rate of the riparian cities was very high, sometimes reaching 350 deaths per 100,000 of population. The speaker then traced in detail the actual methods used in the investigations undertaken in 1913. He pointed out that although the normal bacterial count in waters from the Great Lakes was low, practically all the bacteria so found were of intestinal origin. The cold water of the Great Lakes served admirably to refrigerate these bacteria and thus to preserve them. As a result of the work undertaken, practically all the cities on the Great Lakes are now using water taken from them; in many cases it is filtered to remove suspended matter and subsequently sterilised by chlorination.

NEWCASTLE.

On April 21, Mr. C. L. Haddon read a paper on "The Setting of Calcium Sulphate Cements." Prof. P. Phillips Bedson presided.

The author has investigated some of the factors determining the setting of commercial flooring plaster and of plaster of Paris. By increasing the percentage of water, the setting time is also increased, and a weaker cement is obtained, but in the case of flooring plaster, unless precautions are taken to keep it damp for eight or nine days, drying occurs when the material is far from being hydrated. The water content was found to have a great effect on the tensile strength. Rohland's theory—that substances which increase the solubility of calcium sulphate also increase the rate of setting—was examined and found to be untenable; sulphates of other metals, which various workers have shown to decrease the solubility of calcium sulphate, were found to have a marked accelerating effect on the setting. This was shown to be an effect of mass action; but the tensile strength did not increase uniformly, as with a sufficient ratio of sulphate added to water used (about 5 per cent.) the tensile strength decreased after the first day and then increased again. In the presence of these other sulphates, the rate of hydration was so great that the material set before the excess water had evaporated; thus the troublesome precautions, when flooring plaster alone was used, were unnecessary.

CHEMICAL ENGINEERING GROUP.

The third conference of the Group was held at Birmingham on April 23, over 100 members attending. The subject was "Labour-saving Devices in Chemical Works," and seven papers were presented of which six were read. Mr. W. A. S. Calder presided at the afternoon session, and Mr. C. A. Smith in the evening. The first paper, by Mr. H. Blyth, dealt with high-speed electric telpherage; its various uses were described, and its advantages over transporters, elevators and conveyors discussed. The advisability of introducing such a system is determined by the extent to which the capital cost divided by the number of men saved exceeds £1400, the estimated capital equivalent of one man. After Mr. H. J. H. King had described the pneumatic suction plant for handling coal at the works of Messrs. Boots' Pure Drug Co., at Nottingham, Capt. C. J. Goodwin followed with a paper on portable elevators and transporting trucks, in which the costs of operating these appliances were compared with those for hand-labour. At the evening session, Mr. G. S Layton dealt with the advantages, in certain cases, of the pneumatic handling of granular substances; Mr. S. H. Johnson discussed the subject of automatic weighing machines; Mr. H. Varndell's paper on the importance of the mechanical handling of material in its relation to production costs dealt principally with gravity conveyors; and the last paper, by Mr. H. F. Broadhurst, described the evolution of automatic filling machines for liquids. These papers will be noticed more fully in the *Transactions*, and will be issued in due course in the *Proceedings* of the Group.

An informal dinner was held in the evening at the Grand Hotel, and on the following day a visit was paid to the works of the Birmingham Small Arms Co., Small Heath.

MANCHESTER.

At the meeting held on April 23, with Mr. J. Allan in the chair, a paper was read by M. S. Masfaraud on "Distillation Plant," with special reference to the rectification of alcohol, acetaldehyde and other volatile products, and to continuous ether-manufacturing plant.

After a brief reference to the great importance of fractional distillation in modern chemical industry, the author discussed the theory of the distillation of binary mixtures of non-miscible liquids, and showed how the composition of distillates could be forecast. He then dealt successively with mixtures of liquids which are either partly or entirely miscible, taking for detailed consideration an alcohol-water mixture to illustrate the former class. To solve problems relating to the distillation of mixtures of miscible liquids, it is necessary to determine the vapour pressure of several mixtures of two of these liquids and then introduce the third body, and again determine the vapour pressure. Reference was made to a number of mixtures of alcoholic liquids and to Soret's "coefficient of solubility," in place of which Barbet has introduced his "coefficient of solubility." The theoretical foundation of the latter was discussed and data adduced to show its superior accuracy in indicating the progress of the distillation of complex mixtures. To M. E. E. Barbet belongs the credit of having invented the first type of apparatus for the continuous rectification of alcohol; and during the period November, 1914, to November, 1918, his firm supplied plant with a collective capacity per 24 hours of 917,800 litres of 96—97 per cent. alcohol, 913,000 l. of ether, 480,000 l. of petroleum, and also for all the ether required by the British Government for munition purposes.

In the ensuing discussion Dr. Ormandy drew attention to the handicap placed on industry in this country by the prohibition of the simultaneous fermentation and distillation of alcohol, and of its continuous distillation, together with the required presence of an excise official, and pointed out its consequences in limiting supplies of motor fuel.

There was a record attendance of about 250.

On May 7, a paper on "Hydrogenation in the Naphthalene Series" was read by Mr. F. M. Rowe.

The work of Bamberger and his collaborators on the reducing action of sodium and an alcohol resulted in the preparation of numerous hydro derivatives of naphthalene, which have attracted the attention of subsequent investigators from time to time. As a result it has been shown that ar-tetrahydro-alpha-naphthylamine possesses many interesting properties which might well render this base and its derivatives useful intermediate products to the manufacturers of dyes, if the production of the base on a technical scale were economically possible.

The author has been engaged upon a study of the course of the reduction by which tetrahydronaphthalene and ar-tetrahydro-alpha-naphthylamine are formed from naphthalene and alpha-naphthylamine respectively, and it is now clear that, so far as the reaction with sodium and an alcohol is concerned, a similar series of reactions occurs in each case. First a dihydro derivative is formed, in which the additional hydrogen atoms occupy the para position with respect to one another, and this is converted into a dihydro derivative in which the additional hydrogen atoms occupy the ortho position relatively to one another, by the action of sodium alcoholate, prior to the further reduction to the tetrahydro compound. The intermediate dihydro-alpha-naphthylamines have been isolated and their constitution determined..

The formation of hydrogenated derivatives of naphthalene by the action of hydrogen in the presence of a catalyst was next discussed, and attention drawn to the fact that tetrahydronaphthalene and dekahydronaphthalene, which are valuable solvents and motor fuels, are now available in Germany in large quantities, being manufactured by the direct hydrogenation of naphthalene. The author described the results of preliminary experiments on this subject.

YORKSHIRE.

The annual general meeting was held on May 3, and after the election of officers, Mr. G. B. Haworth read a paper on "Graphical Methods for Interpreting Flue Gas Analyses." The investigation of fuel combustion problems generally resolves itself into the analysis of the fuel and flue gas, followed by an interpretation of these results in terms of correct air supply and heat lost in the flue gases. By ordinary methods the calculations are tedious and complicated, and fuel chemists have made several attempts to simplify them, Bunte's graphical method being the best known. The latter method, however, is not applicable to all classes of fuel, and the present methods have been devised to remedy this. Two series of graphs have been prepared; the first correlates the four variables, carbon dioxide in the dry flue gas, oxygen in the dry flue gas, excess of air for combustion, and a chemical factor calculated from the composition of the fuel; given values for any two of these variables, the corresponding values for the other two can be read off the graph. From the second graph the total heat lost in the flue gases is read off corresponding to the carbon dioxide in the dry flue gas, the temperature of flue gas, and the molecular ratio of hydrogen to carbon in the fuel.

Mr. G. F. Pickering then contributed a paper on "Commercial Analysis of Sulphonated Oils." The author deplored the present state of our knowledge of these products, and pointed out that there was little theoretical basis upon which to form an accurate system of analysis. Furthermore, the chemical and physical properties of sulphonated oils were such as rendered even empirical methods difficult and in many cases unreliable. These difficulties were especially marked with products obtained from oils of high iodine value. The author described in detail the analytical methods which he used in commercial practice, and, in passing, pointed out numerous errors which occurred in the published literature. In the discussion which followed, numerous points connected with the chemistry of "sulphonated" oils were brought forward, the chief being that the action of sulphuric acid upon them produces a true sulphate and not a sulphonate.

The changes in the list of officers for 1920–21 include:—Mr. S. H. Davies becomes chairman in place of Mr. W. Mc. D. Mackey, Dr. L. L. Lloyd, vice-chairman in lieu of Mr. S. H. Davies, and Mr. Mackey takes the place of Dr. Lloyd on the Committee. Messrs. J. I. Graham, L. Neaverson and A. B. Searle have been elected to th Committee in place of the retiring members, Dr. H. Ingle, Messrs. L. G. Paul and F. Wood.

LONDON.

A meeting of the above Section was held at Burlington House on May 3, Mr. Julian L. Baker being in the chair. The first business of the evening was a presentation of silver to Drs. Keane and Miall, in token of the appreciation felt by the Committee and Section for the excellent work done by them in connexion with the organisation of the Annual General Meeting, in July last. The chairman next made sympathetic reference to the losses which the Society had suffered by the deaths of Dr. Messel, Prof. Huntington, and Mr. Watson Smith.

The first paper, entitled "The Theory of Gas Scrubbing Towers with Internal Packing," by Prof. F. G. Donnan and Mr. J. I. Orme Masson, was read by Prof. Donnan. The authors considered the case of the removal of a soluble constituent from a mixture of gases, giving general equations showing how the operation-efficiency of a tower depends on the nature of the dissolved gas, the solvent fluid, the rates of flow of gas and liquid, the character of the packing, and the height and section of the tower. No experimental results were given, and it was assumed, in view of the preliminary character of the work, that no chemical action occurred between the gas and the solvent, and that the temperature and rates of entry of the gas and the counter-flow of the absorbing liquid were all constant. It will thus be seen that the equations obtained cannot from the nature of the case be immediately applicable without modification to the majority of the cases encountered in commercial practice, but it was hoped that they would prove of value in the preliminary design of new structures intended for the scrubbing of gases where the conditions were similar to those described above. In the long discussion which ensued it was evident that the experiences in gas scrubbing described by many of the speakers considerably outranged in complexity the simplified case with which the authors dealt.

The second paper was on "The Preparation of Picryl Chloride," by Prof. P. F. Frankland and Mr. A. F. Garner. The authors have investigated the conditions under which the nitration of 1-chloro-2.4-dinitrobenzene are best carried out at 90°—130° C. The large production of nitrous acid during nitration was correlated with the formation of carbon dioxide during the oxidation of chlorodinitrobenzene and picryl chloride, whilst the mixture of the di-nitro compound and picryl chloride in the nitration product was estimated by determining setting points. It was found inadvisable to employ sulphuric acid of a concentration lower than 96 per cent., and with acid of this strength complete nitration can be obtained after 12 hours heating at 130° C. At 140°—150° C. less nitric acid is needed, and an equally good product can be obtained in about six hours.

The third paper, entitled "The Preparation of Thiocarbonyl Tetrachloride," by Prof. Frankland, Mr. F. Challenger and Miss D. Webster, was read by Mr. Challenger. When carbon bisulphide reacts with 2½ molecular proportions of chlorine in the presence of iodine considerable quantities of tetrachloromethylmercaptan (thiocarbonyl tetrachloride) are produced thus:—

$$2CS_2 + 5Cl_2 = 2CSCl_4 + S_2Cl_2.$$

This reaction has been studied with a view to the large scale production of this substance and of its reduction product thiophosgene ($CSCl_2$), both of which may be employed in the production of vat and organic dyestuffs. The reaction proceeds best at 20° C., and yields about 60 per cent. of the tetrachloride, caluculated on the bisulphide taken, the sulphur chloride formed being removed by decomposition with water. The use of other catalysts such as iron, lead and tin was also investigated. A trace of iron (0·2 per cent. of the weight of the bisulphide) entirely alters the nature of the reaction products, and practically no tetrachloromethylmercaptan is obtained, whether iodine be employed or not. Tin produces a similar effect, but lead is inert. In all the experiments with iodine a certain amount of thiophosgene was produced, but the simultaneous presence of some carbon tetrachloride prevented its isolation. Attempts to increase the yield of thiophosgene by using a large excess of carbon bisulphide were unsuccessful. For the preparation of this substance it is therefore necessary to reduce the thiocarbonyl tetrachloride by means of tin and hydrochloric acid, by copper dust, or by other suitable and less expensive methods.

SOCIETY OF CHEMICAL INDUSTRY: MEMBERSHIP GAINS AND LOSSES.

	1912	1913	1914	1915	1916	1917	1918	1919
Elections	236	188	173	333	455	608	614	618
Restorations ..	18	14	9	19	14	4	16	51
Total Gains ..	254	202	182	352	469	612	630	669
Resignations ..	106	102	121	74	32	65	31	68
Deletions	135	145	159	200	93	89	151	143
Deaths	44	27	46	67	61	52	58	48
Total Losses ..	285	274	326	341	186	206	240	259
Net Gain or Loss ..	−31	−72	−144	+11	+283	+406	+390	+410

The membership number at March 31, 1920, was 5,440.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF PUBLIC ANALYSTS.

A meeting was held on May 5 in the Chemical Society's Rooms, Burlington House, Mr. A. Smetham presiding.

Mr. H. Droop Richmond and Miss E. M. Ison read a paper on "A Volumetric Method of Estimating Iron." The method, devised for the estimation of iron in syrups, is applicable in the presence of hydrochloric acid, phosphorus, oxy-acids, and organic matter. The colouring matter is destroyed and the iron oxidised with permanganate and hydrochloric acid; strong hydrochloric acid and sodium bicarbonate are added, and the ferric iron then titrated with stannous chloride solution in presence of thiocyanate as indicator.

Mr. C. A. Mitchell, in a paper on the "Estimation of the Age of Ink in Handwriting," dealt with the importance of knowing dates of alteration in the composition of inks. The distinctions between old and modern inks were shown and tests for estimating their ages described.

A paper on "The Examination of Chinese Crude Camphor" was read by Mr. E. R. Dorey. Camphor oil is estimated by expressing a 100 gm. sample and weighing the pressed cake, thus obtaining by difference the loss of water and oil. Moisture is determined on the original sample and on the pressed cake by the calcium carbide or other method, and the weight of water lost in pressing is found by difference. This, subtracted from the total liquid expressed, gives the amount of oil. It is assumed that the proportions of oil and water in the sample and expressed liquid are the same, and the total oil content is calculated on that basis.

THE CHEMICAL SOCIETY.

On April 29, a special meeting was held to consider the Society's by-laws, and the proposed alterations in them were passed with a few verbal alterations.

As a preliminary to any effective alterations it was found necessary to secure a Supplemental Charter, for the original one, granted to the Society in 1848, included various hampering restrictions, prescribing, for example, a definite numerical limit to the size of the Council and a particular method for its election. Such provisions, made for the conduct of a comparatively small society, associated mainly with the London district, have become quite unsuitable in these days when the membership is over twelve times what it was in 1848, and the metropolitan area embraces a minority only of the Fellows. There has further been doubt whether under the original Charter it was permissible to admit women as Fellows. The position is now cleared up by the declaration in the Supplemental Charter that Fellows may be of either sex, and there is therefore now no obstacle to the admission of women.

Various other modifications of the by-laws aim at securing to provincial Fellows a greater share in the conduct of the Society. Under the old system everything of importance affecting the Society, including the election of the officers and council, was determined at a general meeting by the majority of those present and voting. The Supplemental Charter confers on the Society the power to elect the officers and council by a postal vote, and to take in certain cases a poll of all Fellows resident in the United Kingdom. These powers have been incorporated in the new by-laws.

It is noteworthy that in some of the changes made there has been kept in view the possibility of united action with other related bodies, as, for example, the acquisition of common premises or in the publication of joint abstracts. Conceivably these provisions may turn out to be among the most significant of the changes embodied in the new by-laws.

Ordinary scientific meetings were held on April 15 and May 6. On the former date a paper on "The Viscosity of Nitro-cellulose in Mixtures of Acetone and Water" was read by Messrs. J. I. Orme Masson and R. McCall; and on the latter date the following papers were presented:—"The Mustard Gas Problem," by Mr. G. M. Bennett; "The Formation and Stability of Associated Alicyclic Systems," by Prof. J. F. Thorpe and Mr. R. M. Beesley; "Orientation of the Nitro- and Arylazo-glyoxalines," by Mr. R. G. Fargher; "Orthochlorodinitrotoluenes," by Prof. G. T. Morgan and Mr. H. D. K. Drew.

INSTITUTION OF MINING AND METALLURGY.

In his presidential address, delivered at the annual meeting on April 15, Mr. Frank Merricks described the progress of mineral production, more particularly within the Empire, during the last 25 years. Owing to discoveries made during the past 80 years within the Empire, the mineral requirements of the United Kingdom are assured, few ores and metals have now to be obtained from foreign countries, and the Empire controls certain sources of supply which are indispensable to many foreign countries. Comprehensive tables were given showing the great strides that have been made in the output of ore-minerals, including such new-comers as wolfram, monazite, etc.

Of the world's output of gold, valued at over £90,000,000 in 1914, the British Empire contributes about 64 per cent., and of the Empire's production Africa accounts for about 76 per cent. and Australasia 14 per cent. With regard to silver production, the prominence of Canada is especially noteworthy; the production in that country has risen from a value of £68,776 in 1893 to £3,769,144 in 1917, representing about 65 per cent. of the Empire's output. During the last five years about 600 million ounces of silver has gone to India, and a further large amount to China, where it has probably been hoarded.

Least satisfactory from the Imperial standpoint is the position as regards copper, but there are possibilities of developments in Australia, particularly in Queensland, and the capacity of the smelteries and refineries in the Commonwealth is largely in excess of output. The contribution of the Empire to the world's production of this metal —1,415,000 tons in 1917—is only about 7 per cent., and to this Canada supplied 50,351 tons, Australia 40,000 tons, and the Singhbhum mine in India, 20,000 tons.

A rough estimate appears to justify the claim that the Empire is now producing about 25 per cent. of the world's supplies of lead, and there is some likelihood that this will increase. Australia is a prolific producer with a capacity of about 300,000 tons of lead per annum; Canada and Burma each yield about 20,000 tons. The Bawdwin mine in the latter country is expected to produce about 31,500 tons yearly, and the reserves at June, 1918, stood at 4,300,000 tons, assaying, Ag 24·2 oz., Pb 26·8%, Zn 18·72%, and copper 0·07%. The annual production of the United States exceeds 500,000 tons, and that of Spain is about 180,000 tons.

The world's chief sources of supply of zinc ores are the United States, Australia (Broken Hill), Germany, Spain, Algeria, and Tunis; other producing countries are Mexico, France, Greece, China, Japan, Canada, Great Britain and Belgium. Owing to the zinc content of the ores varying widely, it is not possible to estimate accurately the production or proportion for each country. The actual production at Broken Hill was equivalent to about 260,000 tons of spelter in 1917 and 300,000 tons in 1918.

The British Empire produces about one-half of the world's tin, and in addition smelts and refines still larger amounts of foreign ore and crude tin. The chief source is the Federated Malay States, with an output of nearly 50,000 tons of metal in 1914. Bolivia is the second largest producer of tin ore in the world, the production in Siam (about 8300 tons yearly) is advancing, and the output in China is stated to have increased considerably in recent years.

The rise of the nickel industry in Canada is one of the romances of mining enterprise. In 1893 the output of ore in the Sudbury district was valued at £431,489; in 1917 it was £7,027,523. Canada supplies at least 85 per cent. of the world's supply of nickel, and is on the way to become the greatest refiner of this metal; the production is over 1½ million tons of ore per annum. The only other producers of importance are New Caledonia and Norway.

Manganese ore was first produced in India in 1892, and as the grade was high and facilities were good, the output increased to 900,000 tons in 1907, but this fell to 591,000 tons in 1917, owing to the war. Before 1914, Rhodesia and New Caledonia were the chief sources of chrome ore in the world, but since then large supplies have been obtained from Canada, India and the United States. Prior to the war China was the chief source of supply of antimony, computed at 50 per cent. in 1913, and the United Kingdom was dependent mainly on that country, Mexico and Australia; but as a result of recent discoveries made in Canada and South Africa these countries are likely to become considerable producers. Graphite was formerly obtained chiefly from Austria, followed by Ceylon, whose output has now been reduced owing to competition from Madagascar. In 1918 the world's production of asbestos was 164,000 tons, all of which, except 10,000 tons derived from Russia, was produced in the Empire, mainly in Canada. More than half the world's supply of mica is obtained from India, where a record output of 2738 tons was achieved in 1918. The United States and Canada come next in order of importance, the Canadian output being less than half that of India. Competition is to be feared from Brazil, where the industry developed rapidly during the war, and there is a good deposit in the Tanganyika Territory (German East Africa).

Bauxite is derived mainly from France and the United States. The former produced over 300,000 tons in 1913, and the latter 210,000 tons in 1913, and 570,000 tons in 1917. Proved deposits exist in British Guiana and India, and during 1917 Ireland provided 14,700 tons. British Guiana exported 2037 tons in 1917 and 4199 tons in 1918. Six bauxite areas in this country have been leased to the Northern Aluminium Co., of Quebec, on the condition that it establishes in British territory refining works with a yearly capacity of 4000 tons within seven years.

Largely owing to the war and labour troubles, the world's output of the chief minerals has seriously decreased of late years, and the conservation of mineral resources, more particularly of coal, iron and manganese ores within the Empire, requires serious consideration. The use of hydro-electric energy in the mining and metallurgical industries has greatly developed during the past decade, but not to the desired extent in the United Kingdom, where until recently coal and labour have been fairly cheap. Probably the attitude of British engineers, long accustomed to the use of steam plants, has retarded the development of hydro-electric energy in certain other countries.

PERSONALIA.

Prof. G. Ciamician, of Bologna, has been elected a foreign member of the French Academy of Sciences in succession to the late Sir William Ramsay.

Mr. J. A. Brodie has been elected president of the Institution of Civil Engineers for the year 1920-21, and among the members of council are Dr. C. C. Carpenter and Sir Robert Hadfield.

H.M. the King has been pleased to appoint Mr. W. G. Craib to the Regius professorship of botany in the University of Aberdeen, in succession to the late Prof. J. W. H. Trail.

The chair of metallurgy, in the Royal Technical College, Glasgow, vacant by the resignation of Prof. C. H. Desch, has been filled by the appointment of Dr. J. H. Andrew, who has been in charge of the metallurgical research department of Sir W. G. Armstrong, Whitworth and Co., Ltd., Manchester, since 1914.

The sum of £10,000 has been offered to the University of Oxford by Mr. E. Whitley, of Trinity College, for the endowment of a professorship of biochemistry, and one of £5,000 has been received from the British Dyestuffs Corporation, Ltd., to meet the cost of extending the organic chemical laboratory.

The firm of Alfred Holt and Co. has given the sum of £15,000 to the University of Liverpool in response to its appeal for funds, for the establishment and endowment of a chair of metallurgy. The United Alkali Co., Ltd., has contributed £10,000, and Pilkington and Sons, Ltd., of St. Helens, £5,000 for the erection of new chemical laboratories.

The following candidates were successful in the examinations of the Institute of Chemistry, held recently in London, Manchester, and Sheffield:—*Fellowship:* E. Clayton, H. W. B. Clewer, R. O. Eames, N. Ratcliffe. *Associateship:* F. N. Appleyard, S. Bowman, R. Humphries, A. Lees, S. B. Phillips, E. C. Pickering. *Certificate:* S. Dixon.

Sir Henry Birchenough has been appointed to succeed Lord Moulton as chairman of British Dyestuffs Corporation, Ltd. On retiring from the position of Director-General of Explosives Supply some eighteen months ago, Lord Moulton was appointed to the chairmanship, by arrangement between the Lord Chancellor and the Board of Trade, but only for a period of twelve months. His Lordship's resignation from the Board of the Corporation is due to the urgent need for his full-time judicial services in the House of Lords and on the Privy Council.

The death is announced of Prof. J. A. McClelland, F.R.S., professor of experimental physics in University College, Dublin.

Mr. Watson Smith, the editor of this *Journal* from its inception in 1881 until the end of 1914, died on May 1, in London, at the age of 75.

Prof. F. C. Phillips, who died in February last, was for 40 years instructor in chemistry in the University of Pittsburgh, U.S.A. Dr. Phillips had a wide reputation as an authority on natural gas, and was closely identified with the establishment of the Priestley Memorial Fund.

The death is reported of Mr. James Gayley, who received the Perkin Medal of the American Section of the Society of Chemical Industry in 1913 in recognition of his valuable work in chemical metallurgy (see this J., 1913, 180), including the invention of furnace improvements, bronze cooling plates and the dry air blast. Mr. Gayley was president of the American Institute of Mining and Metallurgy in 1904–6, and was the first vice-president of the United States Steel Corporation.

NEWS AND NOTES.

AUSTRALIA.

Manufacture of White Lead, etc.—A company—the British-Australian Lead Manufacturers Proprietary, Ltd.—has been formed for the purpose of manufacturing white lead, etc., in Australia. The capital is £300,000, the greater part of which has been subscribed by the leading white lead corroders in the United Kingdom, and the balance by the Long Life Mining Companies at Broken Hill. The company is erecting works with an output capacity of 4,000 tons of white lead per annum, and it is intended to manufacture paints and varnishes as well. As the Australian consumption of white lead is approximately 10,000 tons a year, there is ample scope for the new company.—(*Ind. Australian and Min. Standard, Feb.* 5, 1920.)

The Eucalyptus Industry in Victoria.—During 1917-18 the eucalyptus oil distilled from forest areas amounted to 806,977 lb., an increase of 161 tons on the previous year. The areas in the north-west chiefly bear trees of the blue mallee species, and are now regularly cultivated under a coppice system. They are not classed as forest reserves, but arrangements have been made with the Lands Department for the issue to eucalyptus distillers of annual licences. In the Wombat forest, Ceneral District, where many small stills are in operation, the peppermint tree only is used; most of the plants are crude and are not properly equipped. At Bendigo, where the foliage of the red and white ironbark is used, there are several good mills, and the industry is useful in disposing of large quantities of surplus coppice growth, which has to be removed in the treatment of the young forests.—(*Chemist and Druggist of Australia, Feb.*, 1920.)

FRANCE.

Industrial Notes.—*Chemical Industry.*—Owing to the enormous cost of obtaining the necessary raw materials for this industry, it is considered probable that chemical firms will follow the lead of the metallurgical companies in grouping together for the common good and thus dispensing with third parties in the buying of raw materials and intermediates. This policy does not appeal in general to the French temperament, but sooner than see the State step in again and impose irritating regulations, the chemical firms will undoubtedly prefer to combine of their own initiative and form a basis of association which will be inspired by a more realistic and direct estimation of their immediate needs.

Great interest is being taken in the formation of the "Société Centrale des Industries de l'Air Liquide et de l'Azote," which is to apply M. G. Claude's patented process of nitrogen fixation on an industrial scale. The capital of the company is 25 million francs.

Metallurgy.—The late strike of the miners in the north of France, which has lasted 24 days, with a resulting loss in extraction of about 630,000 tons of coal, has very severely reacted on the production of the metallurgical works. This shortage of fuel, added to strikes in the metallurgical centres around Metz and the recent disturbances in the Ruhr basin, has caused 90 per cent. of the blast furnaces of Lorraine to stop work, and the situation is very critical. Recourse has been had to the liquidation of war stocks for material that the factories cannot produce.

New Issue of Nickel-Copper Coinage.—The *Journal Officiel* has published the law of October 16, 1919, authorising the emission by the Minister of Finance of a further ten million francs of bronze nickel coins pierced by a hole in the centre and composed of 25 per cent. nickel and 75 per cent. copper, with a toleration of over or under ten-thousandths.

The Zinc Industry.—According to *L'Exportateur Français*, the output of zinc ores in France during 1913 was 46,577 metric tons, of which the two departments of the Gard and the Hautes-Pyrenées supplied nearly 30,000; to this has to be added the production of the French dependencies, Algeria 82,256, Tunis 30,000 and Indo-China 33,430 tons. Imported minerals totalled 178,179 tons (66,178 tons in 1900), against which there was exported 58,203 tons. At the outbreak of war the industry came to a complete stoppage, but to meet the national urgency production was renewed to some extent in 1915, and this was continued, so that in 1917 the outputs were:—France 12,604, Algeria 40,020, Tunis 15,000; total 67,624 tons.

In 1913 the total output of French smelters was 67,890 tons of zinc, exclusively from the three departments of Aveyron, Nord and Pas-de-Calais. During the same year the consumption was 78,153 tons, *i.e.*, there was a deficit of 10,263 tons, which was met by importation, Belgium supplying 84 per cent. To compensate for the temporary loss of the works in the invaded departments of the Nord and Pas-de-Calais other works were opened, and progress was made in the substitution of the electrolytic process for the older distillation process. The present lack of coal, refractory materials and labour all point to a further development in this direction, since by the older method it took 5 tons of coal to produce a ton of zinc, whereas this quantity of metal is produced electrolytically for a consumption of 4,000 kw.hr.

It is estimated that the French production will shortly be increased to 250,000 tons of mineral, and 110,000—124,000 tons of metal. These quantities should meet the home demand—an eminently desirable result in view of the imperative necessity of reducing purchases abroad.

The Proposed Indian Chemical Service.—According to *The Times*, the Chemical Service Committee has recommended the establishment of an Indian Chemical Service (*cf.* J., 1920, 12 R, 56 R), with headquarters at Dehra Dun, and managed by a Board of Control comprising a director-general and four deputy-directors, who would act as heads of departments for inorganic and physical, organic, metallurgical, and analytical chemistry. The main duties of the Board should be to initiate new industries, to develop new processes, and to co-ordinate the activities of workers in the provinces. Each province should have its own research institute, the staff of which should be recruited mainly from Indian chemists, and although assistance should be given to private undertakings, local institutes should in no way compete with industrial enterprises. Further recommendations relate to the need for creating a Ministry of Science, and for the carrying out of a chemical survey of the country.

The Sugar Industry.—For some months past a committee, under the chairmanship of Mr. J. MacKenna, Inspector-General of Agriculture in India, has been investigating the production of sugar in India with a view to discover the best means of increasing it. Although India has a larger area under sugar than any other country, the production is not sufficient to meet the internal consumption, and consequently at least half a million tons is imported yearly, mostly from Java and Mauritius. In view of the general shortage, this is a serious matter for the world as well as for India, but the problem cannot be solved satisfactorily by merely extending the cultivation of sugar cane at the expense of other crops, because there is also a deficit of food grains and cotton. It is therefore desirable to find other means, such as bringing under cultivation waste land suitable for sugar, and improvements in the cultivation and treatment of the crop whereby the yield of sugar per acre may be materially increased. Although the sugar cane grows much better in a tropical climate, in India it is mostly cultivated in the north, where the weather is comparatively cold during part of the year, and this is one of the reasons why the yield is low. Thus, in Java the yield is 3—4 tons per acre, and in Demerara, Mauritius, and Queensland rather less than 2 tons. In the Bombay Presidency the yield is 2·5 tons per acre and in Madras 1·9, but in Bengal it is only 0·9, in the United Provinces 0·8, and in the Punjab 0·6. The reason why sugar-cane is not grown more in the south is partly that water is not as a rule available for irrigation, and partly that there are other crops which pay the cultivator better.

Fortunately, the Agricultural Departments have given considerable attention to sugar cultivation in the past and have made a good start on various methods of improvement. Some improved varieties of cane have been introduced, and it is proposed to continue investigations both by crossing and selection.

The committee has also been collecting evidence as to methods of crushing the cane and boiling down the juice. There are only a few large central sugar factories in India; most of the sugar is sold in the form of unrefined *gur*, which is preferred by the majority of Indians, partly for religious reasons. It is made by the cultivators themselves with rough and generally inefficient plant, and in consequence a considerable proportion of the product is lost. The crushing mills mostly have wooden rollers and are driven by cattle, which are often not strong enough to do the work when the rollers are set close. Consequently much of the juice is left in and is burnt under the evaporators. In some places, however, mills with hardened steel rollers and driven by small oil engines have been introduced, and these are far more economical. Moreover, they are able to deal with thicker and therefore richer canes.

The system of land tenure renders it practically impossible in most parts of India for a central factory to ensure sufficient cane cultivation in its immediate neighbourhood, and consequently some of the factories work for part of the year on the refining of *gur*, which is a somewhat wasteful procedure.

Considerable quantities of sugar are also made in India from the juice of the date palm and toddy palm, and in the extreme north sugar beet is cultivated.

The report of the committee, when it appears, will no doubt contain much valuable information on these and many other points and should help materially to place the industry on a more satisfactory basis.

UNITED STATES.

Cost of Production of Dyes.—The United States Tariff Commission has now placed before the Senate its report on the cost of manufacturing dyes in the United States. The report states that the cost of manufacturing dyes in that country is from two to five times greater than were the German selling prices in America before the war. The American costs, however, were slightly lower than the prices of German dyes as offered to the Reparation Commission, taking the mark at par. Attention is drawn to the difficulty of ascertaining American cost figures, owing to the lack of organisation and uniform methods of accounting, so that only approximate conclusions can be drawn. It appears, however, that while the costs of intermediates, such as aniline, beta-naphthol and nitrobenzene, were falling, the costs of dyes have, generally speaking, shown an upward tendency.—(*Oil, Paint and Drug Rep., Mar.* 8, 1920.)

Exhaust Gases from Motor Vehicles.—In connexion with the proposed vehicular tunnel to join New York with New Jersey, account is to be taken of the exhaust gases from motor vehicles, in which carbon monoxide is found. The Bureau of Standards will shortly undertake a series of chamber tests on human subjects, following road tests which have been under way with motor vehicles of 80 different classes. In the chamber tests compartments designed to represent cross sections of the tunnel will be used.

Quicksilver in 1918.—In 1918 the production of mercury in the United States was 32,883 flasks (of 75 lb.), valued at £772,750. The total number of producing mines was 47, the total exports 3098 flasks, and the total imports 6719 flasks. The following figures show the world's production (in flasks) of quicksilver:—

Country.	1913.	1915.	1916.	1917.
United States..	20,213	21,033	29,932	36,159
Austria..	24,104	25,000	25,000	25,000
Hungary	2,606	2,500	2,500	2,500
Italy	29,513	28,954	32,129	29,300
Russia)..	—	800	1,100	500
Spain	36,619	35,925	23,369	25,147
Mexico and other countries..	4,000	4,000	4,000	4,000
Total	117,055	118,212	118,030	122,606

—(*U.S. Geol. Surv., Oct.* 31, 1919.)

Phosphate Rock in 1918.—The quantity of phosphate rock marketed in the United States in 1918 was 2,490,760 tons, valued at £1,642,892; part of this was due to stocks held over, as the actual quantity mined that year amounted to 2,284,245 tons, a decrease of 19·9 per cent. on the 1917 output. The most extensively developed phosphate deposits in the United States are those of Florida, where four classes are mined: hard-rock, land-pebble, river-pebble and soft-rock phosphate. The world's production of phosphate rock is shown in the following table:—

COUNTRY.	1913.	1915.	1916 Metric Tons.	1917.
Algeria	377,934	225,891	389,211	202,539
Angaur Island ..	90,000	30,000	30,000	—
Belgium	219,420	—	—	—
Canada	349	197	184	135
Christmas Island ..	152,405	24,119	—	—
Dutch West Indies:				
Aruba	38,150	51,000	14,700	3,639
Curacao	1,850	32,915		
Egypt	104,450	82,998	125,008	115,732
France	298,859	—	24,700	—
British Guiana ..	5,000	—	—	—
Japan, including Rasa Island	25,013	57,723	114,389	—
Makatea Island ..	82,056	71,724	39,285	114,780
New Caledonia, Huou Island	2,100	8,400	—	—
New South Wales ..	2,032	—	—	—
New Zealand ..	11,176	—	—	5,557
Norway	757	—	—	—
Ocean and Pleasant Islands	250,000	—	70,000	—
Russia	25,000	—	—	—
South Australia ..	6,045	4,688	5,093	5,183
Spain	3,548	9,080	14,111	28,148
Tunis	2,284,678	1,389,074	1,695,295	999,326
United States ..	3,161,000	1,865,038	2,014,103	2,625,636
	7,141,822	3,852,847	4,536,079	4,100,675

The output so far recorded for 1918 is as follows:—Algeria, 234,825; Egypt, 31,147; Tunis, 818,962; United States, 2,530,612 metric tons.—(*U.S. Geol. Surv., Oct.* 4, 1919.)

SOUTH AFRICA.

The Sugar Harvest.—The current harvest of sugar in Natal and Zululand is expected to produce from 175,000 to 180,000 tons, leaving from 30,000 to 40,000 tons for export. The yield exceeds the previous highest record by 25,000 tons.—(*Official.*)

Mineral Production in 1919.—The mineral output of the Union for 1919, according to official returns of the Mines Department, was valued at £50,841,405, an increase of £3,621,872 compared with the year 1918. The figures for the two years are:—

	1919.	1918.
Gold	£35,390,609	£35,758,316
Silver	203,646	158,815
Diamonds	11,237,778	6,961,062
Coal	3,430,361	3,247,668
Copper	208,902	358,627
Tin	275,111	447,952
Other base minerals	94,998	287,093

It will be noticed that the enhanced value of diamonds was responsible for a difference between the two years of £4,276,716. Corundum to the value of £45,139 was exported from South Africa in 1918, an increase of £11,500 over the previous year. Exports were chiefly to the United Kingdom, America, Japan and East Africa. Production started in 1912 with an output valued at £659. The corundum deposits of the Northern Transvaal are said to be the largest and most important in existence so far as is at present known.—(*Official*.)

GENERAL.

Corrosion of Metals.—The Corrosion Research Committee, initiated some ten years ago by the Institute of Metals, has already issued five reports embodying the results of very valuable research work on the corrosion of metals in general and on that of condenser tubes in particular. The necessary funds have hitherto been provided by the Institute of Metals, by manufacturers, and, more recently, by the Department of Scientific and Industrial Research, but the Department has now stipulated that the continuance of Government aid will be contingent on contributions being obtained from the users of tubes and condensers, among whom shipping interests are specifically mentioned. The Committee is therefore inviting the assistance of consumers to enable it to continue its work. Communications should be addressed to the secretary, Mr. G. Shaw Scott, at 36, Victoria Street, S.W. 1.

"The Institute of Physics."—A new society bearing this title has been founded to promote the interests of physical science and the professional welfare of those who pursue it, on lines analogous to those of the Institute of Chemistry. There will be three classes of members, viz., associates (A.Inst.P.) and fellows (F.Inst.P.), who must possess full professional qualifications, and ordinary members. The Institute has been brought into being by the joint effort of the Faraday Society, the Optical Society, and the Physical Society of London, but it is hoped that other societies will co-operate in due course. The first board has been constituted from members of the councils of the societies above named; Sir Richard Glazebrook is president, Sir Robert Hadfield hon. treasurer, and Prof. A. W. Porter hon. secretary. Further information may be obtained on application to the secretary, Mr. F. S. Spiers, 10, Essex Street, Strand, W.C. 2.

Gretna and Waltham Abbey Munition Factories.—The conclusions of the committee appointed in February, 1919, to consider the future of these factories, and reached in June, 1919, have just been issued as a White Paper [Cmd. 667, 1d.]. The recommendations include the retention of the Gretna factory as being the more up-to-date and better suited for manufacturing cordite, and the scrapping of the works at Waltham Abbey. The committee was advised that cheap, duty-free methyl alcohol of a grade suitable for the dye industry could be manufactured at Gretna, as well as ether, provided the existing plant were slightly modified, and it recommends that a small grant be made for this purpose. The Government could also assist by encouraging local industries to start in the neighbourhood, and by offering cheap power and water, and facilities over the factory railways. Sir Wm. Pearce, in a minority report, recommends the retention of Waltham Abbey and the scrapping of Gretna. The Admiralty already possesses a cordite factory adequate to supply its requirements, there is a large stock of cordite in the country and a large over-production of both oleum and glycerin. The locality of Gretna is unsuitable for peace production, and its enormous capital cost, approaching £150 per ton of cordite produced, should be cut forthwith.

Conjoint Board of Scientific Societies.—According to the report of the Conjoint Board of Scientific Societies for 1919, the total number of constituent societies is now 57, four societies having been admitted to membership in the past year. Among the seventeen committees appointed by the Board are seven which deal respectively with the following subjects:—The prevention of overlapping among scientific societies; the metric system; iron ore; the water power of the British Empire; timber for aeroplane construction; glue and other adhesives; joint buildings for scientific and technical societies. It is stated that water power investigations in many parts of the Empire have been stimulated, particularly in India, British Guiana, and New Zealand, and the suggestion is put forward that some permanent central body is required to co-ordinate, advise, collect, and distribute data relating to water powers throughout the Empire. The research work carried out under the auspices of the committee on glue and other adhesives has now been transferred to the Department of Scientific and Industrial Research. The work includes the formation of numerical standards for adhesives, investigations on the methods of preparing gelatins and glues, and researches on adhesives from casein and other sources. A new method has now been patented for making an adhesive by condensing formalin and phenol, and a number of technical researches has been carried out. The report of the committee on joint buildings for scientific and technical societies states that a joint building and library adjacent to the Institution of Civil Engineers at Westminster would be an asset of great national importance.

Toxicity of Lead Paints.—The committee appointed by the Home Secretary in 1911 to investigate the hygienic effects of the use of lead compounds on persons engaged in painting, enamelling, and varnishing coaches and carriages has recommended that the use of any painting, filling, stopping, or similar material containing more than 5 per cent. of its dry weight of a soluble lead compound should be prohibited after three years from the date of the report. A method for the determination of soluble lead is prescribed.

Sugar in the West Indies in 1919.—The sugar exported from the West Indies in 1919 amounted to 267,247 tons, a decrease of nearly 24,000 tons on the estimated amount. This decrease is ascribed to various causes, including shortage of fertilisers and labour, and drought. The chief sugar-producing areas included in the West Indies group are Barbadoes and British Guiana. At present conditions are reported to be favourable, and the 1920 crop is estimated at 271,318 tons.—(*Bull. Dept. Trade and Com., Canada, Apr.* 5, 1920.)

The Late Prof. W. Will.—Wilhelm Will was born in Giessen in 1854 and died on December 30, 1919. He studied and graduated at the University of Giessen, and in 1876 went to Berlin, where he served as assistant to A. W. von Hofmann. In 1891 he gave up his academic work to undertake the establishment of an institute for explosives' research connected with the War Office, which later developed into the Militärversuchsamt. Will made valuable contributions on the production of a stable nitro-cellulose. His stability tests consists in determining volumetrically the nitrogen evolved from the sample at 135° C., the progress of the gas evolution being recorded graphically. He introduced into explosives technique the so-called "Zentralite," substituted ureas, which act as stabilisers and regulators of combustion. A method of manufacturing nitro-glycerin powders not involving the use of volatile solvents, such as acetone, was introduced by him, by which the processes of manufacture and test were considerably accelerated. He also found a means of overcoming the sensitiveness of nitro-glycerin to frost, and the instability due thereto, by the addition of nitrated polyglycerides. The danger of fire-damp explosions in mines is considerably reduced by the use of the safety explosives introduced by Will; and his introduction of tetranitromethylaniline in place of trinitrotoluene in detonators marked an important step in advance. Much work was carried out under his direction during the war on the use of liquid air as an explosive, and on the substitution of lead azide for mercury fulminate. He served in tho field during the opening stages of the late war, but was recalled to the War Ministry at the instigation of Emil Fischer. There he rendered notable service in connexion with the substitution of wood cellulose for cotton, the chief difficulty being to prepare the former in such a state that it had the same absorptive capacity for acid as the latter.—(*B. Lepsius; Chem. Ind., Feb.* 28, 1920.)

The Origin of Petroleum.—Although largely dependent on chemical investigation, the subject o fthe origin of petroleum is essentially a geological question. Of the many theories that have been advanced, so far it cannot be said that any one has given universal satisfaction or been accepted as conclusive. It is, however, probable that no single theory of origin suffices to meet the case. The theories of origin can be broadly grouped as either organic or inorganic. It appears improbable that any commercial supplies of petroleum can have originated in an inorganic manner, although small quantities of hydrocarbon occur in meteorites, igneous rocks, or in volcanic material. The theories that suggest its origin as due to the action of percolating carbonated waters on metallic iron at high temperatures deep down in the earth, or as due to the interaction of water, or steam, on metallic carbides are not satisfactory, as many objections can be raised to them. Another inorganic hypothesis is the "mining" theory of origin, and has been suggested in view of the frequent association of sulphur and gypsum with petroleum, the supposition being that sulphur dioxide and sulphuretted hydrogen acting on limestone in the presence of water could produce petroleum, gypsum, and sulphur. The gypsum has, however, probably been formed in a stratiform manner or is contemporaneous with the beds in which it is formed.

On the whole, it appears advisable to accept organic hypotheses of origin as affording the most probable sources of derivation—in any case in respect of large deposits of petroleum. The required conditions or factors for the production of deposits of petroleum, originating from organic matter, may be summarised as follows:—(1) Sufficient sources of organic matter (mainly marine and especially micro-organic) and deposition together with rapidly accumulating (preferably) argillaceous deposits, possibly in presence of saline conditions; or transportation of the hydrocarbons by means of clay sediments and subsequent deposition. (2) The existence of a suitable medium whereby the bitumen can reach and accumulate in porous beds—either by means of capillarity and adsorption or through cracks and fissures in the argillaceous or impervious material. (3) The presence of such porous beds suitable to serve as reservoirs, within access from the seat of origin, and sealed by impervious material. (4) The presence of water (preferably saline) in the strata, or water-logged rocks, and the advent of geotectonic conditions favourable for effecting concentration. The possible organic origins are examined in detail, and reasons are given for supposing that marine organic sources are the most important as regards the origin of the largest accumulations of oil. The author considers salinity to indicate a general prevalence of desiccated conditions attending deposition, although he points out that a saline condition of the water would tend to promote the separation of the oil and thus the production of accumulations. The view is taken that petroleum is seldom indigenous to the beds in which it is formed. The author regards bitumen as not of sporadic or restricted occurrence, but as being fairly generally present or accumulating in appreciable deposits where the conditions are favourable.—(*Mining Magazine, Jan.,* 1920.)

LEGAL INTELLIGENCE.*

NAPHTHALENE TRANSACTIONS. *J. M. Steel and Co.* v. *The Gas Light and Coke Co.*

In the King's Bench Division, on April 19, Messrs. J. M. Steel and Co. sought to recover money alleged to have been paid in error to the Gas Light and Coke Co. in respect of purchases of naphthalene.

It was stated on behalf of the plaintiffs that before the war they had bought their supplies from the defendants, but owing to shortage during the war they had been compelled to purchase from people who had bought from the defendants. In this way they bought 10 tons of ball naphthalene from a Mr. McCarthy on March 8, 1916, and paid him £465 on March 10, when they obtained a delivery order on the Gas Co. When plaintiffs sent for the goods, defendants refused to deliver without payment, and plaintiffs then, in error, paid them £425. They had thus paid McCarthy £465 and plaintiffs £425. Two years later the mistake was discovered, and plaintiffs now claimed £425 from defendants. On July 29, 1916, plaintiffs bought another 10 tons from McCarthy, and on August 4 the latter paid defendants £470 for the goods and received a delivery order. On the same day plaintiffs asked the defendants whether McCarthy had paid them, and they said he had. Plaintiffs then paid McCarthy £470, but did not take immediate delivery. When delivery was requested later on defendants failed to deliver, and plaintiffs now sought to recover the money paid, with damages for alleged breach of contract.

In giving judgment, Mr. Justice Shearman said that, in the first claim, plaintiffs could not say that the money paid by them to defendants was money which defendants had to their use and, therefore, defendants were not bound to repay plaintiffs. With regard to the second claim, when plaintiffs and defendants were negotiating for delivery, they both forgot that McCarthy had paid, and it was clear that this was the plaintiff's money, demanded and paid on the basis that money was due when it was not due. Judgment was given for the plaintiffs for £450 with general costs of the action, defendants to have the costs of the first issue.

* More detailed accounts of legal cases reported in this Journal may be seen on application at the Society's offices.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for April 22 and 29 and May 6.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade, 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number:—

Locality of Firm or Agent.	Materials.	Reference Number
Australia ..	Gas mantles..	548
..	Drugs	595
..	Bottles, glass, earthenware	596
..	Glassware, Drycolours	635
British India	Cement, paint	549
..	Lubricating oils and greases, sizing and finishing materials	636
..	Glassware, perfumes	637
Canada ..	Rubber, paper, twine	552
..	Pig-iron	600
..	Chemicals, pharmaceutical preparations ..	603
..	Fertilisers, basic slag	*
..	Essential oils, rubber, leather, paint, varnish, perfumes, soap, glass, matches, paper	†
..	Tinplate	644
..	Sodium hyposulphite, naphthalene, Epsom salts, sodium sulphide ..	646
..	Perfumes, disinfectants	647
..	Pig-iron	654
Egypt ..	Leather, paint, oils, tinplate, galvanised sheets	561
..	Metals	605
..	Oil paint	658
..	Glass and china	659
..	Glassware, aniline, caustic soda, sodium silicate	660
New Zealand	Crockery	553
Rhodesia ..	Lubricating oils, bar iron and steel, disinfectants	657
Belgium ..	Dyes, oxides of cobalt and manganese, sodium and potassium dichromates, ammonium chloride	567
Denmark ..	Varnish	569
Italy ..	Heavy chemicals, pig iron, metals	611
Netherlands..	Steel sheets, bar iron	664
Norway ..	Sugar, syrup, cotton-seed products	576
Poland ..	Type metal ..	578
..	Fats, oils, manures	579
..	Oils, grease, rubber, paper, rope	580
Portugal ..	Metals, carbides	667
Rumania ..	Boric acid, carbolic acid, antipyrin, aspirin, quinine sulphate, iodine, potassium iodide, potassium permanganate, sodium sulphate, bismuth salts, vaseline, dermatol, protargol	‡
Switzerland	Tanned leather	583
..	Nickel steel sheets	615
Argentina	Industrial chemicals, paint, varnish, wire	586
Brazil ..	Metals, paints in powder form	621
Cuba ..	Soap, paraffin	587
..	Wire cloth, steel and galvanised wire and plates, linseed oil	625
..	Asbestos sheets	676
Mexico ..	Iron and steel rope	589
..	Chemicals, drugs ..	590
..	Alcoholic beverages	591
..	Chemicals, paint, varnish, tinplate, china, bottles, glass, leather ..	592
..	Photographic plates, films and chemicals	677

* The High Commissioner for Canada, 19, Victoria Street, London S.W. 1.

†The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

‡ M. le Commandant I. Cerna, Corpul Greniceri, Boulevard Bratiann (Colt cu Batiste), Bucharest.

MARKETS SOUGHT.—A firm in Canada owning mica and molybdenite properties wishes to hear from interested firms in the U.K. [Inquiries to the High Commissioner for Canada.]

A Canadian firm manufacturing aspirin, phenacetin, benzoic acid, sodium benzoate, salicylic acid and potassium permanganate wishes to get into touch with importers in the U.K.

A Canadian firm manufacturing denatured alcohol desires to hear from U.K. importers.

A British Columbian firm wishes to find a market for talc, magnesite, magnesium sulphate, etc., in the U.K. [Inquiries to Canadian Government Trade Commissioner.]

A firm in Poland wishes to hear from importers of cement in the U.K. [612.]

TARIFF. CUSTOMS. EXCISE.

Argentina.—The import duty on sugar has been reduced as from Febuary 14.

The export duties for this year will be levied on the same basis as those for the years 1918 and 1919, except that wheat, flour and preserved meat now pay the full rates of duty.

Australia.—The new schedule of import duties is issued as a supplement to the issue of April 22. The chief new feature of the schedule is an intermediate scale of duties about which, however, no information is available at present.

Austria.—Among the articles for which export licences are required are salt, saccharin, fats, oils, hides, skins, ores, magnesite, asbestos, cement, tanning materials, gums, resins, mineral oil (including paraffin), paper pulp, paper, cardboard, rubber, leather, bricks, tiles, pig iron, metals of all kinds, candles, soap, matches, artificial manures, explosives and many chemicals.

Belgium.—Among the articles under the control of the Ministry of Industry, Labour and Supply for which export licences are required are alcohol, soap, candles, starch, matches and certain seeds.

An import licence is still required for sugar (except molasses).

Canada.—The import of margarine is permitted under licence until August 31, and the sale until March 1, 1921, but the margarine so imported must conform to certain specified conditions.

The import of explosives, except "safety cartridges," is prohibited unless such explosives have been declared to be authorised explosives.

The Dumping Clause of the Tariff Act provides, *inter alia*, that when imported goods of a class or kind made in Canada are sold in that country at more than 5 per cent. below the fair market value in the country of origin, the importation is subject to dumping duty.

Columbia.—The import duty on certain foodstuffs, including sugar, lard, flour and biscuits, is suspended until July 20.

Federated Malay States.—The export duties on tin and tin ore are set out in the issue for May 6.

Finland.—No export licences are required, *inter alia*, for carbide, cork, gneiss, paper and manufactures thereof, pig-iron, resin, tar, turpentine, wood pulp, wood products, except paper-wood and firewood.

France and Algeria.—With some exceptions goods may now be imported from Germany and other European countries without licence.

Recent customs decisions affect incandescent mantles and paper.

The export of industrial alcohol is prohibited save under licence. The increased coefficients of increase relating to yeast, fireproof pottery and firebricks, etc., are given in the issue for May 6. The decree prohibiting the import of "luxury" articles applies to perfumed soap and perfumeries, blacking, glass ware, fabrics of silk and artificial silk, paper and manufactures of paper, kinematograph films, metal wares, arms, powder and ammunition, optical apparatus, etc.

Gambia.—An export duty of £2 per ton has been placed on palm kernels.

Georgia.—The customs duties (*i.e.*, those of the former Russian "European" tariff) have been increased tenfold, but certain foods are exempted from duty. Regulations have been issued regarding the control of exports from the Republic.

Germany.—Rubber wares and medicated wadding may not be exported except under licence.

The regulations respecting the control of export trade are set out in the issue for April 29.

The taxes to be levied on the issue of export licences for export-prohibited goods have now been fixed.

Gold Coast.—The import and sale of "trade spirits" is prohibited as from February 23.

Drugs and official preparations in the British Pharmacopœia are now free from import duty.

Italy.—The amount of duty payable is increased by 100 per cent. when payment is made in paper currency.

Jugo-Slavia.—Among the articles of "luxury" the import of which is prohibited are cocoa, oleaginous fruits, extract of meat, ivory, cantharides, vegetable fats, alcoholic beverages, vinegar, margarine, agate, amber, perfumed soap, saccharin, fusel oil, acetone, wood spirit, volatile oils (except turpentine and camphor oil), artificial perfumes, leather, artificial leather, certain wares of rubber, paper and glass, "luxury" articles of china and porcelain, and certain manufactures of metals.

Luxemburg.—The export of slates is prohibited except under special licence.

Import licences are required for, *inter alia*, slates, cement, polishes, explosives and fire-proof products.

Netherlands.—The prohibition on the export of aluminium and aluminium alloys, copper and copper alloys, salt, vinegar and yeast has been temporarily raised.

Norway.—The prohibition of the import of beer containing more than 4·75 per cent. of alcohol has been cancelled.

Paraguay.—The Budget Law for 1919, with certain modifications, is to be remain in force until August 15.

Poland.—Among the articles on which the import duty must be paid in gold are vanilla, saffron, alcoholic beverages, perfumery and certain kinds of porcelain.

Portugal.—The export of olive oil is prohibited as from February 20.

St. Vincent.—Crude oil is now admitted duty free, and the export duty on syrup and molasses is raised from 1s. 6d. to 5s. per 100 galls.

Spain.—Export licences for olive oil will be valid until September 30 for oil exported in barrels, and to October 31 for oil exported in tins or bottles with Spanish trade marks.

The duty leviable on absorbent gauze is fixed at 2 pesetas per kg.

Turkey.—Sulphur and petroleum are among the articles that may now be exported without licence.

GOVERNMENT ORDERS AND NOTICES.

Prohibited Exports.—The Board of Trade (Licensing Section) has announced the removal from List A of Prohibited Exports of the following goods: Milk, condensed unsweetened; milk evaporated (April 29); cod-liver oil and preparations containing; quinine sulphate (May 6).

Patents and Designs Acts, 1907 and 1919.—The Board of Trade has given notice that Section 29 (1), (2), and (4) of the principal Act, as amended by Section 8 of the Patents and Designs Act, 1919, and Section 15 of the latter Act came into operation on April 23 last.

COMPANY NEWS.

UNITED ALKALI CO., LTD.

At the adjourned 27th and 28th annual meetings, held in Liverpool on April 21, Mr. Max Muspratt, chairman, regretted his inability to include the accounts for 1919. The Inland Revenue authorities were disputing the company's claims for deferred repairs, and were demanding that the minimum working stocks should be written up; these were mainly stocks which were never realised until a works was finally closed, and the object of the demand was to levy excess profits duty on the fictitious profits so created. This impost was also being strenuously resisted by other firms and by the Federation of British Industries.

The 29th annual meeting followed. Mr. Muspratt referred to the long time it had taken to place the company's operations on a peace-time basis. This should be completed later in the year, but the question of deferred repairs would take longer. Owing to excessive costs, manufacturing was being carried on under adverse conditions, but he was hopeful that prices would be reduced before long. Labour, which cost the company £750,000 per annum before the war, cost £1,570,000 in 1919, and fuel, of which 800,000 tons was consumed, cost 27s. per ton, against 11s. in 1915. The general outlook, nevertheless, was good. In accordance with its policy of concentration, the company had closed and dismantled the Gerard's Bridge works at St. Helens, and the Muspratt works at Flint had been sold to Messrs. Courtaulds, Ltd. The sum of £10,000, spread over five years, had been offered to the University of Liverpool and accepted. The dividend payable on the ordinary shares for the past year was 15 per cent., less tax.

UNITED PREMIER OIL AND CAKE CO., LTD.

The first ordinary general meeting was held in London on April 30. Mr. H. Guedalla, who presided, explained that the company was a holding company, and that it held practically all the capital in Wray, Sanderson and Co., J. L. Seaton and Co., Premier Oil Extracting Mills, Sowerby and Co., Ltd., and the Universal Oil Co., Ltd.; and recently various smaller businesses had been acquired. In future the company would not deal in raw material. Investments in subsidiary companies stood at £1,302,794, the net amount received from them was £246,726, and the sum at disposal was £181,456. The ordinary shareholders are to receive 10 per cent., free of tax, for the period under review (7½ months), and the carry forward is about £60,000. The recent decision to issue the remaining 250,000 ordinary £1 shares at 25s. would place the company in a strong financial position. A research department had been established.

TRADE NOTES.

FOREIGN.

Trade in Persia.—The chief articles exported from the Teheran district are raw cotton, opium, nuts, gum tragacanth, silk cocoons, petroleum, asafœtida and saffron. This trade formerly went largely to Russia, but is now diverted to India and Great Britain. Gum tragacanth to the value of £18,693 and £1159 was exported to the United States in 1917 and 1918, respectively. Great Britain has taken the premier position formerly held by Russia in the import trade, which includes textiles, drugs, dyes, paints, glass ware, petroleum, rubber goods, etc.—(*U.S. Com. Rep., Mar.* 30, 1920.)

Chemicals and Drugs in Japan.—The drug and chemical trade in Japan is centred at Ozaka and Tokyo, which are also the chief ports. The exports were valued at about £5,600,000 in 1916, £6,600,000 in 1917, £7,400,000 in 1918, whilst the imports were valued at about £5,600,000 in 1916, £6,400,000 in 1917, and £7,800,000 in 1918. The trade continued active in 1919, especially for sulphate of ammonia. Among the various crude and botanical drugs now obtainable in Japan are ginseng, pyrethrum flowers, scopola root, valerian root, camomile flowers, and cocoa leaves, and in addition to camphor, menthol, etc., the prepared drugs available include aconite, iodine, and peach bark extract. Many of the drugs and medicines in common use are imported.—(*U.S. Com. Rep., Mar.* 30, 1920.)

Tanning Industry in Sao Paulo, Brazil.—Prior to 1914 it was not possible to establish the tanning industry in Sao Paulo on a paying basis, but conditions changed radically owing to the war, and there are now 32 tanneries, four of which contain first-class plants, in the State. All the tanneries work on cowhide save one, which works on sheepskins. Large quantities of cowhide are available for export, salted hides and dry hides being shipped in 1918 to the extent of 2,426,046 and 5160 lb. respectively. In addition, leather, mostly sole leather, was exported to the weight of 72,852 lb. in 1918, as against an importation of 486,448 lb. in the same year. In view of the tax (about 3s. 9d.) on every cowhide exported and the heavy import duties on leather, the tanning industry in Sao Paulo has every prospect of success.—(*U.S. Com. Rep., Mar.* 12, 1920.)

Foreign Company News.—*France.*—*La Revue Economique et Financière* reports that the "Etablissements Poulenc" (fine chemical manufacturers, etc.) show a profit for the year 1918–19 about equal to that of the previous year, say, 5,768,000 fr., and the dividend will probably be maintained at 50 fr.; at the same time, the capital is to be increased by the issue of 16,000 new shares of 500 fr. issued at 550 fr. The total capital will then be 20 million fr., say, £800,000 nominal.

Sweden.—The report of the Svenska Tandsticks A.B. (Swedish Match Trust) states that the year 1919 was essentially a transition period to normal conditions. Although supplies of wood were scarce, chemicals were easier to obtain. During the first six months of the year the foreign trade was very small, partly owing to Japanese competition and partly to the closure of markets as a result of war conditions. In the second half of 1919 trade revived, and the Dutch East Indies and British markets have been recovered, in spite of Japanese competition. The industry was now in a strong position. The net profits, including balance brought in, were 9,116,000 kronor (5,763,000 k. in 1918), and a dividend of 14 per cent. has been declared on the ordinary share capital of 45 million k. (12 per cent. in 1918).

According to *Das Handelsmuseum*, in February last the Trust took over all the match factories in Finland, owing to fear of Finnish competition in foreign markets, especially in Dutch markets, where during the war Sweden acquired a virtual monopoly.

Holland.—The "N. V. Hollandsche Kunstzijde Industrie" has been founded in Breda, with a capital of five million gulden, for the manufacture of artificial silk and similar materials.

Chemical Industry and Trade in Spain.—The wealth of Spain is chiefly of an agricultural and mineral nature, but war conditions have led to a fuller development of the natural resources of the country, chiefly in the mining and metallurgical fields. The following tables give the chief imports and exports of a chemical nature during 1916 and 1918, the figures referring to pounds of weight unless otherwise stated:—

Chief Imports of Chemicals and Allied Products in 1916 *and* 1918.

	1916. lb.	1918. lb.
Acetate of lime and pyrolignite of iron	1,106,564	219,790
Acids:—		
Acetic and pyroligneous	17,742	271
Citric and tartaric and their alkali salts	936,862	700,453
Hydrochloric and sulphuric	64,604	17,489
Nitric	18,060	5,082
Carbolic acid, naphthalene, creolin, etc.	213,460	263,168
Sulpholeic and similar acids	7,824	—
Albumin	59,643	66,419
Alkali carbonates, borates, silicates; ammonium salts other than the nitrate	4,977,273	2,636,607
Alkaloids, other than quinine	4,440	6,512
Alums, sulphate, chloride and acetate of alumina, sodium aluminate, kieserite	2,329,898	553,056
Antipyrin, etc.	17,910	21,383
Calcium carbide	3,413	23,360
Chemical products	6,365,182	2,911,737
Chloride of lime	1,130,455	2,179,578
Chloroform	6,314	9,520
Ether	7,484	2,749
Fertilisers:—		
Superphosphate and basic slag	50,831,378	24,390
Nitrate of soda	98,614,242	41,337,866
Sulphate of ammonia, potash salts	139,548,051	270,584
Phosphate rock (tons)	288,328	115,028
Gelatin	146,892	54,992
Glycerin	2,399	68
Insecticides (sulphates of copper and iron, cyanides)	8,908,909	348,934
Lead oxides	33,854	33,653
Phosphorus	48,192	4,630
Potassium and sodium chlorates and phosphoric acid	212,279	101,388
Caustic soda and potash	46,665	4,989
Sodium chloride	298,673	29,445
Sodium sulphate and sulphite, chloride and carbonate of magnesia	2,567,873	1,521,820
Sulphur:—		
Crude	3,945,800	—
Refined unground	4,349,285	2,609,318
Refined ground and flowers of	17,723,065	6,707,213
Tannin	37,143	5,121
Dyes and dyestuffs	9,429,100	6,205,545
Paints, pigments, colours, etc.	8,301,184	3,486,692
Oils, fats and waxes	28,755,332	19,053,819
Sesame, linseed, copra, etc. (tons)	44,870	16,104
Miscellaneous	223,101,463	120,869,677

Chief Exports of Chemical and Allied Products in 1916 *and* 1918.

	1916. lb.	1918. lb.
Chemical products	70,123,194	40,249,587
Chloride of lime	1,170,725	105,116
Copper sulphate	43,905	250,004
Glycerin	1,860,898	1,993,224
Perfumes and essential oils	1,012,612	1,280,017
Mineral salts	10,400	2,405,227
Caustic soda	5,990,546	8,037,639
Sodium chloride (tons)	423,035	336,068
Sodium sulphate	696,262	419,685
Sulphur	1,243	559,123
Tartar, crude	16,338,750	10,965,288
Tartar, cream of	701,154	1,161,382
Tartrate of lime	1,470,150	2,654,749
Paints, pigments, colours, varnishes	9,107,630	9,015,325
Oils, oilseeds, fats and waxes	351,777,810	64,272,590
Ores:—		
Blende (tons)	58,634	47,666
Calamine (crude and calcined)	40,898	6,495
Copper ores	45,606	22,350
Galena	1,231	113
Iron ores	5,045,575	4,292,406
Iron pyrites	2,744,767	1,065,701
Lead ores	730	374
Manganese ores	8,851	22,521
Barks and tanning materials	24,843,128	12,546,830
Candles	827,538	96,294
Explosives	294,734	647,620
Glass	30,112,814	19,432,730
Rosin	23,662,849	11,786,960
Turpentine	8,234,308	5,113,364
Paper	40,807,525	18,401,808
Soap, common	7,824,560	10,355,774
Sugar	5,579,425	1,390,300
Vegetable pitch	212,435	1,466,867

(For production of minerals and mineral products, see this J., 1920. 96 R.)—(*J. Ind. and Eng. Chem., Mar.*, 1920.)

REVIEW.

Molinari's Chemistry. Volume I.: Inorganic. *Second edition, translated from the fourth revised and amplified Italian edition by* T. H. Pope. *Pp.* xix+876, *with* 328 *illustrations and* 2 *plates.* (*London: J. and A. Churchill.* 1920.) *Price* £2 2s. *net.*

This translation of the fourth Italian edition of Molinari's treatise is dated 1920, but the date of publication of the foreign edition is not given. It is obviously desirable that this should be done in all translations. The text follows closely that of the first English edition; the coloured plate of spectra in the latter is omitted, and a few new sections are added. The latter deal with such topics as the Bone and Schnabel surface-combustion process, the utilisation of peat, the manufacture of cyanides, and many other less detailed additions to the text. There are also new illustrations.

Since the author explicitly states in the preface that his main purpose has been to describe industrial processes, one would expect the theoretical side to be less prominent than usual. On the whole, however, the introductory part of the book, comprising 132 pages, gives a reasonably complete account of the foundations of the science. In some cases, indeed, the treatment is fuller than that accorded to the subject by other books of the same size. Atomic numbers, and Bragg's researches are not mentioned. Werner's theory of valency is explained only very briefly. The very scanty reference to Nernst's theorem, which is now a matter of technical interest, on p. 72, is inadequate and the confusion of α-rays and positive electrons, on p. 127, is another instance of some carelessness on the theoretical side. The historical allusions add to the interest of the text, but are sometimes misleading. Thus, the reference to Priestley on p. 169, and that to Scheele and "Berthelot" (*sic*) on p. 573, give an entirely erroneous impression of the points at issue. The mis-spelling of names now customary (*e.g.*, "Brody" for "Brodie," "Berthelot" for "Berthollet") is also represented. It is much to be regretted that authors who give historical details should almost invariably convey the impression that they have no acquaintance with the original sources. The text-books on the history of chemistry, from which information seems commonly to be derived, are not usually exceptions to this rule. On p. 319 it is stated that the Squire process (really that of Messel and Squire) was used in "the large works of Thann, of London." Thann is a town in Alsace, where the factory was situated. The statement as to the relation of the Norwegian nitrate works to the Badische Co., given on p. 396, seems to be inaccurate.

There are only very sketchy descriptions of hydrazine and hydroxylamine salts, both of which are technical products, and no mention is made of Raschig's process for the preparation of the former. Hydrogen persulphide is still given the formula H_2S_5; there is no mention of Baker in the description of N_2O_3; and in connexion with persulphates it is stated on p. 329 that: "According to Ger. Pats. 172,508 and 205,069, persulphates may be obtained by the electrolysis of sodium or potassium bisulphate," not a word appearing of the original work of Marshall. In many cases, indeed, the reviewer has obtained the impression that the author of the book exercised insufficient judgment in his choice of material.

The translation is not particularly well done. Thus, on p. 396 we read that a reaction proceeds "better in the hot in presence of catalysts."

In spite of these defects, and of its relatively high price, the book should be very useful to students and as a work of reference. The detailed accounts of technical processes form a most welcome supplement to the ordinary text-books, and a mass of really useful information is contained in the work. Although the data on costs all relate to pre-war conditions, they are not without value to the technical student, who too often does not know that potassium iodide, for instance, cannot be used as lavishly on the large scale as limestone. The statistical tables of production, and of exports and imports, have been brought up to date, and the detailed statements of the uses to which chemicals are applied are a good feature.

The description of the several hydrometer scales in use, which occupies pp. 77-79, may serve to bring home to technical chemists the folly of their ways. Great confusion has been caused by the use of these perfectly unnecessary scales. Even if a knowledge of decimals is regarded as less of an obstacle to the efficient prosecution of works routine than was formerly the case, the use of a scale in which water is taken as 1000 or 100, and the statement of specific gravities as 1250 for 1·250, or 986 for 0·986, would seem to meet the needs even of the "practical" man.

J. R. Partington.

PUBLICATIONS RECEIVED.

The Hydrogenation of Oils. Catalysers and Catalysis. *Second edition, revised and enlarged. By* Carleton Ellis. *Pp. xvii.*+767. (*London: Constable and Co., Ltd.* 1920.) *Price* 36*s*.

Tungsten Ores. *By* R. H. Rastall *and* W. H. Wilcockson. *Monographs on Mineral Resources, with special reference to the British Empire. Imperial Institute. Pp.* 81. (*London: John Murray.* 1920.) *Price* 3*s.* 6*d.*

Report of the Fuel Research Board for 1918 and 1919. *Department of Scientific and Industrial Research.* (*London: Stationery Office.* 1920.) *Price* 1*s.* 6*d.*

Annual Reports of the Society of Chemical Industry on the Progress of Applied Chemistry. 1919. *Vol. IV.* (*London: Society of Chemical Industry.* 1920.) *Price to members,* 5*s.* 6*d.*; *to non-members,* 12*s.* 6*d.*

Report of First Conference of Research Organisations. *July* 29, 1919. Report of Second Conference of Research Organisations. *December* 12, 1919. (*London: Department of Scientific and Industrial Research.* 1920.)

Panchromatism. *Second edition, revised and enlarged. Pp.* 32. (*London: Ilford, Ltd.*) *Price* 6*d.*

Publications of the United States Geological Survey. Department of the Interior. (*Washington: Government Printing Office.* 1920.)

- The Work on Mineral Resources done by the United States Geological Survey. *By* E. S. Bastin *and* H. D. McCaskey.
- Architectural Concrete Stone and Building Blocks in 1917 and 1918. *By* G. F. Loughlin.
- Asbestos in 1918. *By* J. T. Diller.
- Potash in 1918. *By* W. B. Hicks.
- Strontium in 1918. *By* G. W. Stose.
- Asphalt and Allied Substance in 1918. *By* C. C. Osbon.
- Talc and Soapstone in 1918. *By* J. S. Diller.
- Mineral Waters in 1918. *By* A. J. Ellis.

REPORT OF THE CHEMICAL SERVICES COMMITTEE (INDIA).*

In the autumn of 1919, Prof. J. F. Thorpe, professor of organic chemistry in the Imperial College of Science and Technology, London, was appointed by the India Office to preside over a committee to consider the advisability of establishing an all-India Chemical Service, and in the event of this being approved to map out a scheme for its initiation, containing, *inter alia*, proposals for the location, scope and organisation of research institutes. In addition to the president, the committee comprised Dr. K. S. Caldwell, Mr. R. W. Davies, Dr. W. Harrison (Imperial Agricultural Chemist), Sir P. C. Rây, Prof. J. J. Sudborough, and Dr. J. L. Simonsen (secretary). Prof. Thorpe arrived in India in November last, and the report was in the hands of the authorities by the following February. The committee found that the formation of a Government chemical service was the best means of overcoming existing difficulties and deficiencies, and of encouraging industrial research and development. **The main defect of the existing order is considered to be the absence of any effective means of co-ordination, and the keynote of the new proposals is research on a co-operative basis.**

It is proposed that the co-ordinating and advisory centre should be a Central Imperial Chemical Research Institute located at Dehra Dun, which is near Simla and Delhi and in the same area as the Forest Research Institute. Its duties would include:—the creation of new industries and the development of new processes up to a "semi-large" scale, or further if necessary; the investigation of problems of a fundamental character which have no apparent immediate practical importance but may be pregnant with industrial possibilities; the maintenance of an information bureau and record office, and the publication of information. The director-generalship of the chemical service and the directorship of the central institute should be united in the same person, and under him should be a deputy director-general and, in the first instance, four deputy directors of research in charge of departments for inorganic and physical, organic, metallurgical, and analytical chemistry at the central institute. It is recommended that the general work of this institute be under a board of control, with the director-general as chairman and eminent chemical experts as members.

An important feature of the proposals is the establishment of a research institute, with or without sub-stations, in each Province, under a local director of research, who, for administrative purposes, would be independent of the central authority. Should a Province not elect to provide an institute or to employ a director of research, it would be open to the director-general to recommend the erection of an Imperial institute in that Province and to place in charge thereof a member of the chemical service as director; but such an institute should be handed over to the local authority when desired. The functions of these institutes would be, briefly, to maintain contact with and solve problems for chemists and chemical industry, to translate laboratory and "semi-large" scale results into industrial practice, to assist in the development of new industries, and to carry out analytical work. The equipment of the institutes would include apparatus of about one-sixtieth of the size of the usual large scale plant. Discoveries made would have to be published, but not necessarily at once, and no manufacturing in competition with private enterprise would be permissible. The centres specified for the location of Provincial research institutes are:—Madras, Bombay, Calcutta, Ranchi, Cawnpore, Lahore, Rangoon and Nagpur. There should be close co-operation between the central and local institutes, the latter sending up certain problems for solution at the former, while the "central" officials would visit the Provincial institutes and co-ordinate the work done in each. The chemists employed at these institutes would be members of the chemical service, but would receive their appointments and pay from the Provincial Government.

With regard to the relationships between the chemical service and existing institutions, it is recognised that the reorganisation of the scientific departments connected with the Agricultural Service is inevitable, and that in the meantime agricultural chemists should be excluded from the chemical service. The opinion is emphasised that research on industries subsidiary to agriculture is outside the scope of the Agricultural Department; also that the chemical examination of forest products *in situ* is within the sphere of chemistry. A joint survey of the forests by chemists and botanists and a joint chemical exploitation of forest products are recommended. Ordnance factories ought to be controlled by men of high chemical attainments, and all chemists employed under the Ordnance Department, as well as assay masters and deputy assay masters, should be seconded from the proposed chemical service. The creation of a Ministry of Science is called for at the earliest possible moment, and a chemical survey of the country should be undertaken as soon as practicable.

In a chapter on recruitment to the chemical service it is laid down that the research laboratories be staffed mainly by Indians, and that there should be no differentiation in the method of appointment of Indians and Europeans. For all appointments to the service there should be a probationary period of three months, and for purposes of recruitment the qualifications recommended are:—(1) an Honours degree in the first or second class, or its equivalent, (2) a suitable training in engineering (workshop practice and machine drawing), and (3) one or two years' training in research. The Government of India should make maintenance and equipment grants to students while being trained in research. The scale of payment in the service is detailed, and a standard pension of Rs.6000 at 50 years of age is advocated. Every member must have at least three periods of study leave, each for a minimum period of six months, on full pay, during his first fifteen years of service. Although no estimate could be formed of the cost of the scheme, it is recommended that liberal grants be allocated for its initiation.

The report is signed by all the members of the committee, but Sir P. C. Rây, in an appended note, affirms his disbelief in the principle of an all-India chemical service. Departmentalism he regards as "an arsenal of delay and procrastination," particularly unsuited to India, the "services" have become a "glaring anachronism," and the country cannot be saved by the installation of a chemical hierarchy. Chemical industries naturally advance *pari passu* with the scientific progress of the people, conditions differ enormously throughout the country, and instead of imposing a cut-and-dried scheme on the whole land, each Province should be left unfettered to work out its own salvation. The road to development lies in the improvement of the teaching of chemistry in the Universities. In spite of these opinions, the writer has attached his signature to the report because he recognises that if a Government chemical service be constituted, the proposals of the Committee could not be bettered.

* Simla: Superintendent, Government Central Press, 1920. Pp. xii + 121.

THE CELLULOID INDUSTRY IN JAPAN.

Celluloid was first imported into Japan in 1881, although a few sample pieces were introduced from 1877 onwards. The manufacture was initiated in 1889 by Rokusaburo Kocho, who established works at Nakanogo in the vicinity of Tokyo, but it remained undeveloped until 1908, when two large factories were built by the Nippon Celluloid and Artificial Silk Co. and the Sakai Celluloid Co., respectively. The former was erected at Aboshi, near Kobe, and managed by Dr. J. L. Keen, an English expert, and the latter was conducted by Dr. C. Axtel, an American chemist, who chose a site at Sakai, near Ozaka. After initial difficulties both firms succeeded in marketing their products in 1910, but subsequently, owing to over-supply, severe competition took place between them. In 1914, after both works had reduced their output by one-half, the war materially influenced their prosperity. The Nippon company received an enormous order for guncotton from the Russian Government, greatly increased the capacity of its works, and quickly made good the losses it had suffered during the previous years; at the same time the Sakai company obtained a monopoly of the supply of celluloid sheets and reaped great profits. Owing to the utilisation of the celluloid factories of foreign belligerents for war-time services the Japanese celluloid and camphor industries received a great impetus, many new plants were erected, and, in general, the industry was placed on a very sound footing.

According to the Annual Reports of the Japanese Customs Bureau, initiated in 1896, importations of celluloid sheets etc. have been as follows (kin. = 1·33 lb., yen 2s.):—

Year.	Quantity. cwt.	Value.
1896	882	£13,445
1905	3,547	£49,687
1906	2,456	£81,812
1907	2,374	£32,670
1908	5,308	£66,832
1909	4,728	£59,122
1910	5,661	£64,029
1911	5,960	£67,131
1912	4,471	£49,288
1914	273	£2,952
1915	104	£1,080
1916	2.25	£25.7
1917	[40.]	£6

The export trade dates only from the year 1918. The following returns are available for 1919:—

Destination.	Novelty Articles.	Sheets.
United States	£200,000	—
Russia	£150,000	—
British India and Australia.	£150,000	—
England	—	£100,000
France and Italy	—	£200,000

More recently the export trade has been stimulated by the increased tonnage available.

In addition to the two firms above mentioned there were at least ten others of considerable size manufacturing celluloid sheets. Towards the end of last year six of the latter amalgamated with the two pioneers to found the Dai Nippon Celluloid Co., with a capital of $12\frac{1}{2}$ million yen (£1,250,000). In addition there are a few firms, such as the Toa Celluloid Co., which supply raw sheets to the factories at which novelty goods are made. The total annual production of celluloid sheets, rods, tubes, etc., is estimated at 6 million lb., of which two-thirds is consumed in the country for making novelty articles. Although it is not possible to give the number of makers of these goods, as much of the work is done domestically, it is very large; in the neighbourhood of Tokyo alone there are over 700 works. The most important manufacturing firms are the Naganiné, the Chigusa, and the Central Celluloid Co., at Tokyo, and the Koyama and Sakai Celluloid companies at Ozaka. In general, toys, dolls, etc., are made in Tokyo, and hair decorations, brushes, beads, etc., at Ozaka.

CHEMICAL PATENTS *

WITH SPECIAL REFERENCE TO CANADIAN PATENT LAW.

A. E. MacRae.†

The subject of chemical patents, and patents for products and processes relating to industrial chemistry, is one of the earliest in the realm of patents. As early as 1467 a patent was granted in Berne for the manufacture and sale of paper. During the ten years following 1561, when the patent policy of England began, twelve of the eighteen patents granted were for various chemical products and processes.

A patent is a form of monopoly, but is not a true monopoly. A monopoly in its strict sense is an exclusive right granted by the Sovereign or State to an individual or a number of persons of something which before was of common right. That is to say, a true monopoly includes on the one hand an exclusive right or privilege, and on the other hand a restriction or restraint which operates to prevent the exercise of a right or liberty which was open to the public before the monopoly was granted. Thus, a patent for a new and useful invention never known or used before is not a true monopoly, because it does not restrict the exercise of a right that was open to the public before the patent was granted. Patents are frequently condemned by persons who do not recognise this fundamental difference between a true monopoly and a patent for a new and useful invention.

Many people imagine that patent laws are for the exclusive benefit of inventors and that a patent gives to the patentee a concession which he does not deserve, and this regrettable mistake leads to many misunderstandings. A man confers a distinct benefit by developing a patent, and he ought to be treated as a creator of public wealth. Compare the industrial development of such nations as England and the United States, which have liberal patent systems, with that of other countries where patent laws are less favourable to the inventor. Until comparatively recently Holland had no patent law whatever and allowed the unrestricted use of any invention. It was easy to use freely in Holland processes patented in other countries and to distribute from there infringing goods to other countries of the world. Yet Holland, with her highly developed commerce, her abundant money supply and enterprising people, remained industrially undeveloped. Why? Because there was no incentive to saddle oneself with the risks and outlays of starting a new enterprise or of improving methods for manufacture, knowing beforehand that in case of success one's neighbour could do the same thing without any restriction whatever. A patent is simply a contract between a nation and the individual. By the contract the inventor discloses to the public the results of his intellectual work. By doing so he enables others to get acquainted with his work and to improve thereon, and this stimulates further research, invention, and enterprise.

*From a paper read before the Ottawa Branch of the Canadian Section, February 1920.

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It is to be noted that newly disclosed patents are very frequently followed in rapid succession by improvements thereon conceived by others but patterned on the original invention. For the benefit thus conferred on the nation by the inventor the nation, in return, gives him for a number of years the sole use of his invention. At the end of this term his invention becomes public property. The period of monopoly is none too long in view of the time it takes to develop the invention into commercial shape. In many cases inventions reach the money-making stage only after the patents on which they are based have expired.

The rights of the inventor to a limited monopoly of his invention were recognised by Canadian Statute as early as 1824, and the first Canadian patent was granted in June of that year.

Section 7 of the Patent Act, Revised Statutes of Canada, 1906, says:—

"Any person who has invented any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement in any art, machine, manufacture or composition of matter, which was not known or used by any other person before his invention thereof, and which has not been in public use or on sale with the consent or allowance of the inventor thereof, for more than one year previously to his application for patent therefor in Canada, may, on a petition to that effect, presented to the Commissioner, and on compliance with the other requirements of this Act, obtain a patent granting to such person an exclusive property in such invention."

This Section thus provides that patents may be granted for four classes of things, namely, arts, machines, manufactures and compositions of matter, and to be a proper subject for a patent they must each stand the test of invention, novelty, and utility.

Processes come within the definition of arts, and chemical patents are more particularly concerned with arts and compositions of matter. Processes are operations which consist partially or wholly in the employment of some non-mechanical science, such as heat, electricity, light, chemistry, etc., or operations which consist entirely of mechanical transactions which may be performed by hand or by machine. Compositions of matter cover all compositions of two or more substances whether they be the result of chemical union or of a mechanical mixture.

Patents are granted for things invented. A thing may be novel and useful, but unless it embodies invention it is not patentable. To be a proper subject for patent the subject matter must stand the test of novelty and utility as well as of invention. We have seen that a thing may be new but not be an invention. It cannot be an invention without being new. In his petition an applicant for a patent in Canada states that the subject matter of his application was not known or used by any other person before his invention thereof and was not in public use or on sale with his consent or allowance for more than one year previous to his application for patent therefor in Canada. The applicant is presumed to know what has been disclosed in the prior patents or printed publications of every country in the world and what has been known or in public use before his application for a patent. Novelty is thus determined by reference to the prior art as disclosed in patents or other printed publications or in public use or practice. A printed publication is any printed matter distributed to any part of the public. Prior knowledge or use is not to be considered unless disclosed in printed publications prior to the making of the invention or more than one year prior to the application for patent for the invention. Moreover, the information disclosed in the printed publication must be full and precise enough to enable one skilled in the particular art to perform the process or make the article sought to be anticipated before it may be considered.

Inventors have expended much time and thought in developing processes which as far as they knew were quite novel only to find on applying for a patent that someone else had previously worked the same process. This may be a hardship on such inventors, but the Act refuses them a patent. This emphasises the need for careful review of the prior art before undertaking research in any particular art. A slight degree of utility is sufficient to meet the requirement of usefulness. An invention which has an illicit object in view is not patentable, however.

In the present Canadian Act there is no restriction on the nature of the composition of matter which may be patented, except that it must be new and useful and the result of invention. The same conditions exist in the United States and did exist in Great Britain until a very recent date, when a new Patents and Designs Bill, which was introduced in the British House of Commons, in November, 1917, became law This Bill passed the House of Commons without debate, discussion, or division, and by it, I understand, products of chemical processes or intended for food or for medicinal or surgical purposes may not be claimed in a patent application but only the process. That is, specifications relating to an article or substance made by chemical processes or intended for medicinal or surgical use may contain claims for the process of manufacture only and not for the substance or composition of matter. Some other countries also refuse patent protection on similar compositions. Germany, Austria, Japan, and Russia refuse to grant patents on foods, medicines, or chemical products, and in Switzerland neither the product nor the process of making them may be patented. Sweden will patent processes of making foods or medicines but not the product. Denmark will not patent medicines, articles of food, nor processes of making articles of food. France, Italy, and Spain refuse patents on medicines and pharmaceutical preparations of all kinds.

The intermixture of the ingredients of a composition of matter may be by mechanical or chemical operations, or both, and to be patentable the composition must possess characteristics or properties not possessed by any of the individual ingredients. The mere presence of a new ingredient in a composition does not give patentability unless it changes the essential characteristics of the composition. Alloys are a good example of the various kinds of compositions, as they may vary all the way from a true chemical compound to a mechanical mixture of two or more metals. Examples of true organic chemical compounds are found in the following claims taken from recent Canadian patents:—

(1) Dimethyldi-isopropylbenzidene; (2) a new dyestuff consisting of the tetrazo compound of dimethyldiisopropylbenzidene coupled with an amino aromatic compound; (3) amyl ether of cephaoline.

A process is a way of treating substances to produce a desired result, and it may consist of one or more steps to reduce or change the substance to the desired state. It may be performed irrespective of any particular form of mechanical device. A chemical process is patentable, but a process merely involving the function or principle of a particular mechanism may not be patentable A scientific principle of itself is not patentable, but its application to a particular process may be the subject of a patentable invention. A person who discovers a natural force or scientific fact is entitled to patent protection only on the process by which he makes use of the effect of the natural force. For example, the fact that heat will decompose substances cannot be patented, but its application to the manufacture of lime from limestone might be patentable if new. That is, the specific application of the principle is patentable.

An application for patent in Canada consists of a Petition, an Oath, and a Specification, and if the nature of an invention admits of illustration by means of drawings such drawings must be submitted. The specification embodies a preamble, giving the name and residence of the inventor and the title of his invention, a general statement of the objects and nature of the invention, a brief description of the figures of drawings if there be any, a detailed description of the invention and the claim or claims. The specification should fully and clearly disclose the principle of the invention and the preferred way in which the applicant intends applying the principle, in such a way as to distinguish it from other inventions. In chemical cases the terms used should be sufficiently definite to enable one skilled in the art to know precisely what is to be included. The claims should point out the invention definitely and clearly and should not be couched in a great variety of expressions with a view to catch infringers who may hereafter use modifications of the invention.

Two copies of the specification, three copies of claims, and two copies of the drawings on tracing linen and one on Bristol board are required. The original copy of the specification, claims, and drawings remain on file in the Patent Office. The duplicate is mailed as the patent. The third copy of claims is used for printing the Patent Office Record, and the drawings on Bristol board, together with a printed copy of the claims from the Record, are filed in the examiner's room for purposes of search.

The duration of a Canadian patent is eighteen years. The full fee is \$60, but it is the applicant's option to pay the full fee for the term of eighteen years, or the partial fee for the term of six years, or the partial fee for the term of twelve years. Whenever a patent is deemed defective or inoperative by reason of insufficient description or specification, or by reason of the patentee claiming more than he had right to claim as new, but at the same time it appears that the error arose from inadvertent accident or mistake, the patent may be surrendered and a new patent issued for the unexpired term of the original patent upon the payment of \$4 for every unexpired year of the duration of the original patent.

In order to maintain a Canadian patent valid the patentee must at the end of two years from the date of the patent commence and constantly carry on in Canada the construction or manufacture of the patented invention in such a manner that any person desiring to use it may obtain it or cause it to be made for him at a reasonable price. Moreover, the patentee must not import the invention into Canada after twelve months from the date of the patent. The Commissioner of Patents may, however, if sufficient reason is shown therefor, extend the period for non-manufacture in Canada or the period of one year for importation into Canada.

An applicant may, prior to the issue of his patent, or within six months therafter, apply to the Commissioner of Patents to have the Compulsory Licence clause substituted for the above-mentioned conditions of manufacture, and the Commissioner, having regard to the nature of the invention, may grant such request. That is, under this clause any person at any time during the life of the patent may apply to the Commissioner of Patents for a licence to use the invention, and the Commissioner, being satisfied that the reasonable requirements of the public with reference to the invention have not been satisfied, may order that a licence be granted to the person applying therefor upon such terms as the Commissioner may consider just.

An inventor who has not perfected his invention may file in the Patent Office a Caveat, embodying a description of his invention. If at any time within a year of the filing date of the caveat another person applies for a patent covering the same invention, the person filing the caveat will be notified thereof and given three months within which to file his application for patent. If the applications are found to be conflicting they are declared in interference. A caveat gives no protection, but it affords one reasonable assurance that a patent covering the invention disclosed will not be granted within a period of one year from the date of filing the caveat without his being notified.

When an application is received in the Patent Office it is given a filing date and a serial number. The formal papers and the copies of the specification and claims are compared and the application is referred to the examiner who deals with the art to which the alleged invention belongs. It is the examiner's duty to see that the specification properly discloses the nature of the alleged invention and to determine whether or not the subject matter discloses an invention which is useful. As previously stated, the presence of invention and novelty is determined by a search of the prior art. The extent of the search is necessarily somewhat limited, as the facilities for searching in the office include only Canadian patents, the United States patents for a short period, and a somewhat incomplete set of British patents, together with some of the technical journals. The examiner reports to the applicant any informality in or objections to the specification or claims, as well as references to the prior art held to anticipate any or all of the claims. The applicant may amend as often as any objections or references are presented, and in doing so should point out wherein he thinks his case presents patentable novelty in view of the art disclosed. When the application is found to define properly the scope of the invention it is allowed and issued as a patent. Patents are dated and mailed approximately six weeks after allowance. The length of time an application is held awaiting action by the Patent Office is dependent on the condition of the examiner's work. Many of the examiners at the present time are several months behind with their work owing to the increased number of applications for patents and to some extent to the depletion of the examining staff during the war.

Comparatively few applications ever mature into patents, as they are found not to embody invention. When an examiner refuses to allow an application the applicant may appeal from the examiner's decision to the Commissioner of Patents, who may allow the application if he finds that in his opinion the examiner was in error in refusing to allow the case. An appeal may be taken from the decision of the Commissioner of Patents to the Exchequer Court.

In the case of two or more applicants claiming the same invention the applications are held to be in conflict, and the original inventor is determined by arbitration and the patent granted to the one so determined.

The *Patent Office Record* is published weekly and contains from one to three of the claims of each patent with the main figure of the drawings. The complete specifications of patents are not printed but may be obtained from the Patent Office in typewritten form with a photograph of the drawings.

A study of the Canadian patent system is recommended to all interested in the industrial development of Canada, and the attention of our chemists is especially directed to the new British Act, since it affects very greatly the protection of their inventions in that country, and because acquaintance with it will enable them to influence opinion if any similar measure is proposed for Canada.

NEWS FROM THE SECTIONS.

EDINBURGH AND EAST OF SCOTLAND.

A joint meeting of this Section with the Local Section of the Institute of Chemistry was held in Edinburgh on May 11. Dr. T. W. Drinkwater presided.

The subject before the meeting was the method of training chemists who had decided to take up technical chemistry as a profession. Dr. Drinkwater opened the proceedings, and was followed by Dr. A. C. Cumming and Prof. A. A. Boon, who treated the subject from the teacher's point of view. A general discussion followed, in which a large number of members and visitors took part. All the technical chemists present expressed themselves very strongly in favour of a thorough training in pure chemistry and were opposed to too early specialisation as a preparation for any particular industry. The importance of an adequate knowledge of physics and mathematics was agreed to and also biology for certain industries.

In regard to the vexed question of chemical engineering there was naturally some difference of opinion. The advantage of some elementary knowledge of engineering was readily admitted, but the general feeling was that it was impossible for a man to be both an engineer and a chemist, and that the so-called "chemical engineer" was frequently neither a chemist nor an engineer. To study engineering to such an extent as would be desirable would mean that the amount of time devoted to chemistry would be very much reduced, and this was considered a most serious objection.

Several members spoke strongly against degrees and diplomas in technical chemistry and favoured a thorough training in pure chemistry, but the plan which is followed in some districts of a man spending his vacations, or even a whole year, in a works laboratory or in the laboratory of a general analyst was thoroughly approved. As regards instruction in technical chemistry, the opinion was that this should be on quite general lines, *e.g.*, methods of evaporation, distillation, transport, properties of materials used in works, etc.

NOTTINGHAM.

At a meeting of the Nottingham section, held on May 19, Mr. J. White presiding, two papers were read and discussed.

The first, by Dr. E. B. R. Prideaux, described a series of measurements which had been carried out with the object of determining accurately the vapour pressures of ammonium nitrate alone and in admixture with other salts, in order to fix the humidity limits at various temperatures within which this salt could be dried or beyond which it would deliquesce. The methods of using the Johnston and differential tensimeters were described and illustrated by exhibits. A complete series of measurements of the pressures of solutions saturated with respect to both ammonium and sodium nitrates showed how great was the effect of admixtures upon the first deliquescence. A theory of the mechanism of such a process from the first to the final deliquescence was then given and illustrated by some results quoted from the work of Lieut.-Colonel J. A. Hall with his permission.

The second paper, by Mr. J. M. Wilkie, described an expedient which has overcome the difficulty of reducing arsenic acid to the arsenious state—a reduction necessary in the quantitative estimation of arsenic by means of the electrolytic method previously described by the author and collaborators. None of the reducing agents described by former investigators is completely satisfactory. Sulphurous acid may not be expelled completely by boiling, or if so, the long boiling may result in a reoxidation of the arsenic. Stannous chloride was found satisfactory by C. A. Hill, but this was not confirmed by Sanger and Black, so that the U.S. Pharmacopœia adopted sulphurous acid. The authors find the use of crystalline sodium sulphite preferable to that of potassium metabisulphite, employed by Thorpe, but the most satisfactory substance is glycerol. The paper describes the technique of the reduction of arsenic acid in the electrolytic determination of arsenic, using this material as reducing agent.

LIVERPOOL.

This Section met on six occasions during the past session, and for the first time since its formation in 1881 the meetings were not held at the University; four were held at the Adelphi Hotel, and two at the Royal Institution. To the change of locality is probably mainly due the improved attendance, which has been about 50 per cent. better than during recent years. At the meeting in March there was a symposium on "Acid-resisting Materials," to which representatives of a number of manufacturing firms contributed exhibits and short papers. On account of the high cost of printing it was decided to postpone publication of the Sectional list of members.

The annual meeting was held on April 23. There are no changes to be recorded among the Sectional officers, but Prof. E. C. C. Baly and Messrs. W. M. W. Fell, E. Gabriel Jones, W. Mansbridge, and J. W. Towers retire from the committee after three years' service, and Prof. R. Robinson has resigned on leaving Liverpool. To fill these vacancies the following were elected:—Dr. G. C. Clayton, Major F. E. Everington, Dr. C. W. Moore, Mr. W. Ramsay, Mr. W. H. Roberts, and Dr. W. Trantom.

GLASGOW.

The report of the hon. secretary for the session 1919–20 states that six ordinary meetings have been held, and also three informal meetings at which short papers were read and discussed. The latter were arranged in the hope of getting the younger members to participate in the discussions. A full programme is anticipated for next session.

The officers elected for next session include:—Mr. J. H. Young, chairman; Mr. E. W. Moodie, vice-chairman; and the following are the new members of committee: Messrs. J. M. Heilbron, J. Lang, Q. Moore, J. Sorley, W. H. Walmsley, and J. F. Wilson.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF GLASS TECHNOLOGY.

The third annual meeting was held in Sheffield on April 19, the president, Mr. S. N. Jenkinson, presiding.

The report for the year 1919 shows a steady growth in membership and influence. At the end of the year there were 516 members on the roll, of whom 120 were collective, 392 ordinary, and four student members. Nearly one-fifth of the total membership is composed of members overseas. Among the noteworthy events recorded are the formation of the Glass Research Association; the completion by the Refractories Research and Specifications Committee of provisional specifications for tank blocks, silica bricks, and clay for pots; the formation of a Glass Standards Committee, with sub-committees to deal with optical glass, glass for lamp-working, and bottles and general glass containers. The Society is also considering the publication of works of reference, but the financing of the scheme has not yet been settled. Income during 1919 was nearly £1300; over £1000 was expended on the Society's *Journal*, the abstracts section of which has been greatly enlarged. The balance on the year's working was about £20, and the excess of assets over liabilities about £60. At the annual meeting a year ago it was decided to raise the subscription rate for ordinary members from 21s. to 30s.

Vacancies in the list of officers and council were filled by the election of Prof. W. G. Fearnsides and Messrs. E. F. Chance, J. Connolly, and J. Forster as vice-presidents, and of Messrs. E. A. Coad-Pryor, J. H. Davidson, W. J. Gardner, J. Kaye, F. Towers, and Col. T. W. Simpson as members of council. During the meeting reference was made to the Society's impending visit to America next autumn, and the president, in his address, spoke of the continued growth of the membership, over 50 new members having been added since January 1 last.

The technical meeting was devoted to a general discussion on glass refractories, the subject being introduced by a paper on "The Properties of British Fireclays and their Suitability for Use as Glass Refractories, Part I.," by Miss E. M. Firth, Mr. F. W. Hodkin, and Dr. W. E. S. Turner. In the evening the second annual dinner was held, 79 members and guests being present; and on the following day visits were paid to the Ickles Works of Messrs. Steel, Peech, and Tozer, Ltd.; and to the works of Messrs. Rylands Glass and Engineering Co., Ltd., of Stairfoot, Barnsley.

THE CERAMIC SOCIETY.

Sir W. J. Jones, president, took the chair at the seventh meeting of the Refractory Materials Section, held on April 28 and 29, at Stoke-on-Trent. There was a very large attendance of members. It was announced that the proposed visit to the United States had been postponed, owing to the abnormal conditions, and that the autumn meeting would be held in London and the following spring meeting in Bournemouth.

In a paper on the analysis of zirconium minerals, Mr. H. V. Thompson described a method of "opening up" these materials by fusion with sodium peroxide. By treating the fused mass with water and filtering, all the iron, titanium and zirconium, and some of the silica are obtained in the residue, whilst the whole of the aluminium and the rest of the silica are found in the filtrate. Sir W. Jones exhibited and explained a high-pressure oil-burner for use in glass works, which works on a mixture of creosote and pitch (1:1), introduced by a drip-feeder from a storage tank about 10 ft. above the burner. The oil is maintained at 100° F. by means of low pressure steam, and air is admitted through an annulus on the front of the burner. The consumption of oil for a furnace 14 x 8 x 4 ft. is 16·8 galls. per hr., and the heating is very uniform and efficient. Mr. A. Malinovszky described a method of preparing fused artificial sillimanite by smelting in a special cupola furnace a mixture of crushed aluminous rocks or minerals with coke or other carbonaceous material; air is blown into the fused mass to produce cellular interstices resembling those of diatomaceous earth; the specific gravity of the product varies from 2·62 to 2·68.

Mr. W. J. Rees, in his paper on "The Corrosion of Coke Oven Walls; II. The Action of Salt on Silica and Fireclay Bricks," stated that the order of resistance to salt attack, beginning with the most resistant was: silica bricks with lime bond, silica bricks with clay bond, semi-silica bricks (made of clay and ganister, and containing 80 to 90 per cent. silica), and ordinary firebricks. The bleaching action of salt vapour on bricks was fairly complete, and a sample was shown in which the iron oxide was reduced by salt vapours from 3 to about 0·5 per cent. Fireclay bricks with a large proportion of sillimanite were found to be much more resistant to salt attack than ordinary fireclay bricks. Sillimanite and tridymite are much less soluble in alkaline flux than quartz or half-fired clay. Properly made silica bricks appear to be the most promising, although aluminous bricks containing sillimanite are not without possibilities.

The Symposium on Gas Firing proved so interesting that it was decided to continue the discussion at the next meeting of the section. Dr. E. W. Smith reviewed the characteristics of the chief types of gas available, and stated that, on a B.Th.U. basis the relative cost of producer gas, coal gas, and blue water gas was as 3:4:5. He pointed out that the producers, whether external generators or internal producers, could use any type of fuel if the conditions necessary for that type were studied. Steam should always be used in all producers, if only to cut down clinkering troubles. Mr. H. M. Ridge called attention to the importance of regulating the supply of gas and air respectively, and gave figures showing the waste of heat with different proportions of excess air.

Mr. E. M. Myers said that gaseous firing could supplant any coal-firing process and effect economy in fuel up to 50 per cent., and that it was quite as easy to obtain oxidising or reducing atmosphere as with coal. Blast-furnace gas could be used for heating purposes, and coke-oven gas, which is extensively used in the United States, was quite equal in calorific value to coal gas. The chief difficulty was due to its tendency to rise through air. To prevent this the air port might be placed slightly in advance of the gas port in the furnace, or, alternatively, the air might be delivered at a higher temperature so as to approximate to the specific gravity of the coke-oven gas, which is 0·4, taking air as 1.

Mr. William Baylis said that gas-firing was not the cheapest method in the production of steel; and Col. C. W. Thomas contended that a direct coal-fired continuous kiln compared favourably with a gas-fired continuous kiln; the economy really arose in recuperation or regeneration, which could be applied to either type of kiln. The possible saving of labour was greater with gas firing, but there was no hope of any considerable economy of fuel. There might perhaps be a lower repair cost with gas-firing.

THE IRON AND STEEL INSTITUTE.

The fifty-first annual general meeting was held on May 6 and 7, in the Hall of the Institution of Civil Engineers, Westminster. After the report of the Council had been presented M. E. Schneider, the retiring president, inducted into the chair Dr. J. E. Stead, the new president, who delivered an address. This took the form of a condensed review of the progress made during the last fifty years in the ferrous industries, and was divided into sections dealing with the blast furnace, the puddling process, the foundry, the basic Bessemer and basic open-hearth processes, the electric furnace, the production of sound ingots, the recognition of science, the advent and progress of metallography, the application of science to the ferrous industries, the encouragement of research and technical education. In each of these sections Dr. Stead mentioned the principle advances which had taken place, and, in particular, traced the development of the basic Bessemer and basic open-hearth processes from their inception. The address closed with an appeal for greater facilities for scientific research and technical education, particularly the technical education of workers in iron and steel works. In connexion with this Dr. Stead stated the example of his lectures on steel to workers in his districts, and the lectures and discussions organised for the workers by Messrs. Brown, Bayley's Steel Works, the Brown-Firth Research Laboratory, and other industrial establishments. The address forms a very complete monograph on ferrous metallurgy.

A number of papers was read and discussed. Mr. C. A. Ablett reviewed the relative merits of three-phase and direct current for steel works and rolling mills, and pointed out that for practically all purposes direct current was to be preferred. The chief advantage of direct current is that it is possible to vary the speed of motors without loss of power; in the case of three-phase motors this is only possible by the use of machines of a complicated and costly type.

Mr. F. Clements reviewed current British blast-furnace practice, and suggested a design for a furnace capable of producing 2000 tons of pig iron per week from a burden yielding 30 per cent. pig-iron and with a blast temperature of 1000° F., whilst Mr. H. E. Wright also presented a paper on the thermal and chemical conditions in the blast-furnace practice. A paper by Mr. W. E. Hughes discussed the defects of electrolytic iron. It was shown that this product, as deposited, is quite unsuitable for engineering purposes without separate heat treatment; many of the defects can be avoided by efficient control during manufacture, but in many cases the product is far from pure, and should not be taken as the starting point in a research without careful examination of its composition. Messrs. Baker and Russell reviewed the "Ball Test" for hardness and discussed the effect of cold working during the test on the values obtained. An interesting paper by Mr. J. H. Whiteley described investigations into the distribution of phosphorus in steel between the Ac_1 and Ac_3 points. He found that phosphorus is more soluble in ferrite than in austenite containing dissolved carbide, and that on heating to within the critical range phosphorus diffuses out of the austenitic regions into the ferrite; diffusion of phosphorus in ferrite is rapid at 800° C., but slow at 650° C.; the rate of diffusion of phosphorus is always less than that of carbon.

The following papers were also presented or taken as read: "The Utilisation of Titaniferous Iron Ore in New Zealand," by J. A. Heskett; "Iron-Portland Cement," by E. H. Lewis; "Practical Notes on the Design and Treatment of Steel Castings," by G. F. Preston;; "The Valuation of Ores and Iron-making Material," by C. H. Ridsdale; "Slag Conditions in Open-hearth Basic Steel-making Practice," by J. F. Wilson; and "The Reduction of Silicon from the Slag in the Acid Open-hearth Process," by B. Yaneske and G. A. Wood.

The adjourned meeting was held in the Mappin Hall of the University of Sheffield on May 14. Prof. Desch welcomed the members on behalf of the University, and Dr. Stead briefly replied, pointing out the pre-eminent position occupied by Sheffield in the scientific investigation of the ferrous metals. The holding of an adjourned meeting in a provincial centre is a departure from precedent, but the marked success of this experiment leads one to hope that it will be repeated.

The first papers read in the afternoon were those by Prof. C. A. Edwards and his co-workers on the thermal analysis and electrical resistivity of chromium steel. The discussion was very keen, the point which received most attention being the existence of a double carbide of iron and chromium ($Fe_3C.Cr_4C_2$) in the annealed steels. The electrical results very strongly point to the occurrence of this compound, and in the subsequent discussion chemical evidence was brought forward of a strongly confirmatory nature. The paper presented by Mr. J. H. G. Monypenny contained still more proof of this fact. The latter work was of remarkable interest in that the author showed that in these steels it is the cementite which dissolves first on heating, and that the whole of the pearlite carbide does not pass into solution until a very much higher temperature has been attained.

At the evening meeting Mr. Monypenny's paper was further discussed, and that by Prof. Andrew and his collaborators presented. The suggestion made by these workers that carbide of iron dissociates at high temperatures evoked considerable criticism, most of the members who took part in the discussion finding it impossible to accept this view. The paper by Dr. F. Rogers on brittleness in nickel-chrome and other steels gave rise to much discussion of an entirely critical nature. During this the question of the influence of phosphorus in giving rise to temper-brittleness was brought up, and data were adduced tending to show that in general the influence in this respect was negligible.

Owing to lack of time the papers by Mr. A. L. Norbury on the influence of other elements in steel on the electrical resistance, and that of Prof. K. Honda and T. Murakami on the constitution of chromium-tungsten steels were taken as read.

ROYAL PHOTOGRAPHIC SOCIETY.

Prof. Alex. Findlay, of Aberdeen University, delivered the second biennial Hurter and Driffield Memorial Lecture on May 11, the title of the lecture being "Some Properties of Colloidal Matter and their Applications in Photography."

The lecturer, after paying a tribute to the accurate scientific work of Hurter and Driffield, pointed out that in few departments of human endeavour and achievement did colloids play a greater and more fundamental *rôle* than in photography. Not only was gelatin, which was the most largely employed medium for the support of the light-sensitive silver salts, one of the most typical and most important of colloids, but the formation of silver chloride and bromide for use in the photographic process was carried out in a colloidal environment which profoundly influenced the properties of those salts. Indeed, the whole series of processes from the formation and ripening of the photographic emulsion to the production of the finished print was, if not explicable solely in terms of colloid chemistry, largely dependent on the colloidal state.

After discussing the properties of the two main classes of colloids, the suspensoids and the emulsoids, the lecturer pointed out that by the addition of an emulsoid colloid to a suspensoid the latter became endowed with the greater stability of the former, and was no longer so readily precipitated by salts. This fact was of the greatest importance in connexion with the production of the light-sensitive silver salts. Owing to the presence of gelatin, albumin, etc., the silver halide was "protected," and so was obtained in the grainless or fine-grained colloid form. The ultimate properties of the silver halide were largely dependent on the influence exerted by the emulsoid colloids at the moment of formation of the light-sensitive salt; and when, in the course of ripening, the silver halide passed into the crystalline form, gelatin was adsorbed and doubtless greatly modified the sensitiveness of the salt. Moreover, on the basis of the colloid properties of matter an explanation could be given of the nature of the latent image produced by the action of light on the sensitive silver bromide in the photographic plate. Whereas, formerly, the view was held that a sub-bromide was formed, it was now more generally believed that by the action of light on the silver salt colloidal silver is produced, which is then taken up by the silver bromide present by a process of adsorption.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At a meeting held on May 18, Sir Frederick Black, president, in the chair, a paper was communicated by Mr. R. Stirling on "The Air-Lift System for Raising Oil." The air-lift system is stated to be the most advantageous method of raising oil from wells which have ceased to flow naturally or which only flow intermittently. Any gas present with the oil assists the air lift and its energy is therefore utilised, whereas under current conditions it is lost. Where loose sands are encountered the air lift is the only practicable means of raising the sand with the oil, keeping the well always clear to the bottom, and thereby securing the maximum yield. The air-lift system was successfully applied in 1901 in No. 24 Bibi-Eibat, and the production was raised from 1200 to 12,000 pouds per day. In the case of Well 41 of the Baku Russian Petroleum Co. at Saboonchi, which only yielded slightly to baling, the application of the air lift brought about a yield of 7,000 to 8,000 pouds per day. More than 50 wells were dealt with during 1901—1902, and the results were most satisfactory. More recently the system has been successfully demonstrated in Trinidad. The author gave details of the complete air-lift installation applied to oil raising.

PERSONALIA.

Sir William Pope has accepted the nomination of the Council of this Society to be President for the year 1919-1920; Professor H. Louis has been elected Foreign Secretary in succession to the late Dr. R. Messel, and Dr. C. C. Carpenter to succeed him as the Society's representative on the Governing Body of the Imperial College of Science and Technology.

Mr. E. A. Coad Pryor, recently of the National Physical Laboratory, is now Director of Laboratories of British Glass Industries, Ltd.

The members of the Empire Motor Fuels Committee of the Imperial Motor Transport Council include Sir Charles H. Bedford, Sir John Cadman and Dr. W. R. Ormandy.

Dr. F. C. Thompson, lecturer in metallurgy at the University of Sheffield, has been awarded the Sorby Research Fellowship by the Royal Society.

Dr. F. G. Cottrell, chief metallurgist of the U.S. Bureau of Mines, has been appointed director of that institution, Dr. van H. Manning, it is stated, having resigned to take up work for the Petroleum Institute.

Sir Robert Hadfield, Bart., has placed in the hands of the Institution of Mechanical Engineers the sum of £200 to be devoted to a prize, or prizes, for the description of a new and accurate method of determining the hardness of metals, especially of those which have a high degree of hardness.

At a meeting of the Council of Leeds University on May 19, it was resolved that a chair of physical chemistry be instituted, and Dr. H. M. Dawson was selected to be the first occupant. Dr. Dawson was an 1851 Exhibition scholar, and since 1905 has been lecturer in physical chemistry at the same University.

The Franklin Institute has awarded Franklin Medals to the Hon. Sir Charles A. Parsons and Prof. Svante A. Arrhenius. The medals were presented to the British Ambassador and the Minister of Sweden, acting for the recipients, at a meeting held on May 19. On the same occasion a paper by Sir C. Parsons on "Some Reminiscences of Early Days of Turbine Development," and one on "The World's Energy Supply," by Prof. Arrhenius, were read by the vice-president of the Institute and Dr. Cushman respectively, in the absence of the authors.

NEWS AND NOTES.

FRANCE.

"L'Institut de la Victoire."—A committee has been formed under the patronage of M. Paul Deschanel, President of the Republic, and with M. R. Poincaré, M. G. Clemenceau and the Marshals of France as honorary presidents, with the object of establishing extensive laboratories for chemical research in Paris, to be called the "Institut de la Victoire." The committee is composed of well-known scientific, industrial and political men.—(*Rev. Prod. Chim.*, *Apr.* 15, 1920.)

Progress in Chemical Manufacture.—The output of chemical products is increasing satisfactorily, although in certain branches it is still far below the demand. On the whole, however, the progress made since the war has been quite remarkable. In 1913 the production of sulphuric acid was 800,000 tons; in 1919 it had increased to 1,700,000 tons. The output of nitric acid has risen from 20,000 to about 200,000 tons in the same period. Barely 6000 tons of oleum was made annually before the war; now more than 300,000 tons is produced, and new factories are in course of erection near Lille and in the South of France. Liquid chlorine was formerly imported almost entirely from Germany; 18,000 tons is now being produced electrolytically. The output of synthetic nitrogen compounds is now at the rate of 250,000 tons a year, and when present extensions have been completed it will reach 400–500,000 tons. The production of cyanamide has increased from barely 7500 to 200,000 tons per annum. In 1913 some 40,000 tons of calcium carbide was manufactured: the present production, soon to be augmented, is 300,000 tons. These results speak for themselves; their full significance will be realised only after a material reduction in costs of production has been effected.

The Fuel Situation.—In 1919 there were imported into France about 19½ million tons of coal, nearly 1,700,000 tons of coke, and 1,170,000 tons of compressed fuel. Of the above quantity of coal England supplied 74·5 per cent., Belgium 9 per cent., and the United States 1·75 per cent. The total amount of coal, coke, etc., received from Germany and the Saar basin was 3,165,532 tons. The quantity of liquid fuel imported was 3,275,878 hectolitres of refined petroleum, of which over 93 per cent. came from the United States, and 4,231,479 hl. of motor spirit, to which the United States contributed nearly 72 per cent.

Approximate figures for production, importation and deficiencies of coal are given below in millions of metric tons:—

	Demand (D)	Production (P)	Importation (I)	Deficiency (D—P—I)
Pre-war	64	41	23	—
1918		26.3	18.2	19.5
1919		21.9*	19.2†	23.1

*Including Lorraine.
†Excluding amount received from Germany (cf.s.)

The chief causes of the reduced output last year were the withdrawal of prisoners of war, the institution of the 8-hour day, and miners' strikes. Production in the current year is not expected to exceed 24 million tons, and importation about 25 millions (Great Britain 12, Belgium 3, and the Saar Valley 10). Although Germany is under obligation to supply 28 million tons, she has practically intimated her inability to send more than 750,000 tons a month (9 millions p.a.). The disparity between demand and supply is thus very great, and if no solution be found the industrial life of the country must suffer very severely. The remedies suggested are many, and include the importation of Polish and Italian labour, extended use of improved machinery for extraction, harnessing of the abundant water power of the country, and the enforcement of Germany to pay her debts under the Peace Treaty. A contract is being arranged between the owners of the devastated coalfields and an association of Belgian coal merchants whereby in exchange for a monthly supply of 100,000 tons of coal from Belgium, France will send iron ore and phosphate, sulphate and carbonate of lime. Prospecting in the south-west and in the neighbourhood of Lyons is proceeding steadily.

UNITED STATES.

The Spring Meeting of the American Chemical Society.—The 59th meeting of the Society was held at St. Louis, Mo., from April 12 to 17, under the presidency of Prof. W. A. Noyes. After an introductory address by the president, Lt.-Col. A. A. Fries, who has succeeded Major-General Sibert as head of the Chemical Warfare Service, read a paper on chemical warfare, and Dr. C. H. Herty followed with an address on "Victory and its Responsibility," in which he referred to the Longworth Bill for the protection of the coal-tar chemical industry, to the Nolan Bill for effecting reforms at the Patent Office (this has now passed Congress), to the Baccharach Bill, which seeks to repeal the duty-free importation of foreign apparatus, and to the Army Reorganisation Bill, which provides for the separate existence of the Chemical Warfare Service. To the general meeting were also presented papers on the prediction of solubility (J. H. Hildebrand), the study of plant distribution with hydrogen ion indicators (D. P. Wherry), and the absorption of alkaloids; but perhaps the event of greatest technical moment was the general symposium on colloids, at which "colloidal" fuel, flotation, lubrication, soap and proteins, vegetable tanning, ceramic processes, etc., were discussed from the colloidal standpoint. Other notable contributions included papers on the preparation of furfural from corncobs, on the mechanical preparation of finely divided nickel for use in hydrogenation, chemically active nitrogen and hydrogen, and the use of selenium oxychloride as an inorganic solvent.

At the inaugural meeting of the Sugar Section saccharimeters, beet sugar, and decolorising carbons were discussed, and at that of the Leather Section a new method of estimating tannin in vegetable tanning materials was described, which the authors recommend in place of the official American method, the latter being stated to involve errors of from 43 to 198 per cent. In the Rubber Division the practice of marketing compounding ingredients and accelerators under trade names was condemned; and in the Pharmaceutical Chemistry Division chloramine antiseptics, hypnotics, and anæsthetics formed the chief subjects of discussion. The more interesting papers presented to the new Dye Section treated of the Chemical Foundation dye patents, the physical constants of aniline, and dye research.

Among the decisions arrived at by the Council were the appointment of committees to investigate the continued thefts of platinum from certain laboratories, and to consider the question of the inadequate remuneration of university professors. The advertising business of the Society was entrusted to the Chemical Catalog Co., Inc., of New York; Dr. C. L. Parsons was appointed to represent the Society at the June meeting of the International Union of Pure and Applied Chemistry; and Rochester was selected as the locality of the next spring meeting.

Physical and Chemical Properties of Copper.—The possibility of deducing the chemical properties of copper from a physical examination was discussed in a recent paper before the American Institute of Mining and Metallurgical Engineers. It appears that if the surface of copper is in general convex, with a very close and even wave-like structure, the metal may be taken as having a copper content of at least 99 and probably 99·95 per cent. This same appearance cannot be produced on copper less pure, the general contour of the surface of which is concave. Good electrolytic copper should have the following approximate analysis: copper, 99·95; silver, 0·001; oxygen, 0·039; sulphur, 0·003, arsenic, 0·0015; antimony, 0·0020; nickel, 0·0015; iron, 0·0025; lead and bismuth, nil; selenium and tellurium, trace.

Forging Iron-Nickel Alloys.—It has been established that pure iron-nickel alloys do not forge satisfactorily at ordinary forging temperatures, and at the Westinghouse Research Laboratory an investigation has been under way to determine what treatment would make such alloys more readily forgeable. It has been found that aluminium, chromium, magnesium, and silicon have scarcely any effect, but that in amounts of two per cent. of the lesser constituents, manganese or titanium imparts the desired characteristics and makes the alloys forgeable. It is believed that the function of these elements is to strengthen the amorphous intercrystalline material to the point where it possesses greater strength than the crystals.

Desiccated Vegetables.—Dr. Hawk, of the Jefferson Medical College, has found that when desiccated vegetables are immersed in water for a few hours they assume a form very closely approaching that of the fresh vegetable, and that if this rehydrated material be removed from the water and left at room temperature for 24 to 36 hours, it returns to approximately the same anhydrous state as before being freshened. This behaviour is entirely different from that observed with fresh vegetables, and the conclusion is reached that there must be a structural difference. The failure of the re-hydrated product to retain its water may be due to the change in the colloids of the vegetable cells, with an accompanying decrease in their power to hold water. The decrease in the inhibition power of the colloids might be due to the removal of mineral salts from the vegetable during soaking in water. These experiments have no reference to nutritive values.

The Beet Sugar Industry.—Out of a total world production of 16½ million short tons of sugar in 1919 the United States produced 915,000 tons, including 795,000 tons of beet and 120,000 tons of cane sugar, or a total of 5½ per cent. of the world's supply. Against this the consumption was about 4 million tons, or about one-fourth of the world's production. Thus 23 per cent. of the consumption is home produced; a further 24 per cent. comes from Hawaii, Porto Rico, and the Virgin Islands, whilst the remainder comes from the Philippine Islands, Cuba and other countries. There are now 99 beet-sugar factories in the United States, and it is estimated that, in order to supply the requirements, this number should be increased to 930, which would entail the cultivation of sugar beet over an area of 1,400,000 acres.—(*Chem. and Met. Eng., Mar.* 24, 1920.)

Arsenic, Bismuth and Selenium in 1918.—In 1918, 6323 short tons of white arsenic, valued at £242,600, was produced, as against 6151 tons in 1917. About 2 million lb. of the white arsenic produced is used for the manufacture of insecticides and weed killers, while about 1 million lb. is used in the glass industry, and a small amount for the manufacture of drugs. One company was reported to produce metallic arsenic.

In 1917, bismuth was recovered by only one company in the United States, the source being the refining of lead bullion. In 1918, 135,700 lb. of bismuth, valued at £55,456, was imported.

The production of selenium in 1918 was 103,694 lb., valued at about £41,308, an increase of 162 and 195 per cent. over the output and value for 1917. In 1918, selenium was recovered as a by-product in a number of electrolytic copper refineries. The imports are very small, as the producers can satisfy the home demand.—(*U.S. Geol. Surv., Nov.* 19, 1919.)

Fluorspar and Cryolite in 1918.—The total quantity of fluorspar sold from mines in the United States in 1918 was 263,817 short tons, valued at £1,093,096, an increase in quantity and value of 21 and 139 per cent. respectively over 1917. The bulk of the output (236,121 tons) consisted of gravel spar for use in the manufacture of open-hearth steel. The entire supply of natural cryolite used in the United States is imported from Greenland.—(*U.S. Geol. Surv., Dec.* 9, 1919.)

BRITISH INDIA.

Industrial Progress in the United Provinces.—The report of the Director of Industries, United Provinces, for 1918-19 gives an interesting review of those growing industries to which the Department can be of assistance. *Glass Industry*—Manufacturers had a very successful year, their trade reaching considerable dimensions under the stress of war conditions. It is pointed out that if this trade is to be permanently secured and increased, methods, both of business and manufacture, must be improved on scientific lines. The importance of affording technical advice as to plant and processes of manufacture is fully recognised, and steps are being taken to obtain a glass specialist. The services of four English glass blowers were secured during the year for the Allahabad Glass Works to facilitate the training of good workmen, with the result that workmanship has much improved, and the output of the factory has doubled during the twelve months. *Metal Ware Industry.*—This industry has also done well, but expert guidance is urgently necessary. With better craftsmanship in the preparation of pressing tools, the making of lamp parts and other similar articles of pressed metal ware would have excellent prospects. *Chemical Industries.*—Development in this direction is limited by the absence of some of the more important raw materials, but considerable assistance has been afforded by the Department through its Industrial Chemist. The industrial laboratory carried out a large number of inquiries on behalf of the Government and also for private firms. A considerable sum was spent on the investigation of the production of alkali from *reh*, the manufacture of which could be successfully undertaken if conditions for the collection of the raw material were available. *Essential Oil Industry.*—It is in the laboratory that most assistance can be given to this industry, which is reported to be in a flourishing condition, though worked on primitive lines. Work on the distillation of clove oil was completed, and an exhaustive series of experiments on the distillation of rose and patchouli was carried on. Work in connexion with dyes, tanning and sizing materials was continued by the Industrial Chemist, who also records very encouraging results from work on the preparation of printing inks, and speaks hopefully as to the possibility of starting a varnish and paint industry. *Weaving Industry.*—A large section of the report is devoted to this industry. Handloom weavers took advantage of the rise in price of cloth and many new sheds were started in villages, while a real advance appears to have been made in the use of the fly-shuttle loom. Much is expected from the development of co-operative effort. The chief factor, however, in the development of the weaving industry in this province must, as in all cases, be education, and attention is drawn to the success of the established weaving schools and the activities of the Department of Industries in organising peripatetic instruction.

SOUTH AFRICA.

Occurrence of Lead.—No lead deposits of considerable extent have yet been found in the Union; the Transvaal contains the more important localities. The Rhenosterhoek (Marico district) deposit has been worked for some time on a small scale through an adit 75 ft. below the original outcrop. It is very similar in character to the other local occurrences of galena, being found in dolomite; small outcrops are visible on the surface, the value of which decreases in depth, and the ore gives out at about 50 ft. The galena occurs in irregular lumps or masses of characteristic shape, weighing a few ounces to several tons, embedded in a soft brown earth carrying manganese peroxide; it is extremely pure (Pb 83 %, Ag 9—15 oz. per short ton). The ore now being taken out is smelted in Johannesburg and is used principally in the manufacture of lead nitrate. At Leeuwkloof (Pretoria district) 700 tons of galena (Pb 73—75 %, Ag 2—4 oz.) have so far been extracted. At a number of other localities in the Transvaal lead has been mined in the past, but the mines are at present shut down: Witkop, Bokkraal, Buffelshoek, Rietspruit, Doornhoek (Marico district), Broederstroom, Edendale, Dwarsfontein, Roodekraus (Pretoria district), and Windhuk (Pietersburg district). Throughout the whole of the dolomite area of the Transvaal irregular deposits of galena are found and occasionally worked, the ore being sold to the ore reduction companies on the Rand. In the Transvaal Silver Mine (Pretoria district) argentiferous galena is associated with chalcopyrite, copper carbonates, and tetrahedrite, in the vicinity of a diabase dyke. At Edendale, also in the Pretoria series, a vein has been worked in which galena occurs in conjunction with zinc blende. Another vein which was formerly worked is found near Argent, 50 miles east of Johannesburg.

In the Cape Province lead ores have been found at the Maitland Mine (Port Elizabeth), Banghoek (10 miles west of Hopetown), Knysna, Richmond, in the Beaufort West and Victoria West districts, and at various other points. No mining appears to have been done. In Natal no promising deposits are known; a quartz vein near the Tugela river has been prospected, but contains only small and isolated nests of galena. Since limestones and dolomites are fairly abundant in South Africa, it is likely that numerous occurrences of lead ore are still undiscovered; but prospecting will not be easy as these rocks are largely covered with soil owing to the ease with which they weather.—(*S. African Eng., Mar.*, 1920.)

GENERAL.

Proposed Site for London University.—The Government has offered a site of about 11½ acres near to and on the north side of the British Museum, for the accommodation of the headquarters, King's College and other institutions connected with the University of London. The President of the Board of Education, in communicating the offer to the Chancellor (Lord Rosebery), stated that the condition of the national finances precluded any offer to provide the cost of the buildings from public funds, although the Government was prepared to secure the University from loss in respect of maintenance charges on the new headquarters. The proposed site includes houses now occupied by several scientific and learned societies, of which the Institute of Chemistry is one.

Society of Dyers and Colourists.—The 36th annual report states that 83 members and 60 junior members joined the Society in 1919. A Midlands Section has been formed and will be in active operation during the present year. The accounts show a slight adverse balance, which is traced to the greatly increased cost of printing and publishing; owing to this cause the subscription rate for the

Society's *Journal* has been raised to 60s. per annum for non-members. The Right Hon Lord Moulton has been elected president, in succession to Mr. C. F. Cross.

Agricultural Industries in St. Vincent.—The Report of the Agricultural Department of St. Vincent for 1918-19 records that the progress in the chief industries of the island has been maintained.

Cotton.—The season was favourable, and the area planted exceeded 6,030 acres, compared with 4,710 acres in 1917-18. Of this total 4,583 acres was planted with Sea Island cotton. The increase in planting was stimulated by the satisfactory prices paid by the Government for the cotton, which was required for aeronautical purposes. The total yield of Sea Island cotton was 437,273 lb. (329,115 lb. in 1917-18).

Starch.—The output of starches was increased as the result of high prices. In view of the increased cost of production, of anticipated lower selling prices, and of competition, a serious consideration of the position would appear to be necessary. Provided that the cost of production can be lowered, it might possibly be profitable in the future to erect central stills and manufacture power alcohol from the starches.

Cacao.—The improvement noted in the previous year was continued during 1918, when the export of cured cacao was 206,547 lb., as compared with 133,391 lb. in 1917.

Sugar.—Although the exports of sugar and syrup were not so large as in the two previous years, the position of the industry was well maintained. In this connexion the Imperial Commissioner of Agriculture has reported that the time is now opportune for developing the manufacture of syrup in St. Vincent. It is doubtful whether conditions are favourable for putting up the elaborate machinery necessary for the manufacture of sugar on modern lines, but simpler machinery will serve for the manufacture of syrup.

Among the minor industries improvement is also general. Progress in the production of maize has continued, exports having steadily risen from 745 bushels in 1913 to 3,037 bushels in 1918. Small shipments of copra and nuts are recorded. Large areas of coconuts are commencing to bear, and exports are likely to rise considerably. Groundnuts is a profitable minor industry. Good prices were realised for the unshelled nuts, more particularly in Trinidad. The export for the year was 13,489 bushels, against 14,424 bushels in 1917.

New Industries in Portugal.—The number of new industries being established in Portugal is steadily increasing; they include the manufacture of sodium carbonate, copper sulphate, calcium carbide, chloride of lime, vaseline, gasoline, aluminium sulphate, sodium chromate and dichromate, artificial silk, liquid air, etc. This development is largely due to the absence of German competition, which has put certain industries in a position to export, in spite of the difficulty experienced in obtaining the necessary machinery and supplies. In order to protect certain of the new industries it has been proposed that the Government should grant them monopolies for a term of 15 years, provided that they increase their present production by at least five times.—(*Z. angew. Chem., Mar.* 12, 1920.)

Camphor in South China.—The growing demand for camphor from South China is leading to increased activity in the industry. The government officials of the Kwangsi province have founded a company at Kuelin for carrying on the industry, and a modern factory is being established. The production and export of camphor are also being organised, and American buyers are attempting to establish a trade in camphor oil. Large quantities of this oil are being exported from the Kwangtung, Fukien, and Kiangsi fields. The best virgin field in China is said to be in Kiangsi province, where, it is stated, the trees have been cut but little. The island of Hainan is under investigation as a possible source of camphor.

The exportation of camphor from the Foochow district fell from 1,516,600 lb. in 1906 to 49,533 lb. in 1917, owing to the creation of a monopoly and unwise official control, as well as to the competition of Formosan camphor. In 1918, however, owing to the high prices offered, the trade improved and 56,533 lb. was exported. The camphor is produced by crude native methods, and trade is further hampered by transport difficulties, though labour is cheap. It is stated that the Government is anxious to revive the camphor trade and might be willing to bear at least a part of the expense of re-afforestation.—(*U.S. Com. Rep., Feb.* 11, *Mar.* 2, 1920.)

Iron Ore in Dutch Guiana.—The concessions in the Donderbari mountains, belonging to the Guiana G. H. Placer Company, are said to contain over 50 million tons of iron ore in sight, the ore containing 62 per cent. of iron. These iron ore beds are being investigated by two German mining engineers, who are also examining deposits of nickel, chrome, wolfram, molybdenum, and vanadium, which are reported to exist on the concession.—(*Bd. of Trade J., Mar.* 25, 1920.)

Discovery of Iron Ore in Switzerland.—Important deposits of iron ore about 2–5 metres thick, have been discovered in the Frick Valley (Fricktal, Aargau). The quality of the ore resembles that of the "minette" of Lorraine and Luxemburg; it is an oolitic limonite and assays: Fe 25—35 %, Mn 0·15—0·32 %, SiO_2 12·8—20·5 %, CaO 7·9—13·6 %, Al_2O_3 1·2—8·8 %, Mg 0·72—1·8 %, P 0·39—0·63 %, S 0·01—0·05 %, and CO_2 8·5—12·5 %. The deposits appear to be extensive, and can be mined partly by open working. It is hoped that electrical smelting will be adopted, as the necessary water power is available.—(*Schweiz. Chem.-Z., Mar.* 17, 1920.)

The German Iron Industry in 1919.—The following figures give the production of pig-iron, steel, and rolling-mill products for the last two years, in millions of metric tons:—

	1918.	1919.
Pig iron	11·9	6·3
Steel	15·0	8·5
Rolling-mill products	10·1	5·9

The great decrease in the figures for pig-iron is due primarily to the loss of Luxemburg and Lorraine, from which a large part of the supplies of ore (minette) was derived. Considerable ore reserves were held at the beginning of the year, but they were soon used up, and an agreement was reached with the French Government for the exchange of 1 ton of German coke per 1¼ tons of Lorraine ore at the rate of 6500 tons of coke daily. Lack of the necessary transport and coal has greatly hindered the fulfilment of this agreement. The distribution of the ore among the smelters is arranged by an Imperial commissioner for ore supply, assisted in disputed cases by a commission of experts. The output of steel was interfered with by the manganese famine which was partly overcome by working up Donawitz manganese slags and by the importation of Caucasian ore *via* the Danube. The latter trade, however, encountered difficulties in the supply of bunker coal. The cost of the various manufactured articles has risen greatly (7—8 times the 1918 figures) owing to the great demand and the collapse of the currency; eventually the Government was obliged to negotiate with the smelters for the setting up of maximum prices. Should the negotiations prove unsuccessful by January next the Government is empowered to decree maximum prices and set up an administrative committee to regulate prices, on which the smelters, consumers, merchants, and employers will be equally represented.—(*Glückauf, Mar.* 20, 1920.)

Professional Fees in Germany.—The "Vereinigung selbständiger Metallanalytiker Deutschlands" (Union of Independent German Metallurgical Analysts) has decided to raise its scale of minimum fees, fixed on January 9, 1919, by 100 per cent. as from January 3, 1920. (*Z. angew. Chem., Mar.* 5, 1920.)

Diminished Alcohol Production in Germany.—According to the report of the "Verein der Spiritusfabrikanten Deutschlands," the German brewing and alcohol industries are passing through a difficult period. The pre-war production of 3,500,000 hectolitres of alcohol per annum declined in 1918–19 to 1,300,000 hl., all of which is required for lighting, heating, and power, so that none is available for the manufacture of potable spirits; in addition, the output for the current year is estimated at only one-fifth of that of the previous year. The decline in output is mainly due to lack of fuel, shorter hours of work, and low prices, and to the fact that the number of potato distilleries working has diminished from 6000 to 1300.—(*Z. angew. Chem., Mar.* 9, 1920.)

Lignite Tar Oils.—Dr. H. Franck, chief chemist to the Sunlicht-Gesellschaft (1914) A.-G., Mannheim, which was taken over from Lever Bros. on the outbreak of war, states that about a year ago he solved the problem of the manufacture from hydrocarbons of fatty acids suitable for edible purposes, as well as for the manufacture of soap, etc. The method consists in "cracking," *i.e.*, converting high-boiling hydrocarbons into partly unsaturated hydrocarbons of lower boiling point. The process, when carried out in a reducing atmosphere gave, even from tar, "Bakura" and similar material, and saturated petroleum hydrocarbons (Bergius process of the Erdöl-und Kohleverwertungs A.-G.); it was first carried out with paraffin in an atmosphere of oxygen, with and without a catalyst, and ultimately with the aid of special catalysts yields of 70—80 per cent. of higher fatty acids and 15—25 per cent. of middle and lower fatty acids were obtained. The process was applied to other aliphatic and aromatic hydrocarbons, also to lignite and low-temperature tar oils. The fatty acids obtained were not only excellent for soapmaking, but could be esterified with ethyl alcohol, glycol or glycerin, yielding useful edible fats by means of the process which was being worked by the War Committee.

Dr. Franck does not consider the process commercially practicable. The German production of lignite paraffin before the war amounted to about 18,000 tons, whilst that of Galicia was about 100,000 tons, of which about 20,000 tons was treated or consumed at home. During the war great hopes were entertained of the low-temperature tar process, and the production of tar was expected to reach 300,000 to 400,000 tons with a content of 10 per cent. paraffin. Apart from a few scattered generators, only the Rositz plant of the Deutsche Erdöl A.-G. is now in operation, producing 10 tons of paraffin daily, which is all absorbed by the candle industry. The total production of paraffin at present amounts to about 21,000 tons, and that of lignite tar about 150,000 tons; the German soap industry alone used 250,000 tons of fatty acids in 1913, while the same quantity of neutral fat was treated in the German margarine industry. It does not appear possible therefore for a private undertaking profitably to carry out the manufacture of synthetic fatty acids from lignite tar.

Dr. Harries points out that the "cracking" process is costly, and at present results in considerable losses. To reduce these losses the attempt was made to obtain valuable oxidation products by treatment with either oxygen or ozone. As chief product a refined oil is obtained, which is of great commercial value, and which is not produced by Dr. Franck's process.—(*Die Seife, Mar.* 30, 1920.)

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

Exportation of Fertilisers.

The Fertilisers (Temporary Control of Export) Bill, which has now passed the House of Lords and been sent to the House of Commons, is intended to secure to farmers supplies of fertilisers during periods of shortage. It empowers the Board of Trade for a period of two years to prohibit exportation when considered necessary. The materials specified are sulphate of ammonia, superphosphate, basic slag, potash manures, and compound fertilisers containing any of these substances. During the Committee stage, Lord Bledisloe moved to substitute "nitrogenous chemical manures" for "sulphate of ammonia"; this was opposed by the Minister of Agriculture on the grounds that restrictions on re-export would stop the importation of synthetic nitrogenous fertilisers from abroad, that the Bellingham works would not manufacture under such conditions, and that the proposed amendment would operate against the maintenance of stocks of Chilean nitrate in this country. The amendment was withdrawn.

HOUSE OF COMMONS.

Fats from Sewage.

Dr. Addison, replying to a question put by Mr. A. T. Davies, said that only four local authorities possessed plants for the recovery of fats from sewage on a large scale, and that there was no reason to suppose that such fats were used in the manufacture of foodstuffs.—(May 6.)

Income Tax (Subscriptions).

Captain Elliot asked the Chancellor of the Exchequer whether he could see his way to grant that, in computing net incomes, there should be allowed as deductions contribution made within the taxable year to corporations organised and operating exclusively for charitable, scientific or educational purposes to an amount not in excess of 1 per cent. of the taxpayer's net income.

Mr. Chamberlain, in reply, stated that where subscriptions of the characters indicated are given by traders in such circumstances that they may fairly be regarded as money wholly and exclusively expended for the purposes of trade, they are admissable as expenses in the computation of profits for income tax purposes. He was not prepared to extend the relief of income tax to charitable and other contributions which do not satisfy this condition. This was allowed in the United States, but the Royal Commission on the Income Tax found that it was unable to recommend such a deduction in this country.—(May 10, 12.)

Oil in Great Britain.

Mr. Kellaway, replying to Viscount Curzon, said that one of the eleven oil wells drilled had been abandoned owing to the difficulty of shutting off the water encountered. Five wells had yielded traces of oil, and the well at Hardstoft had a natural flow of 50 gallons a week, which could be increased to 250 barrels a week. The oil produced amounted to about 2800 barrels (100,000 galls.), and was in storage pending a decision on the question of oil rights in this country. Nine other wells were being drilled, and it was hoped that five would be completed shortly.—(May 11.)

Answering Lieut.-Com. Kenworthy, Mr. Bonar Law said that the Government had now reached a decision regarding the ownership of and royalties on oil deposits in Great Britain; a Bill had been drafted and was under consideration.—(May 13.)

Dangerous Drugs Bill.

This Bill, presented by the Home Secretary on May 4, is designed to regulate the importation, exportation, manufacture, sale, and use of opium and other dangerous drugs in accordance with the International Opium Convention of 1912. It prohibits the exportation and importation of raw opium (save under licence) and prepared opium, and restricts their manufacture; it also regulates the importation, exportation and manufacture of morphine, cocaine, ecgonine, and diamorphine, and their respective salts, medicinal opium and any preparation containing from 0·2 per cent. of morphine to 0·1 per cent. of cocaine, ecgonine and diamorphine. Other new preparations likely to produce, if improperly used, similar effects to those produced by morphine or cocaine, may be brought under the Bill by Order in Council. The Act is to come into force on September 1.

Mineral Rights (Acquisition) Bill.

In answer to Major Cope, Mr. Bonar Law said that the Government intended to introduce a Bill to provide for the acquisition of mineral rights as soon as possible.—(May 13.)

Morphia.

Sir R. Horne, replying to Mr. Gilbert, said that at present only three factories in Great Britain were making morphia, and that licences for its export are granted by the Board of Trade on the basis of the estimated legitimate requirements of the country of destination. During 1919 a total of 322,970 oz. of morphia and morphia salts, valued at £336,861, was exported, of which British Possessions took 20,397 oz., including India 530 oz., Australia 967 oz., and Canada 18,501 oz.; foreign countries took 302,733 oz., including Belgium 15,088 oz., France 140,873 oz., and the United States 121,474 oz.—(May 17, 18.)

Indian Opium.

In a detailed statistical answer to Mr. Gilbert, Mr. Montagu stated that the opium exported from India in 1918–19 amounted to 17,278 chests (including 6811 chests exported on Government account), valued at Rs.4.20.15.975. The largest amounts were taken by Indo-China (3440 chests), the United Kingdom (2400 chests), Java (2400 chests), Japan (1936 chests), and Siam (1750 chests). Statistics of opium production were not available after 1916–17 when the output was 32,124 maunds from 204,186 acres. (Chest=1·5 cwt., maund=82·3 lb.)—(May 19.)

Smoke Abatement.

Dr. Addison, in reply to Mr. Sugden, said that a Departmental Committee had been appointed to deal with the question of atmospheric pollution by smoke and other noxious vapours.—(May 19.)

River Pollution.

In response to Sir F. Blake, Sir A. Boscawen said that he hoped to introduce this Session a Fisheries Bill, which will, among other things, deal with river pollution. In addition, an Inter-departmental Committee, appointed by the Ministries of Agriculture and Transport, was investigating the question of road tarring in relation to stream and river pollution. The general question was the subject of discussion hetwen the two Ministries mentioned and the Department of Scientific and Industrial Research.—(May 19.)

Benzol.

Mr. Hope, replying to Sir A. Yeo, said that on November 11, 1918, the Ministry of Munitions held, or was under contract to buy, 11,700 tons of standard benzol and 9800 tons of pure benzol. All the standard benzol was sold by October 7, 1919, at an average price of 1s. 8¼d. per gall., and a further 100 tons subsequently notified for disposal was sold by March 20, 1920.—(May 19.)

Gas Regulation Bill.

The main object of this Bill, introduced by the President of the Board of Trade on May 19, is to substitute calorific value instead of volume as the basis upon which prices of gas will be fixed. It empowers the Board of Trade to authorise increased selling prices to meet increased costs of production, and to modify the sliding scales where necessary.

British Trade with Japan.

Mr. Bridgeman, replying to Mr. Doyle, stated that in 1919 this country imported goods worth £23,871,012 from Japan, and exported goods to the same destination worth £14,729,643. The imports include the following values: Iron and steel, £7851; copper, £195.075; other metals, £326,261; and the exports include values for these three heads of £3,980,625. £489.331, and £782,710, respectively.—(May 20.)

LEGAL INTELLIGENCE.

Carriage of Heavy Naphtha. *Midland Railway Co. and Others v. Brotherton and Co. and Another.*

The Railway and Canal Commission (Mr. Justice Lush presiding) on May 10–13 heard an action brought jointly by the Midland, Great Western, and Lancashire and Yorkshire Railway Companies against two firms of tar distillers, viz., Messrs. Brotherton and Co., Ltd., and Messrs. Wm. Butler and Co. (Bristol), Ltd.

The Railway Companies asked the Court for a declaration that certain traffic consigned by the respondent firms was "Naphtha, Coal Tar" and "dangerous goods" within the meaning of Acts by which the companies were authorised to charge such reasonable sums as they thought fit in respect of traffic so declared. The respondent firms contended that the traffic in question was "Mineral Tar Oil," which is included in a class of non-dangerous goods for which rates are fixed in the Acts. It transpired that the traffic in question was a distillate of coal tar, which, though frequently invoiced as "heavy naphtha" or "high-flash naphtha," had been consigned by the firms as "mineral tar oil," in virtue of its flashing point by the Abel close test being not lower than 100° F. Technical evidence was given for the railway companies by Messrs. L. Archbutt and J. H. B. Jenkins (chemists to the Midland and Great Eastern Railway Companies respectively), and Messrs. Horatio Ballantyne and W. J. A. Butterfield; and for the respondents by Messrs. Thomas Butler (managing director of the firm of that name), J. Lukes (traffic manager to Messrs. Brotherton), Prof. G. T. Morgan, and Dr. P. E. Spielmann. The railway companies in March, 1917, announced that the entry "mineral tar oil" applied only to dark-coloured distillates from coal tar, of which 1 gm. exposed for six hours in a watch glass to the air at 60° to 65° F., in a position free from strong draughts, must not lose in weight more than 10 per cent. Samples from 20 lots, consigned by the defendant firms as "mineral tar oil," had all shown a considerably greater loss than 10 per cent. by this test, though mostly flashing above 100° F. The respondents' witnesses said this test lacked precision, and was inferior to the flash-point determination in discriminating between safe and dangerous traffic. For the railway companies it was contended that their evaporation test was simple and indicated dangerous properties which were not indicated by the flash-point alone. They regarded the traffic as dangerous not merely on account of its flash-point being only a little above 100° F., but also for other reasons. For instance, contrasted with the heavier tar oils to which they restricted the use of the term "mineral tar oil," it penetrated absorbent material such as sawdust and sacking more readily, and spread fire much more rapidly, while, owing to its being lighter than water, restriction and extinction of fire became more difficult. The defendants, while admitting that it was more inflammable than, *e.g.*, creosote oil, contended that as its flashing point was above 100° F. by the close test, and considerably higher by the open test, it was not dangerous traffic.

The judgment of the court, given on May 20, granted the application of the railway companies and declared that they were entitled to treat the traffic in question as dangerous goods and to require it to be consigned as "Naphtha, Coal Tar." It was not necessary or expedient for the Court to decide whether the traffic was in fact dangerous; it was sufficient that the railway companies had satisfied the Court that they had acted in good faith in classifying the traffic as dangerous goods. Their evaporation test had been inserted for good and sufficient reasons and served its purpose.

Potash Contract. *J. D. Pritchard & Co., Ltd. v. S. Diamant.*

In the King's Bench Division, on May 3, before Mr. Justice Bailhache, an action was brought by Messrs. J. D. Pritchard and Co., Ltd., of Swansea, to recover from Messrs. S. Diamant, of London, the sum of £259, due for alleged breach of contract to supply a quantity of potash equal to sample.

For the plaintiffs it was stated that on October 11, 1919, the defendants offered them 50 casks of natural purified Russian potash, containing 96·50 per cent. of potassium carbonate, at £117 per ton. When the potash was delivered it was found to contain only 78·3 per cent. of potassium carbonate, and the plaintiffs, having paid £2700 on the contract, declined to pay more and claimed a rebate *pro rata* with the deduction in the percentage of potassium carbonate to the extent stated. The defence claimed that it was entitled to be paid in full as no warranty had been given and as the plaintiffs, after inspection, had agreed to purchase the potash in bulk. The plaintiffs put forward evidence to show that there was no purchase in bulk.

Judgment was given for the plaintiffs, with costs.

Damaged Liquorice. *W. R. Andrew v. British East Africa Corporation, Ltd.*

On May 18, in the King's Bench Division, the plaintiff, trading as Messrs. Linton, Hubbard and Andrew, sued the British East Africa Corporation to recover £4500 for loss on a policy of marine insurance in respect of 150 cases of Spanish black liquorice paste. Plaintiff's case was that the liquorice had been damaged by sea water on the voyage, and expert evidence was called to prove that impregnation with sea water had occurred; the salt content was twice that of the normal. For the defence it was claimed that the deterioration was due to fermentation caused by packing in a damp condition. The analytical evidence showed that the chlorine content was higher in the interior than near the exterior. Impressed by the latter evidence. Mr. Justice Bailhache gave judgment for the defendant corporation, with costs.

COMPANY NEWS.

BRITISH DYESTUFFS CORPORATION, LTD.

At the first annual meeting, held in Manchester on May 21, Sir Henry Birchenough, the chairman, expressed regret at the resignation of Lord Moulton, and announced that the Board of Trade had nominated Lord Ashfield (formerly Sir Albert Stanley) to be the second Government representative on the board.

Reviewing the financial year, to October 31 last, the chairman said that the net profit of £172,500 did not reflect accurately the company's earning power inasmuch as the new capital, £5,000,000, issued last July had not by then come into bearing. The change-over from war to peace conditions had necessitated much reorganisation and concomitant expense and dislocation; delay and difficulties had been experienced in the delivery and installation of new plant; and the costs of wages and materials had risen continuously. Selling prices of dyes had not been put up so soon as they might, or perhaps ought to, have been; and even now the increases made were relatively less than those for woollen, cotton and silk yarns. The tangible assets valued in the balance sheet at £6,185,822 included:—buildings, plant and machinery, £3,500,000; stocks on hand, £2,250,000; debts due and investments, £1,187,000.

After referring to the basic importance of the dye industry, particularly in relation to munitions production and the textile industry, Sir H. Birchenough said that although the home supply of dyewares was still short of the demand both in respect of quantity and range, dye-users should remember that they have been better supplied than any country in the world. The output of the British dye industry to-day exceeds the total consumption in this country before the war, and it is almost entirely based on British-made materials and intermediate products. It would be foolish to deprecate the importation of foreign dyes pending the full development of the home industry, but on no account should those alien organisations which were uprooted during the war be allowed to re-establish themselves in this country. The unexpected Sankey judgment had rendered possible the temporary free importation of German dyestuffs, but they looked to H.M. Government to fulfil immediately its promises of protection. Such promises could, in the speaker's opinion, only be effectively fulfilled by prohibiting foreign imports, except under licence. Research undoubtedly lay at the root of the solutions of problems confronting them, and the place of research in the company's plans was regarded as all-important. About 100 highly qualified research chemists were now engaged; buildings erected, or under construction, for this work were costing £250,000, including equipment, and over £70,000 had been spent during the past financial year on actual operating costs. The Corporation had received a Government grant of £100,000 for research purposes. The number of workpeople employed was 6000, and the total staff numbered over 7000.

The resolution authorising the payment of a dividend of 8 per cent. on the preferred ordinary shares was passed unanimously. No dividend has been declared on the ordinary shares.

JURGENS, LTD.

Presiding at the first annual meeting—since the company was converted into a public one—on May 18, Sir Charles Stewart referred to the issue of one million 7 per cent. participating preference shares in May last, with the proceeds of which it was intended to erect large crushing mills at Purfleet. In lieu of this, however, the company, in association with the Dutch company, Anton Jurgens' United (Margarine) Works, had purchased the whole of the share capital of the Olympia Oil and Cake Co., Ltd., of Selby, Yorks. By this course delay in delivery of crushing machinery and the necessity of establishing a large organisation for the disposal of the cake products were obviated. The company is now self-contained, all the processes, from the purchase of the seeds to the sale of the margarine, being under one control. To provide for this purchase and for future contingencies the nominal capital was raised to £10,000,000 in November last, and 1½ million each of preference and ordinary shares were issued to the public. The issued capital is now £5,000,000. The available profit from last year's working was £256,574, inclusive of £34,534 brought in, and out of this sum it was agreed to pay a dividend of 7 per cent. on the ordinary shares, and to leave £68,813, subject to excess profits duty, to be carried forward.

North Persian Oils, Ltd.—This company was registered on May 8 with a capital of £3,000,000 in £1 shares. H.M. Treasury and the Anglo-Persian Oil Co. are to be represented on the board of directors.

Lever Bros., Ltd.—A scheme of capital reorganisation has been formulated which provides for the raising of the authorised capital from £100,000,000 to £130,000,000 by the creation of 10 million new 7 per cent. cumulative preference shares of £1 each and 20 million new 8 per cent. cumulative "A" preference shares of £1 each. The existing first, "A," "B," and "C" preference shares will be merged into the new 7 per cent. preference shares, and the existing 15 per cent. "A" preferred ordinary into the new 8 per cent. preference shares. These proposals involve the capitalisation of £3,944,111, representing undivided profits, and an increase of £217,963 per annum in the sum paid in dividends on the existing preference and 15 per cent. preferred ordinary shares. The holders of the ordinary shares do not participate in the capital distribution.

British Glues and Chemicals, Ltd.—An important amalgamation of firms manufacturing glue etc. has been effected, and a new company with the above title and a capital of £2,000,000 will acquire and develop the businesses of the following undertakings: The Grove Chemical Co., Ltd., of Wigan; Charles Massey and Sons, Ltd., of Newcastle, Staffs., Market Harborough, and Stoke-on-Trent; Meggitt's (1917), Ltd., of Sutton-in-Ashfield, Notts; Quibell Bros., Ltd., of Newark; J. and T. Walker, Ltd., Bestwood Colliery, Notts; The Weaver Refining Co., Ltd., Acton Bridge, Cheshire; and Williamson and Corder, Ltd., of Low Walker, Newcastle-on-Tyne. The principal manufactures to be undertaken are glues, gelatins, edible and technical fats and greases, fertilisers, calcined bones, phosphoric acid and its derivatives. The sale of the business of Quibell Bros., Ltd., does not include its sheep dip and disinfectants branches. The assets, less liabilities, were valued at £1,260,527 (including £379,384 for goodwills) on January 10 last, and this is the amount of the purchase price, £760,527 being payable in cash. The annual profits for the last three years averaged £336,982. Before the war, it is stated, the industry was largely in the hands of continental countries, especially Germany and Austria. Great importance will be laid on research, and a highly qualified chemist has been engaged to control a central department devoted to this work. The share capital is divided into 700,000 eight per cent. cumulative preference shares of £1 each and £1,300,000 ordinary shares of £1 each; of these, 333,334 preference and 666,667 ordinary shares are now being offered to the public at par.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for May 13—20.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
Canada ..	Glass, crockery	684
" ..	Chemicals, drugs..	688
" ..	Carbon, tungsten and nitrogen lamps..	*
" ..	Tool steel	*
New Zealand .	Iron, steel, tinplate, salt caustic soda, soda ash	716
" ..	Glassware	†P. D. 12
Nigeria ..	Drugs, salt, crockery	718
South Africa ..	Paper, leather	689
Finland ..	Copper, lead, tin, tinplate, iron, galvanised sheets	721
France ..	Iron, steel, industrial oils	722
" ..	Tanned hides and skins, metals, fatty products	724
" ..	Cement, drain pipes, cast iron pipes, lead pipes	‡
Germany ..	Tanning materials, olive oil	692
Greece ..	Chemicals, pharmaceutical products, soap, candles	693
" ..	Leather, paper, perfumery, sugar ..	727
Hungary ..	Black iron plates, zinc	728
Italy	Agricultural chemical products ..	695
Norway ..	Chemicals, asbestos, rubber	732
Portugal ..	Sheet copper and brass, tin, lead, vegetable fibres	734
Switzerland ..	Metals	701
" ..	Toilet soap	702
Algeria ..	Chemical manures	703
" ..	Black and galvanised sheets, iron, steel, tin, zinc	704
Morocco ..	Candles	705
Tripoli ..	Textiles	706
Argentina, Paraguay	Paint, varnish	741
Brazil	Cement, textiles	708
Latin America	Rubber, porcelain, essential oils, perfumery, drugs	742

*The High Commissioner for Canada, 19, Victoria Street, London, S.W. 1.

†The High Commissioner for New Zealand, 415, Strand, London, W.C. 2.

‡H.M. Consul, Nantes.

Markets Sought.

A firm in Canada wishes to get into touch with U.K. importers of crude asbestos and asbestos fibre.

A Canadian firm able to export colours for use in the manufacture of lithographic and writing inks wishes to hear from manufacturers in the U.K. [Inquiries to the Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.]

A merchant in Samoa able to export papain, candlenuts, kola nuts, cardamom seeds and cocoa beans wishes to get into touch with U.K. importers [740].

TARIFF. CUSTOMS. EXCISE.

Australia.—Import prohibitions have been removed from, *inter alia*, alcoholic beverages, perfumery, sheep dips, stranded copper cable and calcium carbide.

Belgium.—Export licences are again required for calf skins and horse hides in the hair.

Bolivia.—The fee for the certification of consular invoices has been increased to 3 per cent. *ad valorem* as from April 26.

British East Africa.—The import duty on spirituous liquors has been increased to Rs.15 per gallon.

British India.—A rebate of two-thirds of the export duty on raw hides and skins is allowed, under certain conditions, when exported to places in the Empire or in a territory in respect of which a mandate of the League of Nations is exercised by the Government of any part of H.M. Dominions.

Crimea.—The export of fats and animal and vegetable products from which fats are extracted is prohibited as from April 16.

Denmark.—Export prohibitions have been removed from molasses and certain feeding stuffs.

Finland.—The duties prescribed by the tariff have been increased by 200 per cent. as from March 10. Among the articles specially exempted from the increase are lard, margarine, milled cereals, cocoa and chocolate.

Germany.—Further information respecting the export control regulations is given in the issue for May 13.

The export of alloyed gold leaf in the form of books is no longer subject to licence.

Greece.—Recent customs decisions affect compressed gases, cowhide, alcohol, spirits, and earthenware.

Italy.—Crude mineral oils and residues when destined to be used exclusively and directly for fuel are subject to import duties at the reduced rate of 50 centesimi per 100 kg.

Among the articles the export of which is subject to a certificate of cession of exhange are platinum, castor oil, magnesia, carbon bisulphide, glycerin, chemical products, medicaments, horse hair, iron pipes, articles of iron, copper, brass, bronze, nickel, lead and alloys thereof, aluminium, certain earths and minerals.

Luxemburg.—Export taxes have been levied on iron ore, slag, semi-manufactured iron and steel, cast-iron, waste and scrap of iron and steel.

Persia.—The text of the Anglo-Persian agreement for the revision of the Persian customs tariff and regulations which came into force on April 2, is set out as a supplement to the issue for May 20. Articles affected include alcoholic liquors, perfumes, matches, rubber, gutta-percha, cement, wax, vegetable oils, salt, sugar, drugs, animal oils, mineral oils, metallic ores, metals, paper, hides, skins, pottery, chemicals, chemical fertilisers, dyes, colours, varnishes, and glass.

Portugal.—The export of organic manures is prohibited.

St. Lucia.—The import duty on rum has been reduced to 6s. per proof gallon.

St. Vincent.—In addition to the customs and excise duties already leviable on alcoholic beverages, a trade duty of two shillings per gallon has been imposed as from April 7.

Sierra Leone.—Rates of export duty per ton of palm kernels are:—£2 10s. (May 1); £2 15s. (June 1); and £3 (July 1).

Spain.—The manufacturing taxes on alcohol, alcoholic beverages and chicory have been increased.

The import from England of raw hides is now permitted.

Switzerland.—Pure aluminium in lumps, ingots, cast slabs, bars and scrap may be exported under a general export licence as from April 15.

Tunis.—The export and re-export of coal tar and its distillates and certain hides and skins is prohibited, except under licence.

Turkey.—Olive oil from the vilayet of Aidin may now be exported.

United States.—Recent customs decisions affect earthenware, precipitated chalk, and synthetic coumarin.

Uruguay.—A copy of the law relating to the customs *régime* for chemicals, drugs, etc., may be seen at the Department of Overseas Trade.

GOVERNMENT ORDERS AND NOTICES.

The following new Orders were issued by the Board of Trade on May 10 last, *viz.*:—

THE COAL (REVOCATION OF RESTRICTIONS) ORDER AND DIRECTION, 1920.—On and after May 12 last the following Orders cease to have effect:—(1) The Coal (Pit's Mouth) Prices Order, of November 29, 1919, and all other Coal (Pit's Mouth) Prices Orders of earlier date; (2) the Wholesale Coal Prices Order of November 28, 1919; and (3) the Prescriptions of December 30 and 31, 1919, made under the Coal (Pit's Mouth) Prices Order as above. The provisions of the Wholesale Coal Prices Order of 1917 are not affected.

THE COAL (PIT'S MOUTH) PRICES ORDER, 1920.—For the standard amount of 4s. fixed by the Price of Coal (Limitation) Act, 1915, there shall be substituted standard amounts of 23s. 2d. and 20s. 8d. according to locality (defined).

THE COAL (BUNKERING AND EXPORT) PRICES ORDER AND DIRECTION, 1920.—The prices of coal sold for bunkering certain ships at United Kingdom ports, which were increased by 9d. per ton as from January 15, are increased by a further 4s. 2d. per ton. Paragraph (1) of the Directions of the Board of Trade as to the sale of coal, coke-oven coke, and patent fuel, dated May 28, 1919, are revoked and cancelled.

EXPORT PROHIBITIONS.—The following notices were issued by the Board of Trade (Licensing Section) on May 20, *viz.*:—

Munitions for use with smooth-bore guns may be sent under open general licence to Asiatic Russia.

Suet, marrow fat, and cocoa raw have been removed from List A.

An open general licence has been issued permitting the export to all destinations of apomorphia hydrochloride, cotarnine hydrochloride, cotarnine phthalate.

TRADE NOTES.

BRITISH.

British Solomon Islands in 1918.—The imports and exports of the British Solomon Islands were valued at £188,408 and £170,125 respectively for 1918, as against £154,743 and £149,743 in 1917. The chief product of the Protectorate is copra, the export of which in 1919—9891 tons—showed an increase of 50 per cent. over the previous year. These islands have vast potentialities, which, however, can only be developed by an adequate labour supply, and this does not exist locally.—(*Col. Rep.—Ann., No.* 1027., *Feb.*, 1920.)

Sierra Leone in 1918.—The value of the imports into Sierra Leone in 1918 was £1,680,336 (£1,332,752 in 1917), whilst the exports amounted to £1,516,871 (£1,497,995 in 1917). Palm kernels were exported to the value of £683,137 (40,816 tons) during the year, showing a decrease of £159,371 as against 1917, mainly owing to lack of shipping facilities, to influenza, rain and the high cost of imported goods. For the same reasons, only 260,442 galls. of palm oil valued at £33,748 was exported, compared with 543,183 valued at £63,385 in 1917. All the palm kernels and most of the palm oil went to the United Kingdom. The export of kola nuts amounted to 2302 tons, worth £397,726, showing an increase of 600 tons in quantity and £76,599 in value over the preceding year's figures. Among other items, 590 tons of piassava valued at £15,065 and 8470 hides valued at £3488 were exported, chiefly to the United Kingdom. The cocoa industry in the Northern Sherbo District is being carefully fostered, and the area of 700 acres in the Kassewe Hills Reserve planted with gum copal in 1917 is showing great promise.—(*Col. Rep.—Ann., No.* 1032, *Apr.* ,1920.)

FOREIGN.

Trade and Industry in Crete.—According to H.M. Consul at Canea, Crete is now in a flourishing position, owing to the revival of the export trade. With the exception of certain foodstuffs, practically every kind of goods produced in the United Kingdom, especially tinplate, galvanised sheets, caustic soda, sodium carbonate, earthenware and china, is required. Apart from the making of wine and the extraction of oil from the olive, the only industries of importance are the manufacture of soap and of sole and upper leather. The raw materials available for export include sheep and goat skins, silk cocoons, carobs, cedrates, wool and raisins. At present the exportation of olive oil is prohibited. Lignite deposits have been discovered in the province of Aghios Vassilios, near Plakia, and so far about 1000 tons of good quality lignite has been shipped to the Piræus (*cf.* J. 1918, 417 R; 1919, 29 R).—(*Bd. of Trade J., May* 6, 1920.)

Swiss Exports of Organic Dyestuffs.—According to the *Europäische Zeitung*, the value of the organic dyes exported from Switzerland during the first nine months of 1919 was 78 million francs, compared with 64 million francs in the corresponding period of 1918. The chief customers were: Great Britain, 32%; France, 23%; U.S.A., 12%; Italy, 11%; Belgium, 4·5%; British India, 4·3%; Spain, 2·2%; Brazil, 2%; Japan, 1·5%; and China, 1·5%. China and Japan took most of the indigotin, viz., 37 and 17%, respectively, of the total value of 8·1 million francs (about 4 million francs in the previous year).—(*Schweiz. Chem.-Z., Mar.* 17, 1920.)

Foreign Company News.—*France.*—The "Compagnie Tunisienne des Phosphates de Djebel-Mdilla" has recently been formed with a capital of 16 million francs for the exploitation of phosphate in Tunisia.

The firm Poulenc Frères, of Paris, manufacturers of pharmaceutical preparations, has come to an understanding with the English firm of May and Baker with the object of enabling Allied manufacturers to compete with German and other interests. The understanding is the outcome of an exchange of ideas and manufactures which was found to be mutually advantageous during the war and since.

According to a Dutch source a new factory has been established at Marseilles to manufacture white lead and red lead. The capital is 525,000 francs.—(*Z. angew. Chem., Mar.* 12, 1920.)

The accounts of the French Viscose company for the period 1914–19 show a gross profit of 8,458,143 francs and a net profit of 8,084,801 fr., the latter figure including 3,328,561 fr. in respect of 1914–18 and 4,756,240 fr. for 1919. For the whole period total dividends of 75 fr. per preference share and 52·50 fr. per ordinary share have been declared.—(*Rev. Prod. Chim., Apr.* 15, 1920.)

The capital of the "Société Chimique de la Grande-Paroisse" is to be increased from 14 to 34 million francs. The company was founded jointly by "L'Air Liquide" and the "Compagnie de Saint-Gobain" in June, 1919, for the purpose of manufacturing synthetic ammonia by the Claude process, and the former has placed its factory at Montereau—used for the production of liquid chlorine during the war—at the disposal of the new company.—(*Chem. Ind., Mar.* 31, 1920.)

Germany.—Following a report that the "A.-G. für Stickstoffwerke in Knapsack," near Cologne, had ceased to produce nitrogenous fertilisers and was concentrating on the manufacture of carbide as being the more lucrative, a question was asked of the Government as to the means it proposed to take to induce the company to resume manufacture. The Ministerial reply was to the effect that no cessation of the production of nitrogenous fertilisers at Knapsack had occurred or been contemplated, although the company had considered the possibility of temporarily stopping the manufacture of cyanamide. The application made by the company to increase selling prices had been sanctioned, and further, compensation would be paid up to mid-May for any losses due to increased costs of production. —(*Z. angew. Chem., Mar.* 16; *Chem.-Zeit., Apr.* 8, 1920.)

Martinique in 1918.—The total imports of the island in 1918 were valued at about £2,114,158 and the exports at £1,960,890, the decreases as compared with the previous year (£69,415 and £1,180,255) being mainly due to lack of transport facilities. The chief products are sugar, rum, cacao, and pineapples. The sugar crop was small, owing to lack of potash fertilisers, labour, and to disease, the exports (20,711 short tons) being nearly 14,000 tons less than the pre-war average, although only 169 tons less than those in 1917. The chief exports and their values were as follows:—Cacao (£75,581), campeachy wood (£1035), lime juice (£770), rum (£813,564), and vanilla (£3945). The chief imports, together with their values, are as follows:—Asbestos (£1182), candles (£5307), cement (£17,676), sulphur (£518), sulphuric acid (£1069), copper and manufactures of (£15,214), fertilisers (£26,514), glass and glassware (£8143), aluminium (£5131), mineral oils (£72,174), vegetable oils (£79,488), and soap (£19,070). The United States furnishes about 50 per cent., France about 11, and the United Kingdom about 8 per cent. of the imports.—(*U.S. Com. Rep., Suppl., Jan.* 31, 1920.)

OBITUARY.

WATSON SMITH.

To the members of the Society of Chemical Industry and the readers of this Journal the news of the death of Watson Smith will bring with it a sense of personal loss. From the first appearance of this Journal in January, 1882, Watson Smith acted as editor, and he filled that position for a period of 32 years. Under his able guidance the Society's Journal made for itself a position unsurpassed by other similar enterprises, serving not alone as a record of the activities of the various Sections, but providing abstracts of papers dealing with the multifarious aspects of chemistry, both "pure and applied," and also records of patents. The Journal offers to all interested in one or other of the innumerable industrial applications of chemistry a means of keeping abreast with the progress of affairs in all parts of the world. In fact it has become the great asset of the Society and a contributor in no small measure to its world-wide activities.

This brief recital serves to remind us how great is the debt which we owe to Watson Smith, when as the first editor he laid the foundations which have secured its development on broad and sound lines, and also ensured its success at the present day.

Watson Smith, son of the Rev. Watson Smith, was born at Stroud on June 16, 1845. His training in chemistry was received at Owens College, Manchester, in the early period of Roscoe's tenure of the professorship of chemistry. Subsequently he continued his studies at Heidelberg and later at

Zürich. Here he became a pupil of Lunge, whose teaching exercised a great influence upon his outlook. On returning to England he went into industry, and after some years spent in practice became lecturer in technological chemistry in the Owens College. Shortly after his appointment to this lectureship the Society of Chemical Industry was founded, and in this movement he took an active part, becoming, as already stated, the editor of the Journal. The importance of his editorial work led him to resign his post in Manchester and to take up residence in London, where for a time he acted as professor of applied chemistry at University College. In 1914 Watson Smith resigned the editorship of this Journal, but until the time of his death remained an active member of the Transactions and Abstracts Sub-Committee.

Watson Smith, by his investigations, has added much to our knowledge of coal, and his published works show that in this country he was one of the first to draw attention to the study of rational methods of coking. As far back as 1884 he identified himself with the advocacy of the more economical and sane method of coking coal with the recovery of by-products, and contributed to the spread of a knowledge of these methods of utilising coal, which at long last have obtained a general recognition in this country.

L. T. O'SHEA.

Lucius Trant O'Shea was born in 1858 as the eldest son of the late Major R. P. O'Shea and grandson of Sir Lucius Curtis, Bart., Admiral of the Fleet. He was educated at the Grammar School and Owens College, Manchester, and then went to Sheffield as assistant lecturer and demonstrator in chemistry at the Firth College. In 1890 he became lecturer in mining chemistry at Sheffield University, and in 1905 was appointed professor of applied chemistry, a position he held until his death on April 18 last.

Prof. O'Shea published many papers in various journals, including those of the Chemical Society and Society of Chemical Industry, also in the Transactions of the Institution of Mining Engineers and the Proceedings of the Coke Oven Managers' Association. During the past 25 years he made a special study of the chemistry of fuel from the point of view of coke-oven development, preparation of fuel for carbonisation, the gases contained in and evolved from coal whilst being mined, coal dust and gases in mine explosions, and published papers on these subjects. During the last six years he was actively engaged on the investigation of low-temperature carbonisation of inferior fuels with a view to the formation of mobile fuel oils and the production of higher yields of ammonia. O'Shea was a member of several committees for the general education of miners and engineers, and for many years served on the committee and afterwards as vice-chairman of the Yorkshire Section of the Society of Chemical Industry. At the time of his death, and for many years previously, he was honorary secretary of the Institution of Mining Engineers. He was also on the sub-committee for research on miners' lamps, and actively connected with the Imperial Mineral Resources Bureau and the British Association Fuel Economy Committee. In addition to his numerous activities in industrial chemistry, O'Shea was a keen volunteer, and commanded a detachment of Engineers throughout the South African War. He was Commanding Officer of the Sheffield University Officers' Training Corps from 1911 to 1918, and during the late war devoted much of his energy to the training of young officers.

A. E. Findley.

REVIEW

Quantitative Analysis by Electrolysis. *By* Alex. Classen, *with the co-operation of* H. Cloeren. *Revised, rearranged, and enlarged English edition by* W. T. Hall. *Pp.* xiii.+346. *(New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1919.) *Price* 17*s.* 6*d. net.*

The present edition of this well-known book represents a slight enlargement and rearrangement by the translator of an English edition which was published about six years ago and was based upon the fifth German edition. Some new methods have been added and the theoretical introduction has been slightly enlarged. Thus the chapter on the history of electrolytic analysis has been extended by a short account of the history of theoretical electrochemistry in which the modern views of the structure of the atom and of the processes of ionisation and chemical combination are discussed. A theoretical chapter has also been added which deals with the application of potential and conductivity measurements to chemical analysis and with electrometric titrations. No account of the practical application of these important methods is, however, given.

To those English readers to whom Classen's book is known from Boltwood's translation of the fourth German edition the present volume will appear as practically a new book. The theoretical introduction, which, including the description of apparatus employed in electrolytic analysis, occupies about one-third of the book, has been entirely rewritten and gives a good acount of the theory of the subject. In the practical part it will be found that in agreement with the results of recent investigation simple solutions have wherever possible been given the preference over complex electrolytes. Details of the methods of rapid electrolytic analysis are everywhere given, the apparatus in use in the author's laboratory being more fully described. The methods of determination and separation of metals based upon the control of the potential of the cathode are fully discussed both in the introduction and under such metals as bismuth. The processes worked out in the laboratory of the University of Pennsylvania for the determination and separation of the metals of the alkali and alkaline earth groups and for the simultaneous determination of anions have been included. A section which will be welcomed by many users is that dealing with the analysis of commercial products which takes the place of the laboratory exercises on electrochemical analysis to be found in the earlier editions. The book has been well translated throughout without a too rigid adherence to the text of the original, and misprints are few. It may be hoped that it will stimulate the use of electrochemical methods in British laboratories.

Henry J. S. Sand.

PUBLICATIONS RECEIVED.

South Wales Coals: Their Analyses, Chemistry and Geology. *By* Llewyllyn J. Davies. *Pp.* 89. *(Cardiff: The Business Statistics Co., Ltd.* 1920.) *Price* 10*s.* 6*d. net.*

Introduction to General Chemistry. *By* H. N. McCoy *and* E. M. Terry. *Pp.* 648. *(London and New York: McGraw-Hill Book Co., Inc.* 1920.) *Price* 18*s. net.*

Animal and Vegetable Oils, Fats, and Waxes. *By* Geoffrey Martin. *Manuals of Chemical Technology.—IX. Pp.* 218. *(London: Crosby Lockwood and Son.* 1920.) *Price* 12*s.* 6*d. net.*

SOCIETY OF CHEMICAL INDUSTRY.

THE ANNUAL SUBSCRIPTION.

During the past two years the financial position of the Society has been receiving the serious consideration of the Council. Mainly owing to the increased charges for printing and publishing, the Society's balance-sheet, for the first time, showed a serious loss on the working for the year 1918; and this has been repeated in respect of the last financial year. In common with many other administrative bodies, for some time the Council held the view that the high prices of commodities would in due course fall to a lower level, and in this expectation it was decided to meet deficiencies by encroaching upon the Society's invested reserves. Unfortunately, however, events have falsified this view, and it has accordingly become necessary to provide for financial stability by other means.

In regard to increased costs, it may be of interest to mention that expenditure upon printing and publishing is now approximately 4 times greater than it was in 1914, and that paper costs 5 times and postage twice as much as in that year. Further, owing to the increased activities of the Society, more particularly in connexion with the *Journal*, and owing to the need for making provision to meet the increased cost of living, administrative and editorial expenses have risen about 2½ times. During this period the circulation of the *Journal* has increased from about 5000 to over 6500. So far as can be foreseen, it is almost certain that the costs of printing and paper will continue to rise; even as recently as June 4 last a further increase of 12½ per cent. in printing charges was notified, making a total increase of 22½ per cent. since the beginning of the year.

In view of the above considerations, the Council has had to choose between raising the annual subscription and drastically cutting down expenditure; and in deciding to recommend the former alternative it has been actuated by the conviction that any serious curtailment of the Society's activities or reduction in the efficiency of its *Journal* would be in the highest degree detrimental not only to the interests of the Society, but to those of chemical science and chemical industry in general. The proposal to raise the annual subscription from 30s. to 50s. per annum, as from January 1, 1921, will, it is confidently hoped, be received and supported in the same spirit of loyalty as that in which it has been conceived.

With a view to meeting any hardships which the fulfilment of this proposal might inflict upon the younger chemists, to whose recruitment the Council attaches the greatest importance, it has been resolved to recommend the institution of junior membership for those under the age of 25 years. It is proposed that the annual subscription for this grade should be £2 until the age of 25 has been reached, or for a period of three years from the date of election, whichever may be the longer period. Applicants for junior membership would be required to adduce satisfactory evidence of age, and to sign a declaration that they were not seeking election as nominees of any firm or corporation.

THE FORTHCOMING ANNUAL MEETING.

The arrangements for the annual general meeting, to be held at Newcastle-upon-Tyne on July 13-16 (particulars of which were sent to members with the issue of the *Journal* for May 15), constitute a *via media* between the pre-war custom of devoting the major part of the proceedings to social entertainments, and the plan adopted during the past four years of devoting most of the time to the reading and discussion of papers. It will, we think, be generally agreed that each type of programme was appropriate to the circumstances of the time; and that in the present state of flux and reflux, a judicious combination of the two will provide the greatest pleasure to the greatest number. Those who desire the "strong meat" of industrial chemistry will be well catered for by the conference on By-product Coking, by that on Centrifugal Machines, Filtration, etc. (under the direction of the Chemical Engineering Group), and by the papers dealing with metallurgical subjects, whilst those who incline more to the social side, and who wish to make or renew acquaintance with the great chemical industries of Tyneside (*cf.* J., 1919, 80 R), will find full scope for enjoyment in the very attractive programme of excursions to works and entertainments arranged by the Local Committee. As the choice of riches in the latter connexion appears somewhat embarrassing, we have asked the Honorary Secretaries to supply a few notes—hereunto appended—to guide intending visitors in the difficult, albei' pleasant, task of selection.

At the Tharsis Company's works at Hebburn both the wet and dry processes for the extraction of copper can be seen, whilst by contrast with these long-used operations, visitors to the Newcastle Alloy Company's works at Rowland's Gill will see electric furnaces and electrical processes for the preparation of iron and other alloys. Messrs. Cookson, at Willington Quay, will show both the old "stack" and the new "chamber" processes for manufacturing white lead, together with the plant recently set up for the preparation of orange lead and other coloured lead products. One naturally associates Newcastle with coal, and at the great Ashington collieries members will have an unusually good opportunity to see what conditions of work are like underground—though under exceptionally favourable conditions, the seams being comparatively thick and dry, so that this trip can be undertaken even by ladies. The hospitable colliery company will take the party out from Newcastle by motor and entertain it in other ways; it is possible that those who wish will, like the Ashington coal, be put on ship at Blyth and returned to Newcastle by sea—a distance of 20 miles. At Marley Hill, Messrs. Bowes and Partners have their fine coke ovens and by-product plant, and this visit may well be combined with that to the Newcastle Alloy Company, as the motors which take the party to Marley Hill will convey it across country to the latter works.

The North country can be relied upon to show its wonted hospitality, and Scottish members need not fear that they will be received as their forefathers so often were; indeed, a special day (Friday) has been assigned for a motor tour through South Northumberland—through the beautiful valleys of the Derwent and the Tyne—during which it will be shown that the elaborate precautions taken by the Romans and throughout the Middle Ages have been abandoned and remain only as fascinating ruins.

Newcastle counts it an honour to entertain the Society, and has endeavoured to rise to the occasion; fine weather and a large attendance the local officials cannot guarantee, but they count on both.

CHEMICAL ENGINEERING AT THE ANNUAL MEETING.

Some further details have come to hand concerning the projected activities of the Chemical Engineering Group at the Newcastle meeting. In addition to the papers already announced, one on "The Design of Mechanical Filters" will be read by

Mr. Balfour Bramwell; this will treat of the construction of filters for dealing with large volumes of liquid, and special reference will be made to a novel development designed by the author. On July 14 the Group will hold an informal luncheon at the County Hotel, after which a visit will be paid to the works of the International Paint and Compositions Co., Ltd., at Felling-on-Tyne, where a new centrifugal machine, to be described by Mr. W. J. Gee in his paper on "A New Process for Centrifugal Filtration," will be seen under ordinary working conditions. Prof. H. Louis will preside at the conference to be held on the afternoon of July 13, and M. Paul Kestner at that arranged for the morning of July 14.

BRITISH NON-FERROUS METALS.

HENRY LOUIS.

In August, 1919, the Board of Trade appointed a Departmental Committee to investigate and report upon the Non-Ferrous Mining Industry of the United Kingdom, and this Committee has just issued its report (Cmd. 652). At the very outset the Committee found it necessary to limit the scope of its inquiry to the non-ferrous metals and a few of the minerals associated with them, and from the non-ferrous metals copper was promptly eliminated. As stated by the Commitee, the mining of copper ore in this country has practically ceased, and it has, therefore, not been included in the investigations. It may at once be made clear that this conclusion appears to be perfectly sound; not only is the mining of copper practically extinct in this country, but it may fairly be added that there would appear to be but little chance of its ever again attaining any economic importance. A century ago, in the decade 1811 to 1820, Great Britain produced an average yearly output of 7300 tons of copper, which increased rapidly, until a period of maximum activity was reached between 1830 and 1860, during which the annual production averaged 14,000 tons; after this it began to decline, at first slowly and then more rapidly until for the decade 1891 to 1900 it averaged only about 400 tons per annum and has now come down to 180 tons. It is obviously impossible for the relatively small deposits in this country to sustain competition with the huge occurrences in the United States; when it is borne in mind that a single modern American smelting furnace will put through in a day about as much ore as the whole of Great Britain produces in a year, the hopelessness of the British position becomes obvious. Care must be taken, however, not to accept too generally the reason for this decadence assigned in the Committee's report, which states that "the reason why in Cornwall tin mining has survived copper mining" is due to the fact that "tin ore, being less soluble than copper ores, is deposited at a higher temperature and consequently in a relatively lower zone, when both metals are derived from the same source." It is beyond question that tin ores occur in lower depth than copper ores in Cornwall, though it is doubtful whether the above simple explanation of relative solubilities is sufficient to account for observed facts. Tin is supposed to be of pneumatolytic origin, whilst copper is generally admitted to be deposited from solution, and it is only natural to expect that a liquid would carry its solute further from its point of origin than could a relatively easily decomposed gaseous emanation. Furthermore, it must be emphasised that copper ores occur elsewhere at far greater depths than have been reached by any Cornish tin mine—for example, in the Lake Superior region.

The report lays perhaps most stress on the production of lead and zinc ores; it was, of course, impossible to suggest that non-ferrous mining in this country will ever again become what it once was, and the Committee is probably, if anything, more optimistic than the facts warrant in expressing the view that the position affords "grounds for the expectation that there may yet be a prosperous future for non-ferrous mining in this country"; nevertheless it is added that "it is unlikely to revive unless it receives direct State aid." Accordingly, the Committee advocates such aid in a few selected cases, and though it admits the principle that such assistance is unjustifiable unless the industry can be shown to be within a measurable distance of becoming self-supporting, it makes no attempt to prove that the particular case upon which it lays most stress is likely to reach this stage, far less to repay the public money that it wishes to see spent upon it. The case which it urges most strongly is that of the Halkyn district in North Wales. This is a district which had long been noted for its important production of lead and zinc ores, but the mines are very heavily watered, and with increasing depth the cost of coping with the water became so serious that most of the mines were compelled to close down more or less completely. Soon after 1875 a company, known as the Halkyn District Mines Drainage Company, drove an adit about 200 ft. above sea level, which drained a large portion of the district and enabled it to be worked down to this depth, and the mines appear to have been practically worked out down to that level within some thirty years after the completion of the adit. In order to enable deeper working to be resumed, in the hopes that an important output of ore might be obtained from the district, the Mineral Resources Development Department of the Ministry of Munitions advanced a sum of £42,000 to enable certain of these mines to erect pumping plant. Needless to say, the war was over long before the plant was erected; it appears never even to have been put into commission, and the nation not to have benefited to the extent of a single pound of mineral by the expenditure of this important sum. With this object lesson before its eyes the Committee nevertheless advocates the expenditure of further large sums of public money for driving a new drainage tunnel from sea level in order that the mines may be able to resume working. It is noteworthy that no estimate at all is presented of the cost of this scheme, still less any figures as to the quantity of ore that might thereby be expected to be rendered available, and the Committee is apparently oblivious of the fact that the important outlay proposed, for it obviously must be an expensive project, would only open up some 30 fathoms of backs for mining. Still more reprehensible is the fact that it appears to have given no consideration at all to the effect of its recommendations upon the owners of the minerals. In the report a few paragraphs are devoted to the question of royalties, but the important consideration that the royalty owner never seems to hold it his duty to contribute towards the discovery or development of the minerals upon which he receives royalty payments has been entirely overlooked. Thus, in the present case it is obvious that the minerals in the Halkyn district are worthless until such a drainage tunnel has been driven, yet it is proposed to drive this tunnel, and apparently to make the owners of the minerals a present, at the national expense, of the royalties that they would derive from their being worked. Whilst the country has apparently come to the only conclusion that was to be expected from the British nation, namely, that royalty owners must in any event receive equitable treatment, it is surely wrong to propose, as has been done here, that they shall be allowed to collect royalties at the public expense, and the entire omission of this consideration cannot but be looked upon as a very serious defect in the preseut report. The Committee is naturally opposed to the nationalisation of mineral rights as regards metalliferous minerals, but the reasons given are undoubtedly feeble, being mainly that "the prospective value of a mineral lode cannot be assessed even approximately; its very existence is only a matter of conjecture." It is certainly possible to put a value upon any metalliferous deposit, and this is one of the everyday tasks of the mining engineer; necessarily it is a speculative value because the article itself is a speculative article, but an equitable basis for valuation can assuredly be arrived at; obviously, too, as long as the existence of a mineral deposit is unknown its value is necessarily *nil*. The reasons that militate against the nationalisation of minerals are much wider than those that are here advanced, though the present is scarcely the place for their discussion.

Perhaps the portion of the report which will be of the most general interest is the section dealing with the organisation of a Mines Department. It was probably inevitable that a Departmental Committee appointed by the Board of Trade should recommend the formation of a Mines Department which should be part of the Board of Trade, but it is a pity that the Committee took so narrow a view of the position. Those who have taken a wider survey of the mineral industry of this country are tolerably unanimous in the opinion that the mining industry of the country ought to be placed under an entirely independent Department presided over by a Minister of Mines, and it is a matter of regret that the present Committee could not sufficiently free itself from the shackles of the Department which appointed it to take this wider and more statesmanlike view. It may, however, fairly be expected that when the recommendations of this Committee come to be considered, the subject will be viewed as a whole, and that the narrower proposal here advocated is not likely to prevail.

THE RUBBER INDUSTRY AND THE WAR.

B. D. PORRITT.

In considering the share which this country contributed to the final downfall of the German-Austrian cause, it is impossible not to include reference to the plantation section of the rubber industry, since had it not been for the foresight and initiative of the Indian Government of some 30 years ago, and the subsequent lavish support of British capital, the supremacy which the Allied forces enjoyed in respect of all the many naval and military articles of equipment of which rubber articles are components must have been endangered. In fact, rubber furnishes a striking example of the advantage accruing from the possession of a raw material within the Empire and independence from outside sources of supply.

It is unnecessary to go into the details of this development of the plantation industry in Ceylon and Malaya, and it will suffice to point out that, in 1914, of the world's supply of raw rubber, amounting to 120,000 tons, no less than 71,000 tons was produced within the Empire. As the consumption of the British rubber manufacturers at this time was only 18,000 tons, not only was their supply of raw material secured*, but in addition neutral manufacturers were dependent on the Empire for the means to continue their trade. To this fact in a considerable measure we owe the success of blockade and embargo on the import of rubber and rubber goods into Germany. Further, in return for adequate supplies of rubber and unrestricted export facilities to all parts of the Empire, the rubber dealers and manufacturers of America undertook that no material, raw or manufactured, should be exported directly or indirectly to enemy countries, where its need was from the first acutely felt. This undertaking appears, on the whole, to have been faithfully observed, and although American manufacturers profited to good purpose in home and foreign markets while the British manufacturers' output was almost entirely monopolised by war supplies, it must be a source of satisfaction to the producer and manufacturer to know that the military and naval resources of our enemies were thereby much hampered in the production of many important and essential articles of equipment. Not only has the Federated Malay States contributed—largely from the revenues derived from rubber—a super-dreadnought (the "Malaya") to the fighting units of our Fleet, but the rubber trade has amply met every requirement of rubber goods for our army, navy, and auxiliary forces, and by its predominant position as a producer has been able to deprive our enemies of one of the most important materials necessitated by the latest developments of science and enginering.

From the moment when Germany realised that the duration of the war was to be protracted the disadvantage due to her dependence on outside sources of supply for rubber and cotton was recognised, though her available stocks were carefully husbanded† and efforts made to procure satisfactory substitutes; with rubber these efforts met at the most with but partial success, and, while satisfactory ebonite for electrical purposes is claimed to have been manufactured from a synthetic product available, the lack of the natural material seems to have precluded the manufacture of the many soft rubber articles for mechanical purposes—more especially pneumatic and solid tyres, which are called for by recent developments of mechanical transport and aeronautics.

Such being the condition of our enemies in respect of rubber supplies, it is perhaps well to turn to the other side of the picture and consider in what ways the rubber trade contributed actively to the Allied cause.

As in most other industries, the personnel of the rubber trade made a full contribution of men to the fighting forces. For many years women had been largely employed on lighter work, and when the call for "dilution" came this industry was among the first to respond. Notwithstanding the departure of practically every able-bodied man of military age, the efficiency and output of the trade was little if at all impaired, and throughout the period of the war the requirements of the country were placed by British rubber manufacturers before the wants of their home or foreign trade, a circumstance of which, as has been mentioned, our American competitors did not fail to profit.

The war work of the rubber trade perhaps does not lend itself to spectacular treatment in the same way as that of some industries. Although of the greatest importance by reason of the enormous variety of the uses—many familiar, some novel—to which rubber has been put, it is somewhat difficult to give a just impression of the wartime activities of this industry.

To begin with, the branch of the industry con-

* The supremacy of the Allies in respect to rubber was intensified by the fact that London and Liverpool were in the early stages the chief distributing centres, so that the British manufacturers were, as a result of the heavy stocks held, in a great measure secure against stoppages by blockade.

† Considerable stocks of rubber were no doubt secured as a result of the capture of Antwerp in 1915, but quite insufficient to meet the needs of the German and Austrian trades which before the war together consumed 14,000 tons per annum.

cerned with the product variously known as hard rubber, vulcanite or ebonite may be briefly considered. As might have been expected, large quantities of sheet, rod and moulded ebonite were needed for various electrical purposes, switchboards, wireless telegraphy installation, field telegraphs and telephones, whilst the development of the British-made magneto for aeronautical and motor use was rendered possible by the production of a high temperature insulating material to replace the German "Stabilite" hitherto employed. The rapid development of the submarine and aeroplane, moreover, called for the production of accumulator cells of special design and quality capable of withstanding exceptional conditions of usage.

The more important section of the industry employed in the manufacture of soft rubber goods can now be considered. The introduction of trench warfare in the early stages of the war necessitated special equipment, and the rubber trench boot was devised to protect the troops from the water. In one factory alone these were manufactured at the rate of about 60,000 pairs per month, and the total delivered by the Scottish rubber footwear manufacturers alone must together have totalled 1,500,000. Enormous quantities of rubber hose, moreover, were supplied for pumping out the water from the trenches. The subsequent introduction of poison gas attacks by our enemies resulted in an urgent demand for some form of protection to enable our troops to withstand this novel form of warfare. As a result the rubber-fitted gas mask, which gave satisfactory protection so far as the respiratory organs were concerned, was soon evolved; and when it was found necessary by the Allies also to resort to the use of gas the rubber trade met the demands for a means to ensure the even distribution of the gas from the cylinders in the trenches. The amount of rubber hose employed for this purpose must have been well over a million feet, and though rapidly destroyed by the action of the gas, it was found much more convenient in use than the lead piping used by the Germans for a similar purpose.

It is common knowledge that motor transport and aeronautics played a vital part in all the military operations, and that consequently vast quantities of solid and pneumatic motor tyres and aeroplane and motor cycle tyres had to be obtained. No trade statistics are available to show the magnitude of these supplies, but it may be gauged from the fact that during the latter stages of the war when private motoring was practically abolished in Great Britain owing to petrol restrictions, the whole output of every motor tyre factory throughout Great Britain was barely adequate for military needs.

The surgical branches of the industry were working at high pressure throughout on the production of such articles as sheeting, jaconette, surgical gloves, drainage tubing and the like. It must be a source of satisfaction to those engaged in the rubber industry that so large a proportion of their efforts was directed to the production of articles destined to promote the comfort and the safety of those in the fighting lines and to the alleviation of the sufferings of the wounded. Camp sheets, trench boots, hose, respirators and safety collars for those exposed to submarine attack are examples of the former, and ambulance tyres, hot water bottles, surgical requisites of the latter. It may be mentioned as an illustration of the work of this branch of the trade that from one factory alone 20,000 camp sheets were supplied weekly for a period of over two years, or a total delivery of no less than two million sheets in all.

The enormous dimensions of the fighting area called for an unprecedented system of telegraphic and telephonic communication for which insulated wires and cables had to be provided, and the huge supplies of insulated material needed taxed the capacity of the cable industry to its utmost limits, and necessitated large extensions to the plant which provided for the pre-war requirements. Unfortunately, here again no trade statistics are available as to the vast quantities of various types supplied.

This necessity for co-ordination between headquarters and the fighting units and the remarkably increased employment of artillery gave rise to the development and extensive use of the "sausage" or Caquot kite balloon, which was subsequently largely employed in the navy (in conjunction with small airships of the non-rigid type) as a defence against submarine attack. The production of balloon fabric—which prior to the war had been a speciality of a few European rubber manufacturers—consequently assumed the position of an important branch of the trade, as may be gauged from the fact that one British factory was gas-proofing sufficient material to construct 25 kite balloons per week, representing approximately 25 miles of two-ply finished material weekly, and a yearly production of over 1200 miles in pieces of from 50 to 100 yards in length, each of which had to be carefully examined and tested by accurate scientific methode for weight, strength aud gas tightness.

Scientific investigations into the effect of ultra-violet light on rubber resulted in the discovery of a method for prolonging the effective life of the rubber gas-retaining medium in balloon fabric for a period vastly in excess of that hitherto obtained. This achievement, which is specially important in connexion with the development of aeronautics in tropical countries, will serve as a token that the necessity for research was not being entirely overlooked by the British rubber trade even under the stress of war conditions.

The foregoing rough outline of war activities of the British rubber industry would be incomplete without some indication of the difficulties encountered and overcome in obtaining these results.

Though the supply of crude rubber was at no time seriously jeopardised, the processes of its manufacture necessitated the employment of many auxiliary materials in order to obtain the variety of products which were required by the many different uses to which rubber was put. The outbreak of hostilities and the later depredations of submarines involved the reconsideration and modification of many processes and mixings which long use had endowed with the odour of sanctity. Up to 1914 the chemist had played but a small part in the economy of the rubber works generally. Thenceforward the manufacturer had to invoke his aid to solve the novel problems presented by war conditions. Among the first effects of the war was the partial or complete interruption of the supplies of several of the manufacturers' most important compounding ingredients. Among such must be cited barytes, zinc oxide, lakes and pigments, antimony sulphide, French chalk and cotton tyre ducks. The barytes supply of the rubber trade has in the past been practically a German monopoly, the colour, texture and price of the foreign supply being apparently such as to render the trade unattractive to the owners of the British deposits of this mineral. Supplies of home origin and manufacture were soon available after the outbreak of war, but it would be idle to contend that even after five years they compare as a whole with the standard of quality shown by pre-war supplies. The matter of the subjugation of the world's zinc supply to German influence prior to the war has already been the subject of serious consideration, but in the case of the rubber trade the outbreak of hostilities and the German invasion of Belgium resulted in the elimination of one of the most important sources of manufacture of zinc oxide, namely the *Société de la Vieille Montagne*. Whilst the increased output resulting from the developments of the New Jersey Zinc Co. of America after a few months made up for the initial shortage of this important compounding ingredient, and fair quantities of British manufacture became available, there still would seem to exist scope for development in our home supply with a view to a greater degree of independence of foreign sources and also to meet the needs of the celluloid, paint and related industries.

The interruption in the supplies of German colours and pigments was in a measure compensated for by the alteration in industrial requirements and the development of a less critical spirit on the part of the consumer. The development of home supplies though slow has, on the whole, been satisfactory, so that with the exception of antimony sulphide comparatively slight difficulty has been experienced with this class of supplies. A preponderant proportion of the rubber manufacturers' pre-war supplies of this pigment was derived from two sources, one German and the other French; hostilities naturally at once cut off the former, whilst the occupation and industrial destruction of the North of France soon eliminated the latter, together with the supplies of motor duck woven in the Lille district. A limited home supply of this important red pigment has throughout been available. New manufacturers, however, have not been uniformly successful in obtaining either the requisite purity of tint or stability to heat, with the result that since 1914 rubber manufacturers have frequently experienced difficulty with red goods depending on this pigment for their colour. With the shortage of shipping resulting from military requirements and the losses due to submarine attack, the problems confronting the rubber manufacturer and chemist were intensified. The supply of all imported materials became precarious, and such staple ingredients as cotton, litharge, lamp black, Russian shoe waste, paper, sulphur, solvents, became affected, whilst the necessity for the conservation of oils and starch for foodstuffs intensified the difficulties in practically every section of the trade. Although some inconvenience resulted to civilian supplies, the difficulties were in the main surmounted, and no diminution either in output or quality occurred in the goods destined for war purposes.

The foregoing survey, though necessarily superficial, should be enough to show that the rubber industry can justly look back with satisfaction on its war record. Though it has emerged without any radical alteration in its general technical procedure, in common with other industries, the experiences of the war have served to dispel many prejudices and to broaden the views generally of those in positions of responsibility. The institution of associations by various sections of the trade and the recent formation of a research association point to the existence of a spirit of co-operation greater now than in the past, and to a growing appreciation of the need for scientific assistance in the industry.

On June 3, between 70 and 80 members of the Birmingham Section of the Society of Chemical Industry took part in a visit to the works of the Dunlop Rubber Co., at Fort Dunlop, Erdington. By the courtesy of the directors, the visitors were enabled to spend two hours in the works and to inspect the various operations involved in the manufacture of rubber tyres from the raw material. The works were laid out on a very extensive scale during the war, but are not yet complete; at present some 6000 workpeople and a laboratory staff of 35 are engaged.

NEWS FROM THE SECTIONS.

CANADA.

Toronto Branch.

The final meeting of the session 1919-20 was held at the Engineers' Club, Toronto, on April 22. Prof. E. G. R. Ardagh presided, and the members were addressed by Mr. C. Price-Greene, Commissioner, Industrial and Resources Department, of the Canadian National Railways, on "The Resources of Canada." The key-note of the address was not "We have the greatest country on God's green earth," but rather "We have wonderful resources that need scientific development and conservation." Chemistry, the speaker affirmed, was at the basis of all the greatest developments that had taken place in the world during the last 50 years, developments more wonderful than those that had occurred during the preceding 1500 years.

Referring to the scheme for the merging of the great iron and steel companies of Canada with the master steelmakers of England as a development that would be most beneficial to the industrial progress of the Dominion, Mr. Price-Greene stated that in Ontario alone there were 425,000,000 tons of iron ore awaiting development, whilst along the north shores of the St. Lawrence River there were large valuable lead-zinc deposits and an enormous iron-ore deposit of over 80 miles in length as yet untouched. Out of the mines at Cobalt, Ontario, silver valued at $250,000,000 had already been taken, and at the Porcupine gold camps over $50,000,000 of gold had been extracted to date. Hollinger, in the Porcupine district, was undoubtedly the greatest gold mine in the world, and he believed that the Burke mine at Porcupine would prove a second Hollinger. Larder Lake, Gowganda, Shining Tree, and West Shining Tree, all in Northern Ontario, were splendid mining camps. Ontario's mining development had been held back owing to the mistake of earlier mine operators in attempting to work with insufficient capital. Reference was also made to the graphite, talc and marble deposits of Central Ontario, centred in Hasting's County, which needed only a little more capital and a little more scientific development to make them important industrial centres. A geological survey of the marble deposits of Hasting's County had shown that they had a depth of over 50,000 ft., and that the marble was of the purest quality.

Unlike the United States, Canada need not fear concerning the future of her wood-pulp supply, provided that an extensive reafforestation policy was at once put into force. The United States, on the other hand, was fast nearing the completion of her wood-pulp resources, and another six or seven years at the most would see their finish. This was not surprising when it was considered that the United States alone consumed one-half of the world's supply of white paper, involving the yearly consumption of $5\frac{1}{2}$ million cords of wood. One Sunday edition of a Chicago paper used up the pulp equivalent of 40 acres of spruce trees. For all purposes, the United States consumed annually, of all kinds of wood, 244 million cords. A prominent American lumber-man had informed the speaker that within the next ten years over 3000 lumber mills in the southern United States now operating on pine would be forced to close down, as the supply would be exhausted. In conclusion, Mr. Price-Greene prophesied a great future for the copper mining industry in Northern Manitoba at the great Mandy and Flin Flon mines, and also for the mineral resources of British Columbia.

The following were elected to form the Executive Committee of the Toronto Branch for the session 1920-21:—Profs. E. G. R. Ardagh and J. T. Burt-

Gerrans, Messrs. M. L. Davies, A. J. MacDougall, J. P. Murray, T. E. Rothwell, H. van der Linde, and L. E. Westman, with Messrs. J. Sale and T. Sinmett representing the associate members.

The annual meeting of the Canadian Section is being held conjointly with the Convention of Canadian Chemists at Toronto on May 27 and 28.

LIVERPOOL.

On May 27 Mr. F. F. Renwick delivered the Hurter Memorial Lecture.

After referring to Hurter's valuable services to photographic science, the lecturer briefly analysed the many complex factors which go to make up those qualities of light-sensitive materials which are summarised in the "characteristic curve" of Hurter and Driffield, and emphasised the need for further researches to unravel their separate influences. The chief theories of the latent image, *viz.*, the sub-bromide, the silver-germ, and the physical-change theories, were then discussed, with special reference to the following phenomena:—(1) Physical development after fixation; (2) Image-transference from one silver salt to another; and (3) Light-sensitiveness (destruction) of the latent image under certain conditions. It was shown that, in addition to those already known, soluble iodides in concentrated solution may be used as fixing agents for exposed plates, and an image subsequently built up in the clear gelatin matrix by means of a "physical" developer. Then it was demonstrated that the latent image on an exposed gelatin dry plate may be transferred to silver iodide and subsequently developed either physically or chemically with but little loss of detail, and that the latent image after transference to silver iodide, and in the presence of soluble iodides, is easily destroyed by the further action of light, although the silver iodide itself is almost insensitive. The interesting observation was recorded that the rays responsible for this destructive effect (reversal) are limited to a narrow region in the blue lying between ·43 μ and ·48 μ, with a sharp maximum at ·45 μ.

The phenomena discussed, and others mentioned incidentally, are held to necessitate the assumption that the latent image is a material substance and not merely an electrically or physically changed form of the original silver salt. The only known material capable of giving the observed reactions is silver, which has been proved to exist in a great variety of forms.

Finally, on the basis of Reinder's work and other independent observations, the conclusion was reached that colloidal silver in solid solution in crystalline silver bromide is the most light-sensitive material present in a ripened emulsion, and that the initial step in the formation of a latent image consists in the precipitation in the (electrically neutral) silver-gel form of this dissolved colloidal silver. Subsequently halogen is split off and more silver-gel nuclei formed; but ultimately this process may lead to repeptisation, by the liberated bromine, of the already precipitated gel, with formation of a photo-salt rich in silver but not readily reducible by the developer, when solarisation (reversal) occurs.

CHEMICAL ENGINEERING GROUP.

The following announcements have been supplied by the Hon. Secretary of the Group:—

Data Sheets.—The first four of the series of data sheets which have been in course of preparation for some time past are now ready, and will be issued to members of the Group; they are entitled: No. 1, The Properties of Saturated Steam; No. 2, The Capacity in Gallons of Vertical Cylindrical Tanks per Foot of Depth; No. 3, The Capacity in Gallons of Hemispherical Vessels; No. 4, The Physical Properties of Sulphuric Acid. Other sheets are in active preparation, and will be issued at short intervals. The Hon. Secretary of the Group will welcome any suggestions from members of the Society as to suitable subjects for data sheets, or offers to supply material for their preparation.

Proceedings.—It is expected that the first volume of the Group's Proceedings, containing the papers read at the first two conferences, will be published by the end of this month. To secure earlier publication of papers in the future, the Committee has decided that, starting with the Birmingham Conference, the proceedings at each conference shall be published separately; the numbers so issued can then subsequently be bound together to form the annual volume.

Winter Conference.—Arrangements are being made to hold a conference on "Plant for the Utilisation of Waste Products" in November or December next; a further announcement will be made shortly.

MEETINGS OF OTHER SOCIETIES.

ROYAL SOCIETY OF ARTS.

A paper on "The Commercial Application of Electrical Osmosis," by Mr. J. S. Highfield, Dr. W. R. Ormandy and Mr. D. Northall-Laurie was read by the first-named at a meeting held on May 19.

After a brief exposition of some of the more important fundamental phenomena of colloid chemistry, the authors considered the application of the principles involved to the purification of clay and similar materials. The apparatus for obtaining osmosed clay consists of a tank containing at the bottom two paddles which agitate the suspension and direct it through the perforations of the semi-circular cathode. The anode is a metal cylinder, revolving at the rate of one revolution in three minutes, at a distance of about 0·75 in. from the cathode. A scraper removes the clay from the anode, where it forms a blanket up to 0·5 in. thick containing about 25 per cent. of water. The fresh clay suspension is fed into the lower part of the tank and the water effluent is returned above to be mixed with fresh clay. A machine with a cylinder 2 ft. in diameter and 5 ft. long produces about 1,000 tons of pure clay per annum. The consumption of electricity varies from 20—70 units per ton of machine product.

The purified and finely-divided clay obtained in this way has many advantages. Its melting point is raised and its sintering or vitrifying temperature reduced (by as much as 300° C. for low-grade clays); the temperature-interval between vitrification and incipient decomposition ("blowing") is increased. In the manufacture of porcelain and earthenware, osmosed clays yield whiter bodies, and chemical porcelain ware so made is of the very highest quality, the body consisting entirely of pure kaolin, which, owing to the fineness of the particles, vitrifies completely.

The electro-osmotic filter press for de-watering and purifying many finely-divided substances consists of a series of chambers which are closed on both sides by filter cloths held in position by perforated or grooved metal, carbon or other conducting plates, one forming an anode and one a cathode. An electrical pressure of from 20 to 100 volts, depending on the substance to be filtered, is established between the plates, and the water is forced towards the cathode. With this apparatus materials fine enough to choke an ordinary press can be filtered

On May 31, Mr. A. Howard, Imperial Economic Botanist to the Government of India, read a paper on "The Improvement of Crop Production in India."

The speaker pointed out that agriculture is, and must long remain, India's greatest industry, and that crops were more important than live stock. After the Indian Agricultural Department was founded in 1904, it was discovered that improved crop production could be obtained by improving the existing varieties and working out a practicable method of seed distribution, also by studying the factors that influence plant growth. The work done on the improvement of varieties has led to much new knowledge in regard to the inheritance of characters and also to subjects of immediate importance. New varieties of wheat which add more than £1 per acre to the profits of the cultivators now cover almost a million acres, and similar results have been obtained in the case of rice, jute and tobacco. Most attention has been paid to cotton, and the distribution of new varieties has already affected large areas under this crop.

In connexion with the factors influencing plant growth, Mr. Howard dealt at length with soil aeration, including the development of waste lands and drainage, with irrigation and soil temperature; in conclusion he emphasised the value of a knowledge of science, of cultivation and of trade, as the essential qualification of those who are to take in hand the development of economic botany in India. Future, as indeed all past, advance lies with the individual and not with systems of organisation.

THE ROYAL SOCIETY.

At an ordinary meeting, held on May 20, Prof. J. Norman Collie contributed "Some Notes on Krypton and Xenon," which included the measurements of a considerable number of new spectroscopic lines at the red end of the spectrum. A curious observation was made in regard to xenon. When a strong current from an induction coil is passed through it, much splashing of the electrodes occurs, and the xenon disappears as a gas. What becomes of it is not clear, as it is not observed to be liberated either by strongly heating the metallic splash, or by dissolving the latter in suitable solvents.

SOCIETY OF PUBLIC ANALYSTS.

The concluding meeting of the session was held at Burlington House, W., on June 2, Mr. A. Smetham presiding.

In a paper on "The Estimation of Nitroglycerin," Mr. H. Droop Richmond discussed the hydrolysis of this compound and described two methods of estimating it, one gasometric and the other alkalimetric, both of which were stated to give satisfactory results.

Mr. R. L. Morris contributed a paper entitled "A Study of the Determination of Potassium as the Perchlorate." This method, he stated, gave highly accurate results when properly carried out, the average error not exceeding $-0{\cdot}1\%$ on pure potassium salts and $+0{\cdot}1\%$ in the presence of much sodium. Attention was directed to the need for the wash fluid to contain not less than 97% of alcohol, after adding 0·2% of perchloric acid. Exact details for carrying out the determination were given, the necessity for the removal of sulphates was emphasised, and the use of quartz dishes recommended. The author has found that the presence of iron, magnesium, calcium, and barium does not interfere with the determination, although when the last-named is present, traces of barium sulphate are detected during evaporation.

INSTITUTION OF GAS ENGINEERS.

The fifty-seventh annual meeting was held in London on June 1, 2 and 3. The president, Sir Dugald Clerk, in his inaugural address, sketched briefly the present position and future possibilities of the gas industry. Statesmen, he remarked, who fail to understand the magnitude and efficiency of the services rendered to the public by the gas industry, appear to have formed very erroneous ideas of its future; developments were unquestionably impending. Reviewing the thermal efficiencies of various gas-making processes, the following were given as the best percentage efficiencies of the several processes employed at the present time: (1) coal gas produced by destructive distillation, 62·5 per cent.; (2) coal gas mixed with water gas made from coke in a separate producer, 67 per cent.; (3) coal gas produced in vertical retorts, combined with steaming, 62·1 per cent. A thermal efficiency of 70 per cent. may be expected from the process of complete gasification of coal, and such a process may be desirable in certain circumstances determined by the sale prices of coke and residuals. Suction producers consuming anthracite show a maximum thermal efficiency of 90 per cent., and those consuming coke about 80 per cent.

The Third and Fourth Reports of the Research Sub-Committee of the Gas Investigation Committee were submitted to the meeting. The third report is concerned mainly with the effect upon the efficiency for lighting and heating purposes of the dilution of coal gas with nitrogen, carbon dioxide, and air, respectively. Equal percentages of these gases added to straight coal gas exert very different effects upon the thermal efficiency in use. The illuminating and thermal efficiency attainable with the incandescence mantle burner is not reduced by the admixture of as much as 20 or 30 per cent. of air, if heat units are supplied to the burner at equivalent rates. Carbon dioxide and nitrogen, in contradistinction to air, are true inerts, and the effect upon the thermal efficiency of coal gas in use is more pronounced in the case of carbon dioxide than in the case of nitrogen. The effects of the presence of inerts in the gas upon the radiant efficiency of gas-fires are relatively small, at least for dilutions down to 350 B.Th.U. per cb. ft. The fourth report gives a detailed account of the first stage of an investigation carried out at Uddingston into the comparative economies of production from the thermal and chemical standpoints of different grades of gas. A full setting of eight vertical retorts was employed in each test, and the results showed that the quantity and quality of gas made are dependent both upon the quantity of steam used per ton of coal and upon the temperature of the charge. Employing steam to the extent of 49·9 per cent. of the coal gasified, the yield of gas was 21,849 cb. ft. of gas of calorific value 410 B.Th.U. gross, compared with 10,384 cb. ft. of gas of 544 B.Th.U. gross without steaming. The action of steam is not merely to produce water gas, but also to increase the proportion of unsaturated hydrocarbons and methane in the gas.

The Refractory Materials Research Committee presented a report on the casting of gas retorts, by Dr. J. W. Mellor and Mr. W. Emery. For purposes of casting, a mixture of sodium carbonate and silicate with some water is recommended for adding to the slip (prepared from any fireclay and grog) in order to produce a smoothly-flowing mixture. The average proportion of sodium salts required is about 3 per cent. of the dry weight of clay and grog. The largest pieces made during the investigation were gas retorts of ⌂ -section, which, after firing, were 2 ft. 4 in. × 2 ft. 5 in. long and 3 in. thick throughout. Such a retort weighs about 8 cwt., and the time occupied in casting is 10—15 min.; the core is removed in about 24 hours and the mould after a further 24 hours. Other sections of the report relate to some comparative tests of machine-made and hand-made silica bricks, and the specific heats of refractory materials at high temperatures.

The Report of the Life of Gas Meters Joint Committee dealt with the internal corrosion of mains, services, and meters. It amplifies the interim report presented last year and in the main confirms the conclusions then reached. Cyanogen compounds are responsible for the corrosion troubles to a very large extent. Experiments upon lead-coated iron, aluminium and a special alloy have yielded promising results as regards the possibility of preventing corrosion. A simple process for the elimination of hydrocyanic acid from coal and gas, suitable for adoption by small undertakings, is eminently desirable.

A paper on "Oxygen in Gas Production" was presented by Mr. H. J. Hodsman and Prof. J. W. Cobb. The authors have examined theoretically the possibility of increasing the thermal efficiency of the carbonisation process by generating the heat for carbonisation within the charge by the use of a regulated supply of oxygen. The efficiency of the projected process is 91·1 per cent. employing a system of carbonisation with steaming, and 90·1 per cent. with complete gasification of the charge. The commercial feasibility of the proposal hinges, in the first place, upon the cost of oxygen, which, it is hoped, will become cheaper owing to extended use. With oxygen at 10d. per 1000 cb. ft., the cost of completely gasifying 1 ton of coal would be 10s. 4d., whilst for carbonisation of 1 ton the cost of oxygen would be about 1s. 11d. The cost of plant would be considerably reduced, and the carbonising process speeded up, thus reducing fixed as well as running costs of gas-making. The provision of a cheap supply of oxygen is urged as one of the most effective ways of promoting efficiency and economy in the utilisation of the coal supplies of the country.

Mr. S. F. Dufton and Prof. Cobb presented a paper on "Some High Temperature Reactions of Benzene and Toluene." It is established that with such dilution with hydrogen as occurs in ordinary carbonising practice, benzene is stable up to 800° C., and toluene begins to undergo molecular condensation at 550° C. Whereas hydrogen inhibits the decomposition of benzene by preventing its molecular condensation to diphenyl, it promotes the decomposition of toluene by converting it into benzene and methane.

Other papers dealt with carbonisation in horizontal retorts, the Report of the Fuel Research Board, and electricity supply by gas companies.

THE CHEMICAL SOCIETY.

At an ordinary scientific meeting held on June 3, Dr. M. O. Forster presiding, the following papers were read and discussed: "Studies in the Camphane Series. Part XXXVIII. The Cyanohydrazone of Camphorquinone": M. O. Forster and W. B. Saville; "Arsinic Acids derived from Guaiacol and Veratrole": R. G. Fargher; "Diphenylarsenious Chloride and Cyanide (Diphenylchloroarsine and Diphenylcyanoarsine)": G. T. Morgan and D. C. Vining; "Organo-derivatives of Bismuth. Part III. The Preparation of Derivatives of Quinquevalent Bismuth": F. Challenger and A. E. Goddard; "The Influence of Nitro-groups on the Mobility of Substituents in the Benzene Nucleus. Part II. The Dinitrotoluenes": J. Kenner and M. Parkin; "Decomposition of Nitric Esters": R. C. Farmer.

An extraordinary general meeting has been convoked for June 24, at 5 p.m., to consider resolutions passed by the Council recommending an increase in the annual subscription from £2 to £3, as from January 1, 1921, and certain alterations to the entrance and life-composition fees.

NEWS AND NOTES.

CANADA.

Industrial Notes.—*Benzol Plant at Hamilton.*—The Steel Co., of Canada, is erecting a benzol plant in connexion with its coke-oven installation at Hamilton, Ontario. The benzol will be produced either for chemical or motor fuel purposes, according to market demand.

New Manufactures.—Three materials have recently been added to the steadily growing list of chemicals made in Canada, the Durham Chemical Co., at Durham, Ontario, having successfully put into operation processes for the manufacture of lead carbonate (refined), lead nitrate, and hexamethylenetetramine. The Quinte Chemical Co., Ltd., has undertaken the manufacture of juniper oil and cedar oil at Deseronto, Ontario, thus establishing a new industry in Canada. Juniper oil is extracted from the berry of the shrub of that name, which has a wide distribution in Canada.

A New Magnesite Plant.—The Scottish Canadian Magnesite Co. has completed a new calcining plant, consisting of three 60 ft. kilns, at a cost of $500,000. The works are located at the company's quarry, 16 miles from Grenville, Quebec. Formerly the magnesite was burnt at the plant of the Canada Cement Co., at Hull, Quebec.

British Empire Steel Corporation.—In an announcement to the Toronto Board of Trade Lieut.-Col. Grant Morden states that the objects of this new big amalgamation of the principal steel and coal companies of Canada with the leading ironmasters in the United Kingdom are to develop the great iron and coal resources of the Dominion and to supply Great Britain with materials for the production of finished steel products. The two chief Canadian companies concerned are the Nova Scotia Steel and Coal Co. and the Dominion Steel Corporation. It is believed that the new company will eventually extend its activities into Ontario and help to develop the 425 million tons of iron ore waiting development in that province. The initial issue of stock is $207,000,000, and the assets, presumably made up of coal reserves, are valued at $403,000,000. The headquarters of the Corporation will be at Sydney, Nova Scotia.

The Wood Distillation Industry in 1918.—The Dominion Bureau of Statistics states that the quantity and value of the various products of the wood distillation industry of Canada for the year 1918 at the point of production were as follows:—

Classes of Products.		Quantity.	Selling Value, $
Wood alcohol, refined	galls.	1,070,928	1,531,356
Wood alcohol, crude	galls.	875,024	981,535
Acetate of lime	lb.	25,998,139	1,017,465
Acetic acid	"	1,772,223	170,173
Acetate of Soda	"	295,572	51,389
Acetone	"	3,458,810	909,570
Formaldehyde	"	1,154,902	159,263
Ketone oils	"	792,864	211,440
Acetic anhydride	"	44,981	60,515
Methyl acetate	"	132,121	29,350
Charcoal	bushels	6,472,925	1,575,701
All other miscellaneous products			537,460
Total value of production			$7,235,217

Exclusive of charcoal and miscellaneous products, the value of the chemicals produced was $5,122,056. The sum of $398,905 was expended on machinery repairs and on plant made by employees. The total cost of materials delivered at the various works during the year was $3,319,731, of which $1,321,893 represented hardwoods (128,097 cords), and $1,991,198 the cost value at works of materials used in the industry; items under this heading included:—acetate of lime, for further manufacture, 9316 long tons; sulphuric acid, 469 tons; soda ash, 140 tons; caustic soda, 83 tons; lime, 140,420 bushels; and crude wood alcohol for further manufacture, 1,081,837 galls.

In the year under review there were thirteen plants in operation, eight of which were located in Ontario and five in Quebec, with one refinery in each Province. The total capital invested was $3,612,573, divided between these two Provinces in the approximate ratio of 2:1. The industry has been stimulated by war needs, but even prior to 1914 there was a considerable export business, mainly to Great Britain and Australasia.—(*U.S. Com. Rep., Apr.* 30, 1920.)

FRANCE.

Industrial Notes.—*Coal.*—The recent unsuccessful strike has left its mark on the chief industries of the country; in particular, the development of the metallurgical industry, for the products of which an enormous demand exists, has been retarded by the new shortage of coal due to the dislocation of transport. The price of British coal is considered prohibitive at 600 fr. a ton, while American coal can be delivered at Havre for 420 fr. The tendency is to look to the United States rather than to Great Britain for future supplies. During the first fortnight of May, 50,000 tons of American and only 10,000 tons of British coal arrived at Havre.

The Chemical Market.—High prices for chemical products still prevail, except in the case of chlorates, of which there is a surplus production, and rubber, for the neglect of which no exact reason can be assigned. The market for chlorates would improve if they were used as substitutes for chromates and bichromates, which are scarce and at prohibitive prices, and for permanganates, the manufacture of which has ceased owing to lack of raw material. A great shortage also exists in sodium and potassium salts, and even caustic alkalis are lacking; importation from England and America is rendered difficult by the fact that the demand in these countries also exceeds supply.

Sugar.—The right of free importation of sugar into France was restored to foreign producers on June 6, 1919, but the prohibition of the export of home and colonial sugar was maintained in order to provide for household requirements. As the food controller of the late Ministry announced that this embargo would be raised before September 30 next, transactions were entered into between sugar manufacturers and wholesale merchants. Great, therefore, is the discontent of the latter at the recent intimation that the new Ministry would maintain the embargo on the entire home and colonial production of the next season.

BRITISH INDIA.

Indian Turpentine and Rosin.—During the last few years there has been a great development in the collection and distillation of pine rosin in the Himalayas. It is estimated that there is available an area of 400,000 acres of *Pinus longifolia* in the government forests of British India, and about as much again in native states. There is a small turpentine factory at Bowali in the United Provinces, and a more up-to-date one at Jallo, near Lahore, in the Punjaub. Both these belong to the governments of the provinces, and are the only factories of the kind working at present in India, but the United Provinces Government is erecting a larger one near Bareilly on the same plan as that at Jallo. In the year ending June, 1918, the Forest Departments of the two provinces mentioned worked some 2½ million blazes over an area of 92,500 acres, and produced 141,400 gallons of turpentine and 58,500 maunds of rosin. It was still necessary to import some of each of these products to satisfy the Indian demand, but it is expected that India will soon be self-supporting in this respect. Absence of roads in the mountain areas impedes the development of this and other forest industries.

The 1919-20 Sugar and Cotton Crops.—The final memorandum of the Department of Statistics on the sugar-cane crop estimates the total area at 2,667,000 acres, or 7 per cent. less than in 1918–19. The total yield of raw sugar (*gur*) is estimated at 3,001,000 tons, which is 27 per cent. above that of the previous year.

The area under cotton is 23,063,000 acres (about 10 per cent. above the revised total for 1918–19), and the estimated yield is 5,845,000 bales of 400 lb. each, or 47 per cent. more than in the preceding year.—(*U.S. Com. Rep., Apr.* 20, 1920.)

UNITED STATES.

New Method of Treating Raw Cane Juices.—By treating raw cane juices with zinc hydrosulphite, after treatment with sulphurous acid but before treatment with lime, it is claimed that their viscosity is much diminished, thereby rendering filtration more rapid, evaporation more economical, and crystallisation more complete.

Inflammability of Aluminium Powder.—Investigations of explosions in mills producing powdered aluminium for paints have shown that this material when suspended in the air may be ignited by electric sparks and give rise to violent explosions.

Cellulose Nitrate as Aeroplane Dope.—It has been found that 5—8 per cent. of ammonium phosphate or ammonium magnesium phosphate added to cellulose nitrate renders it fire resistant and able to compete with cellulose acetate as an aeroplane dope. When ignited the ammonia evolved extinguishes the flame.

Use of Aluminium Leaf as a Water-proofing Material.—The Forests Products Laboratory reports success in the use of aluminium leaf, applied with size or lacquer, as a water-proofing material for wood. The leaf can be applied quickly at a reasonable cost, and the resulting coating has been found twenty-five times more effective than any other for water-proofing such objects as aeroplane propellers.

Determination of Carbon in Steel.—A method of determining carbon in steel has been announced which depends upon the change of electrical conductivity produced in a standard baryta solution when the carbon dioxide from the combustion of the steel is passed into it. An accuracy of 0·01 per cent. is claimed.

American Potash in 1918.—The chief sources of potash are natural brines (which yielded 73 per cent. of the output), alunite, dust from cement mills and blast furnaces, silicate rocks, kelp, distillery waste and other organic matter (*cf.* J., 1919, 248 R). The production of potash-bearing material in 1918 was 207,686 short tons (126,961 in 1917), with an average content of 26·4 per cent. K_2O. This was the output of 128 firms and represents about 22 per cent. of the normal consumption in the country, which is approximately 250,000 tons of potash yearly. About 58 per cent. of the 1918 output consisted of crude mixed salts, with 20—28 per cent. of K_2O, and composed mainly of carbonates and sulphates of sodium and potassium; about 24 per cent. was chloride (60—96 per cent.), and 6 per cent. sulphate (35—51 per cent. K_2O). The domestic output of refined potassium salts was 53,661,676 lb., produced by 47 firms.

Imports of potash materials in 1913, 1917, and 1918 were 1,092,588, 25,287, and 24,419 short tons respectively; before the war they consisted mainly of kainite and manure salts, but these were not imported at all in 1918. In that year the imported potash was furnished by Russia (20·9%), India

19·6%), Japan (12·4%), Italy (12·2%), Spain (11·4%), the remainder being supplied by fifteen countries.—(*U.S. Geol. Surv., Mar.* 31, 1920.)

SOUTH AFRICA.

Mineral Wealth of the S.W. African Protectorate.—Besides diamonds and copper (*cf.* J., 1919, 167 R), base minerals occur in large quantity in the Protectorate, although they have not yet been exploited to any great extent. Coal is found and is said to be worth exploitation, and large iron-ore deposits containing 60 per cent. iron have been located in the central region of the Kaokoveld. There are extensive deposits of wolfram, of which 34 claims, covering 6048 acres, were in existence in 1914. Gold deposits in the Kaokoveld and galena deposits at Arais are said to be such as to justify further investigation. The value of the output of tin was £34,500 in 1913, and that of lead £11,400 in 1912.—(*Bull. Dept. Trade and Com., Canada, May* 3, 1920.)

Oil-Seed Cultivation.—The sunflower is grown only to a limited extent in South Africa, mainly as poultry and cattle food, but it is cultivated on a considerable and increasing scale in Rhodesia, and it would appear to be a suitable crop for other parts of the Union. Cropping tests carried out in Cape Province in 1907 gave satisfactory results, in one case a yield of 3350 lb. per acre being recorded; and recent experiments in Rhodesia, in which yields varying from 581 to 1304 lb. were obtained, showed that sunflowers will occupy an important place in the agricultural economy of that country when the initial difficulties attending the introduction of a new crop have been overcome.

Cultural tests of *Madia sativa*, which yields madia oil, were made at Kerstenbosch in 1914 and at Salisbury in 1915–16, with results that were sufficiently encouraging to warrant a more extensive trial. If satisfactory results are obtained it is hoped to establish the plant on waste land with a view to supplying the local soap factories with oil. (*S. African J. Ind., Mar.*, 1920.)

AUSTRALIA.

Projected New Steel Works in Queensland.—It is reported that a new steel works will be established at Bowen, a seaport 725 miles north of Brisbane, at an estimated cost of £3,000,000. The equipment will be of the most modern type, and the capacity of the initial plant will be considerable; an output of 350 tons of pig iron and from 800 to 1000 tons of rails per day is hoped for.—(*Bd. of Trade J., April* 29, 1920.)

Alkali Manufacture.—The possibility of developing the alkali industry in Australia is at present receiving attention. Dr. W. G. Woolnough, late professor of geology in the West Australian University, has joined the technical staff of Messrs. Brunner, Mond and Co., and is now visiting Australia to investigate the different sources from which alkali could be manufactured. He is conducting a series of tests on the water of Lake Preston (situated in the south-west portion of Western Australia), which contains about 5000 grains of sodium chloride per gallon and is favourably situated as regards coal, fresh water supplies, and lime deposits.

The Flax Industry.—Considerable expansion is reported in the areas devoted to flax growing. Before the war the acreage under this crop was 300—400; this year it is about 2200, and there are prospects of increased cultivation in Tasmania, New South Wales, and Queensland. At present most of the flax is grown in Victoria. The guarantee of the British Government to purchase Australian grown flax at a price remunerative to growers has greatly stimulated production. Recently the Minister of Customs has been in consultation with the Commonwealth Flax Committee as to the amount of the guarantee to growers for the ensuing three years, and the Committee indicates that a dividend of about £1 10s. per ton will be payable to growers over the guaranteed amount of £5 per ton already paid on the 1918 crop. The fibre from the flax crop was originally sold to the Imperial Government at £170 per ton, but in view of the increased prices ruling for the fibre, and the British Government's desire to relax control of the flax industry, the contract was cancelled, and Australian fibre is now being placed on the open market. There is every indication that prices will be obtained substantially in advance of the contract prices.—(*Indust. Austral., Feb.* 19, 1920.)

JAPAN.

Chemical and Physical Research Institute. — An institute for chemical and physical researches has been founded in Japan at an estimated cost of 5 million yen (£500,000), half of which has been guaranteed by persons engaged in industry and commerce in Tokyo and Yokohama, and the other half by similar persons in other towns. The Government will give an annual subsidy of £200,000, and the Emperor has made a personal donation of £100,000. No distinction is made in the scheme of work between pure and applied science, and industrial problems will be regarded as of first importance. — (*Chim. et Ind., Mar.*, 1920.)

The Fertiliser Industry.—H.M. Acting Vice-Consul at Ozaka reports that there is a tendency towards the consolidation of the Japanese fertiliser industry in order to provide protection against the possibility of more severe competition and more difficult conditions in the future. The Ozaka Kagaku Hiryo and Nippon Seimi Seizo companies are said to be combining under the name of the Nihon Kagaku Hiryo Co., and, in order to provide the requisite raw materials, a new company, the Teikoku Ryusan Hiryo Co., will be formed with a capital of 5 million yen. As supplies of sulphide and phosphate ores are very scarce, further combinations will inevitably follow. There are three large groups of fertiliser companies—the Kuhard group, the Furukawa group, and the Sumitomo Co., with an output of 7,000,000 bags, 4,180,000 bags, and 680,000 bags per annum respectively.—(*Bd. of Trade J., Apr.* 29, 1920.)

The Sugar Industry in Formosa.—The present sugar season in Formosa has opened somewhat late owing to shortage of fuel and transport difficulties. The sugar crop suffered so greatly from a typhoon and bad weather that it is estimated to amount to only 3,800,000 piculs of centrifugals and 400,000 piculs of browns (picul=133·28 lb.), as against 4,428,742 and 500,000 piculs respectively in 1918–19. The area under sugar cane has decreased from 258,328 to 236,269 acres, but it seems probable that a larger acreage will be devoted to sugar in the 1920–21 season. That the industry is in a sound condition is shown by the large number of new sugar companies established during the past year; eight companies alone have capitals varying from 1 to 10 million yen (yen=2s. 0½d.), and the Ensuiko Sugar Manufacturing and Developing Co. is increasing its capital by 13,700,000 yen to 25,000,000 yen. Formosan sugar companies and Japanese capitalists are also paying attention to sugar production in the Dutch East Indies, Java, and elsewhere in the South Seas. A new departure, dating from early in 1919, has been the importation into Formosa of Javan sugar for re-manufacture during the slack season.(*Bd. of Trade J., Apr.* 22, 1920.)

The Japanese Sugar Trade.—An attempt is being made in Japan to increase the output of the sugar refineries so as to capture European trade. Recently some 400,000 cwt. of refined sugar was shipped to Mediterranean ports, which was manufactured mainly from cane sugar furnished by Javanese refineries, only a small proportion being derived from Formosa.—(*Z. angew. Chem.*, *Mar.* 16, 1920.)

GENERAL.

Raw Material for Paper Making.—The prices of the staple materials for paper making, chemical wood pulp and mechanical pulp, show no indications of any halt. Chemical pulp, which in 1913 could be obtained for £7—£9 per ton now realises £60—£65 f.o.b. Norway, and bleached sulphite, once bought at £12—£14, cannot be bought under £80—£90 per ton. In the same way mechanical pulp purchased ahead fetched £17—£18 f.o.b. Norway, though the coarser qualities are obtainable at the present time at prices below this figure.

The reasons for these apparently high values are not far to seek. The law of supply and demand is in full operation, and the selling prices are bound to be a reflection of the position. But this statement is by no means an adequate explanation of the reasons for heavy costs. The actual production costs for pulp are now extraordinarily high, and one writer in the *World's Paper Trade Review* points out that whereas in the manufacture of "kraft" paper, quoting this as an example, the coal and chemicals in 1914 averaged £2 10s. per ton of paper, the cost to-day is £28. This, together with the fact that labour costs are now at least three times their pre-war value, shows that the economic law in respect of production price is making itself felt.

The result of this critical situation is that various attempts are being made to exploit other fibres and especially in the direction of extending the possibility of utilising the fibrous materials grown within the British Empire. Considerable attention has been given in *The Times* to the virtues of bamboo pulp, and we may anticipate a serious endeavour to produce paper pulp from this material on a large scale. The bamboo is undoubtedly an excellent paper-making fibre, and the conditions of its growth favour the installation of a large pulp-making industry. The bamboo grows easily and rapidly. Enormous areas are available in India, and under a proper system of management there is no doubt that supplies of a uniform character could be obtained in unlimited quantities.

"Arsenic and Antimony Ores" forms the subject of the 15th volume of the "Special Reports on Mineral Resources of Great Britain" issued from the Geological Survey Office. Commencing with an introductory sketch concerning the minerals containing arsenic and the distribution of the ores in Cornwall and Devon, their treatment, the commercial uses of arsenic, and statistics of output, there follows a detailed and authoritative account of the mines, both active and idle, at the present time. It is interesting to note that, out of a total output in 1917 of about 2,620 tons crude and refined "white arsenic," the three mines of Tincroft, East Pool and Agar and South Crofty, primarily worked for tin, produced about 1900 tons. As usual, the figures for the "World's Output" are quoted from an American publication—"The Mineral Industry"—and it should have been possible in a 1920 publication to have brought the figures to a later year than 1914. There is no production of antimony in Great Britain at the present time, although formerly small quantities were raised at a few small mines in Cornwall and in Dumfriesshire in Scotland.

Extension of the Uses of Rubber.—The Rubber Growers' Association offers prizes to the total value of £5,000 for ideas and suggestions for extending the present uses, or for encouraging new uses, of rubber. It is laid down that suggestions must be practical and likely to increase the demand for the raw material; further, that they may relate to improvements or new processes which will facilitate or cheapen the production of rubber goods. The prizes will be:—one of £1,000, three of £500 each, ten of £100 each, and a sum not exceeding £1,500 to be divided among remaining competitors who send in suggestions of value, no competitor receiving more than £100. Suggestions must be received by December 31, 1920, and all inquiries concerning the competition are to be addressed to the Association (Dept. C.), at 38, Eastcheap, London, E.C. 3.

Biochemistry at Cambridge University.—The sum of £165,000 has been allotted by the trustees of the estate of the late Sir William Dunn, banker and merchant of Paisley, for the endowment of a biochemical institute at Cambridge; buildings to be erected on a site provided by the University, £25,000 to be devoted to the endowment of a professorship, and £10,000 for a readership.

The Senate of the University has accepted the offer of £30,000 from the Department of Scientific and Industrial Research for the erection, equipment, and maintenance at Cambridge of a low-temperature station for research in biochemistry and biophysics.

The Sugar Situation and Germany.—The *Mouvement Géographique* publishes the following figures of production throughout the world:—

	1916-17	1917-18	1917-18	1918-19
		Metric Tons.		
America:				
Cane Sugar	11,235,000	11,219,000	11,965,000	12,261,000
Beet Sugar .	747,000	694,000	697,900	870,000
Europe:				
Beet Sugar .	5,006,000	4,247,800	3,658,000	3,469,000
	16,988,000	17,220,000	16,320,000	16,600,000

It will be seen that the production for the present season is 280,000 tons less than that of 1913–14, whilst the European production, compared with that for 1910—8,105,000 tons—shows a decline of 57 per cent. (*Schweiz. Chem.-Zeit.*, Apr. 17, 1920). According to figures published in the *Industrie und Handelszeitung* (Mar. 19, 1920), the world's output of cane sugar can only be increased to 13,700,000 tons, which will still leave a deficit of 4,500,000 tons, assuming that the world demand remains stationary. In addition, American production during the war did not increase and seems unlikely to do so now. In Europe, the only country that can be looked to for increased production is Germany which, before the war, produced one-seventh of the world's sugar. Germany, however, has lost large beet-growing areas and in 1919 her production from 276,000 hectares (681,720 acres) is estimated at 741,800 metric tons of raw sugar (*Verein der deutschen Zuckerindustrie*), compared with 1,063,300 metric tons in 1918 and 2,718,000 tons in 1913–14, but when conditions are again normal it is calculated that Germany will be able to produce not less than 2,330,000 tons of sugar annually. The immediate prospects of the German sugar-beet industry, discussed in the *Z. angew. Chemie* for April 13, 1920, are the subject of very diverging opinions. It is held to be certain that the price of beet-sugar, already raised by 150 mk. per cwt. (at Magdeburg), will again be increased, and it is also considered probable that the sugar factories and farmers will have to face an additional 150—190 mk. per cwt. for beet. Labour conditions have improved, Chile saltpetre has been available in considerable quantities, and in consequence of the expected rise in the price of sugar (*cf.s.*), it is anticipated that the area under sugar-beet will be increased by 15 per cent. The recent political troubles had an adverse effect on the industry, but they did not affect cultivation. The weather has been very favourable, and, given a continuance, an early and improved harvest is to be expected. England's dependence on cane sugar supplies can only be broken by increased cultivation of beet-sugar in sugar-beet growing countries.

The World's Linseed.—According to reports issued by the United States Department of Agriculture, the total production of linseed in that country for the period 1917–19 did not exceed 10,600,000 bushels from an acreage of 1,800,000, *i.e.*, only about 6 bushels per acre. This low yield was the result of a severe drought experienced in the chief producing states — Minnesota, N. Dakota, S. Dakota, and Montana. The official yield figures, however, are said to be considerably lower than those calculated from market reports. The Department strongly recommends that a larger acreage should be planted to linseed, as although the European markets may not be able to absorb more, the domestic market in the United States could take the production from at least 2,700,000 acres of average yield. Even this increased acreage would be less than the area planted in 1910 (2,900,000 acres) and 1912 (2,850,000 acres). Notwithstanding the decline in the English markets, it is stated that the demand for linseed oil, at least in America, is unprecedented and likely to increase, especially for paint and varnish manufacture. It is officially estimated that the Argentine crop now coming in will be 43 million bushels, but this is considered too low. Up to March 31, 8·5 million bushels of the current Argentine crop had been sent to the United States. The approximate acreage in the Argentine is 3,500,000, and it is calculated that 5 million bushels of the present crop will be retained for crushing and for seeding the next crop. The estimated yield of linseed in Canada for 1919 was 170,000 tons; for India, 1918–19, 230,000 tons; also some may be expected from Russia, and small amounts from China, Uruguay, and Tunis. The total world production is put at 1·5 million tons, but this is probably a low estimate, for one report estimates the surplus available for export at the same figure.

The Gutta-Percha Industry.—Gutta-percha is a jungle product, chiefly supplied by Borneo, though smaller amounts come from Sumatra and the Federated Malay States. So far, attempts to cultivate the gutta-percha tree have been unsuccessful, save in one district in Sarawak, where a plantation has been in existence about 30 years and is only just beginning to yield supplies in marketable quantities, as it takes 20 years for the tree to come into reasonable bearing. During 1918, 1469 tons of gutta-percha, valued at £293,758, was imported into Singapore, including 1372 tons from the Dutch East Indies and 91 tons from British North Borneo, Sarawak and the Federated Malay States. The export of gutta-percha from Singapore in 1918 was 3140 tons, of which 1596 tons went to the United Kingdom and 1230 tons to the United States. Owing to reports of new cable projects and the upward tendency of the price of the product, which has increased by 80—100 per cent., it is expected that production will be stimulated.—(*U.S. Com. Rep., Mar.* 20, 1920.)

Rubber in Hainan, China.—The rubber industry in the island of Hainan, China, has every prospect of success, as it is now certain that rubber can be grown there on a commercial scale. Consequently, rubber plantations are being extended all over the island, and it is probable that they will soon furnish an important part of the exports of South China. At present, owing to the cost of transport and the high value of silver, the cost of production is almost equal to the selling price in Singapore, but with improved transport and return to normal conditions the industry should be very profitable.—(*U.S. Com. Rep., Feb.* 18, 1920.)

Mercury Production in Tuscany and Idria.—The Italian quicksilver industry is centred in the Monte Amiata district of Tuscany, and the output from this region represents approximately the national production. The deposits of cinnabar extend over 400 sq. km., and are workable down to about 200 metres; their life is estimated at several centuries. At the present time, owing to the high cost of fuel and labour, production is restricted to the richest portions; eight mines are being worked and 900 employees are engaged. With regard to extraction, the old type of retort oven has been discarded as it was uneconomical and dangerous to the health of the workers. Two types of oven are now used, simple tank ovens for the treatment of large fragments of ore, and special drop or rotating ovens for the smaller fragments. The production involves the consumption of large quantities of wood for use as fuel and mine props, and of charcoal for burning and mixing with the ore before distilling. As the call on timber has seriously depleted the scanty forest resources of the surrounding country, it is proposed to use electric ovens for ore reduction, water power from the Apennines being available. The present furnaces treat 14—15 tons of ore per day and consume 220 lb. of wood fuel per ton of mineral in 24 hours. In addition, some wood is used for drying the ore prior to distillation. The cost of treatment before the war was estimated at 4 lire per ton. The production (in tons) for the period 1915—1918 was: 1915, ore 110,612, metal 985; 1916, ore 132,524, metal 1093; 1917, ore 113,782, metal 1071; 1918, ore 113,782, metal 1038. During the war the Italian Government took over the entire production of mercury at 12 lire per kg., and fixed the selling price at 25 lire per kg. It has recently been proposed to form a combination of the interests concerned in the Monte Amiata, the Idrian and the chief Spanish mines, which, with the backing of the three great Italian banks, would control the world's supply. The Italian industry was formerly financed by German bankers, but during the war control passed to Swiss financiers; at the present time it is entirely in Italian hands.

The output from Idria (Austria) was 600 tons in 1914, and probably the same in 1918, but no figures are available from Austrian sources. It is reported that 1200 workers are now employed, that stocks are accumulating, and that the selling price is rather less than 25 lire per kg.—(*U.S. Com. Rep., Feb.* 20, 1920.)

Italian Chemical Industry During the War.—Prior to the war Italy largely depended on Germany for many chemical products, as the home industry was then but slightly developed. On becoming a belligerent, the demand for explosives, and consequently for nitric acid, increased enormously, with the result that Italy's production rose from 12,531 metric tons of nitric acid in 1914 to 85,800 tons in 1916, about 50,000 tons of which was consumed directly in the manufacture of explosives. As the pre-war import of nitric acid was only about 600 tons a year, the home production will now be amply sufficient. The output of sulphuric acid also increased from 678,390 tons in 1914 to 835,440 tons in 1918, but as this was mainly required for the manufacture of explosives, the chemical fertiliser industry, already hampered by decreased imports of phosphates, suffered severely. With regard to organic acids, the production of citric acid—900 tons in 1914—had approximately doubled by 1918, whilst the output of tartaric acid decreased from 1860 tons in 1914 to 1368 tons in 1918, possibly owing to the accumulation of stocks. Similarly, the production of citrate of lime rose from 6687 tons in 1913–14 to 9087 tons in 1917–18, while the production of cream of tartar in 1918 was only half the output capacity. The production of tanning extracts rose from a pre-war figure of 9800 tons a year to 23,400 tons, with a capacity of 32,400 tons.

Progress has also been made in the production of ammonia compounds and coal-tar products, though the artificial dyestuffs industry has hardly developed at all and supplies still have to be imported. In the case of alkalis, Italy can now supply all the caustic soda required, as large new plants have been erected. Only small amounts of acetone and calcium acetate are produced, practically the entire requirements being furnished by the United States. The production of rosin and turpentine is inadequate, as is that of cellulose, and recourse is had to importation, but the wood pulp industry developed rapidly during the war, the output rising from 1200 tons in 1914 to 7800 tons in 1918. Owing to the shortage of raw material, many of the glycerin plants were unable to operate, with the result that imports of glycerin reached 6827 tons in 1918. The domestic production of oleic acid, stearic acid, glue and gelatin also decreased, as did that of dextrin, due, in this case, to the small imports of sago. Although one of the chief producers of olive oil, Italy is a large importer of other vegetable oils; the existing oil-seed plants have a capactiy of about 3600 tons a month, and, as the shortage of olive oil is acute, a considerably increased production of seed oils may be expected. In 1913, 519 tons of castor oil was exported, but owing to aviation requirements, 2225 tons was imported in 1913. Sufficient copper sulphate is now produced to satisfy home requirements, and instead of an import of 21,905 tons, as in 1914, small amounts can be exported. (*Cf.* J., 1919, 108 R, 359 R; 1920, 120 R.)—*U.S. Com. Rep., Mar.* 8, 1920.)

PERSONALIA.

Sir William Pope has been elected an associate of the section for the mathematical and physical sciences of the Académie Royale de Belgique.

Dr. F. G. Cottrell has been presented with the Willard Gibbs medal by the Chicago Section of the American Chemical Society.

It is announced that Sir John Cadman will retire from the professorship of mining at the University of Birmingham at the end of the current session.

The honorary degree of D.Sc. of Liverpool University has been conferred on Prof. F. G. Donnan, professor of chemistry in University College, London.

Dr. R. S. Morrell, recently chairman of the Birmingham and Midland Section, has been elected president of the Oil and Colour Chemists' Association, in succession to Dr. F. Mollwo Perkin.

The list of honours conferred on the occasion of the King's Birthday includes:—*Privy Councillorship:* The Hon. F. S. Malan, Minister of Agriculture, Mines, Industries, and Education, Union of S. Africa. *Baronetcy:* Mr. Milton S. Sharp, chairman of the Bradford Dyers' Association. *Knighthoods:* Mr. W. B. M. Bird, founder of the Salters' Institute of Industrial Chemistry; Dr. J. C. Carruthers, principal of the University of the Cape of Good Hope. *Imperial Service Order:* Mr. C. Proctor, superintending analyst, Department of the Government Chemist.

The Late Dr. Messel.—With reference to the obituary notice which appeared in the issue for May 15, p. 160 R, we are informed by a relative of the late Dr. Messel that he was not a student of the University at Zürich, but of the Federal Polytechnic in that town.

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Power Alcohol.

Replying to Viscount Curzon, Sir R. Horne said that the Government wishes to encourage the use of alternative fuels for internal combustion engines. As alcohol in suitable admixture is a satisfactory fuel for internal combustion engines, the Finance Bill before the House contains a clause that permits the payment of the same allowance in respect of spirits used for making power alcohol as is made in respect of spirits used in making industrial methylated spirits, and the clause gives power to the Commissioners of Customs and Excise to prescribe the appropriate denaturants.—(May 17.)

Potassium Carbonate.

Sir R. Horne, answering Mr. Sitch, said that he was aware of the shortage of potassium carbonate required for the glassmaking industry; there were no restrictions on the importation of supplies from Germany. Since November 11, 1918, 20½ tons of potassium carbonate had been imported from that country into the United Kingdom, and there was no evidence to show that Germany had discriminated in this matter against the United Kingdom. Such discrimination was forbidden by the terms of the Peace Treaty.—(May 17.)

Sulphate and Muriate of Potash (Exports and Prices).

In reply to Sir R. Cooper, Mr. Bridgeman said that the sale price in this country of sulphate of potash was first fixed by the Government on August 20, 1919, and is still under control. The maximum prices fixed were:—*ex* ship British port, £22 7s. 6d.; delivered at nearest railway station, £23 2s. 6d. In November, 1919, the latter price was advanced to £23 7s. 6d. The contract with the German Government for the delivery of a total quantity of 13,250 tons, none of which was licensed for export to the United States, was signed on July 1, 1919. The total exports of sulphate and muriate of potash from September 1, 1919, to April 30, 1920, were:—Sulphate of potash, 447 tons, 16 cwt.; muriate of potash, *nil*. Neither commodity was exported to the United States during this period, but 4631 tons of sulphate and 12,304 tons of muriate were sold for shipment direct from Hamburg and Rotterdam to British Possessions, and a quantity of muriate for shipment to the United States, these sales being made on the advice of the Potash Distribution Committee.—(June 1.)

Methylated Spirit.

In reply to Viscount Curzon, Mr. Chamberlain stated that methylated spirit imported is liable to the full spirit import duty, whether it be power spirit or not, but plain unsweetened foreign spirit or rum may be imported for methylation in this country, subject to payment of the difference between the Customs duty chargeable thereon and the Excise duty chargeable on British spirits.—(June 7.)

War Wealth Levy.

The Chancellor of the Exchequer announced that the Government had decided that the dangers attendant on the suggested scheme for a levy on war wealth altogether outweighed any advantages which could be derived from it; hence any proposals in that sense would not be made to the House.—(June 7.)

A motion in favour of a levy on accumulated wealth, moved by Mr. Clynes, was defeated by 244 votes to 81.—(June 8.)

LEGAL INTELLIGENCE.

ALLEGED INFRINGEMENT OF ALUMINIUM WELDING PATENTS. *A.-G. für Autogene Aluminium Schweissung v. The London Aluminium Co., Ltd.*

The plaintiff company in this action complained of an infringement by the defendant company of Letters Patent 24096/1907 and 24283/1907 for improvements in welding aluminium. The defence denied infringement and asserted invalidity of each of the patents on the grounds of (1) want of novelty and subject matter, (2) insufficient description, and (3) want of utility.

Mr. Justice Sargant, in delivering judgment on May 21, after a protracted trial, said that the case against the defendant firm was of having used flux covered by the patents mentioned. The defence admitted having used the flux, but pleaded ignorance of its nature. The evidence adduced by the defence did not show that the flux was not an infringement flux, though it was obvious that the fact, if fact, could have been established; on the other hand, expert evidence for the plaintiff firm showed that the flux used was covered by the patents, and he therefore held that infringement had been definitely established. In regard to want of novelty, the public knowledge involved in a passage cited from Roscoe and Schorlemmer's textbook (concerning the melting of aluminium in a crucible) was not sufficient to deprive the plaintiff's invention either of novelty or subject matter, and this also applied to the two specifications (Gooch and Bates) quoted. The defence of want of utility divided itself into two sub-headings:—(1) that no mixture of alkali chlorides when alone or with the addition of fluorides could produce a useful autogenous welding, and (2) that although some such mixtures could produce such a welding, yet other mixtures within the description were useless for the purpose. The defence broke down both from a theoretical and a practical standpoint. On the question of the utility of the fluxes, the defence produced evidence that bad welds sometimes resulted from their use by expert welders; but such evidence was less cogent than the positive evidence of success brought forward by the plaintiff company.

His Lordship found that the defendants had not established any of their defences to the action, and that the plaintiffs were entitled to succeed.

GOVERNMENT ORDERS AND NOTICES.

PRICES OF SULPHATE OF AMMONIA, 1920–21.—The Ministry of Agriculture and Fisheries has notified the following maximum prices of sulphate of ammonia in lots of not less than 4 tons for delivery by rail or water to purchasers' nearest railway station or wharf in Great Britain, less a trade discount to manure mixers, agricultural merchants, dealers and Co-operative Societies:—

Month of Delivery.	Price per ton in bags, net cash. £ s. d.
June, 1920	23 10 0
July	23 10 0
August	24 0 0
September	24 10 0
October	25 0 0
November	25 10 0
December	26 0 0
January, 1921	26 10 0
February	27 0 0
March, April and May	27 10 0

Small additions are made to the above prices for deliveries of less than 4 tons.

SUSPENDED ORDERS.—On June 3, the Controller of Coal Mines, Board of Trade, issued directions and notices suspending the operation of the following Orders, as from June 7:—The Household Fuel and Lighting Order, 1919, the Retail Coal Prices Order, 1917, and the Wholesale Coal Prices Order, 1917. The Sale of Coal (Ireland) Order, 1919, was suspended by the President of the Board of Trade on June 3, to take effect as from June 7.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for May 27 and June 3.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of firm or agent.	MATERIALS.	Reference number.
British West Indies	Galvanised sheets, colours, paint, varnish, leather	751
"	China, glassware	752
Canada	Oleine (45 to 95 per cent.)	748
"	Chemical fertilisers, gelatin, china clay, light magnesium carbonate, shellac	790
"	Chemicals	796
South Africa	China, glassware, cotton waste, galvanised sheets	749
Belgium	Copper, tin, zinc, aluminium, antimony, lead, bronze	754
"	Metals for constructional purposes	755
"	Coke, tinplate	756
"	Paraffin wax, caustic soda, sodium sulphate, materials for the manufacture of paint	759
"	Coal-tar products, firebricks, gas oil, asbestos packing	799
"	Drugs, pharmaceutical products, gelatin, gums	800
"	Chemical and pharmaceutical products	801
France	Colours, paint, varnish	765
Germany	Copper, tin, tinsheet, tinplate	806
Greece	Tinplate, zinc	808
Italy	Chemicals, soap, mineral oil	772
Norway	Iron, metals	810
Poland	Chemical and pharmaceutical products, pigments, colours	776
Spain	Indigo, anilines, caustic soda, citric acid, tartaric acid	777
Tripoli	Porcelain, glassware, colouring materials, sugar	781
United States	Rolling mill products, tool steel	812
Cuba	Chemicals	783

MARKET SOUGHT.—A firm in Morocco able to export fenugreek, coriander, cumin, and other seeds wishes to get into touch with importers in the U.K. [782.]

TARIFF. CUSTOMS. EXCISE.

Argentine.—Under certain conditions the export of 100,000 tons of sugar is allowed during a period of 90 days from May 22.

Australia.—The export of copra is now permitted, but the embargo on the export of copra from the late German New Guinea, except to Australia, is still in force.

Import and export trade is now permitted, under certain conditions, with Palestine, Syria and Mesopotamia.

Barbadoes.—The prohibition of the export of fancy and choice molasses has been revoked as from April 13.

Belgium.—Certificates of origin and import licences are still required for, *inter alia*, colours with aniline base imported from Germany.

The regulations affecting the labelling of pharmaceutical specialities have been amended with effect from March 1.

Canada.—The revised regulations governing drawback are set out in the issue for May 27.

The new budget removes the war tax of $7\frac{1}{2}$ per cent. on imported goods under the Intermediate and General Tariffs. The duty on spirits, essences, perfumes and medicines containing spirit has been increased by $2 per gall.

Cuba.—The *ad valorem* rates of duty are calculated on the rate of sterling exchange between London and New York on the date of the invoice, provided no attempt has been made to undervalue the goods.

Czecho-Slovakia.—Copies of the customs tariff in Czech and German may be seen at the Department. The tariff is mainly the same as the pre-war "general" tariff of the Austro-Hungarian Empire, but numerous additions have been made to the free list, which now includes oil-seeds, fats, dyeing and tanning materials, gums, resins and raw textile materials.

France.—The export and re-export of chicory root and celluloid is prohibited.

The "surtaxe d'entrepôt" on nitrate of soda has been re-imposed as from May 13.

France and Algeria.—The export of resinous wood in logs for the manufacture of cellulose pulp and of round fir wood in the rough is prohibited as from May 14.

Germany.—Import licences are no longer required for certain feeding stuffs and artificial fertilisers.

The "agio" leviable when customs duties are paid in paper money is fixed at 700 per cent. from May 25.

Gibraltar.—An export duty of 1s. 6d. per ton has been levied on all fuel oil.

Iceland.—The regulations affecting imports are set out in the issue for June 3.

Mexico.—A surtax of 2 per cent. of the amount of the Federal taxes has been imposed ou all exports and imports.

Netherlands.—Export prohibitions have been removed from, *inter alia*, brewers' pitch, cow hair, certain woods, horn, artificial horn, turkey red oil, and other sulphonated oils.

Portugal (Mozambique).—A copy of the customs tariff may be seen at the Department. Among the articles affected are acetic acid, alcohol, alcoholic beverages, gasoline, edible oils, opium, paper, cardboard, perfumery, candles, glassware, syrup, sugar, whale oil, and certain organic manures.

Rumania.—The regulations governing the control of exports are given in the issue of May 27. The 20 per cent. *ad valorem* surtax has been abolished. Customs duties when paid in paper are fixed at five times the rates prescribed by the tariff.

Serb-Croat-Slovene Kingdom.—New regulations affecting exports came into force on April 16. The export of certain articles of prime necessity is prohibited except under certain specified conditions. The export of all other goods is free but subject to conditions of sale and payment.

Sierra Leone.—The export of gum copal is prohibited for three years from September 30, 1920.

Spain.—The customs duties on coal tar dyes are fixed at 1 peseta 30 centavos per kg. for powder or crystals and at 50 centavos per kg. for paste or liquid as from May 27.

Switzerland.—The export of malt, milk powder, and certain feeding stuffs is now covered by general export licence.

United States.—The import duties on certain kinds of paper have been amended.

REPORT.

REPORT TO THE BOARD OF TRADE OF THE DEPARTMENTAL COMMITTEE ON THE NON-FERROUS MINING INDUSTRY. *Pp.* 46. (*Cmd.* 652. 9*d.*) *H.M. Stationery Office.* 1920.

The Committee, appointed in August, 1919, to investigate the condition and possibilities of non-ferrous mining and to make recommendations as to Government action, confined its attention to the ores of tin, lead, zinc, tungsten, arsenic, barytes and fluorspar. The mining of copper ore in this country has practically ceased, but it is probable that certain mines in the Camborne-Redruth area, abandoned when the copper production failed, would yield tin if developed at a lower level.

Tin.—The production of black tin is confined to Cornwall and Devon and amounted to 6378 tons in 1918 compared with 15,000 tons in 1890. The decreased output is attributed to the fall in value of the metal after 1890, together with foreign competition, exhaustion of the shallower and richer veins of the mines, increased costs of extraction and pumping, and restriction of development work during the war. The financial organisation of the industry in the past was conducive neither to systematic development nor to stability of the operating companies, and practically the only companies which have survived a long period of depression are those possessing superior organisation, equipment or ore deposits. A summary of accounts of four of the larger companies shows that 1918 was a year of comparative prosperity, but that this was due to the exceptional values of by-products, viz., wolfram and arsenic. There was a decrease in the yield of black tin per ton of ore crushed from 32.43 lb. in 1908 to 25.81 lb. in 1919, accompanied by a heavy increase of working costs. Many mines are now working with a grade of ore which cannot yield a profit unless economy in working or more efficient extraction be effected. The actual increase in labour costs between 1913 and 1919 was 60 per cent., but it would have been 75 per cent. if a normal amount of development work had been done; about 57 per cent. of the increase in expenditure is due to the increased cost of coal.

The future is considered hopeful, as there has been a steady rise in price since the spring of 1919, a fact which has considerably altered the position of the industry.*

Many of the larger mines have been able to make more stable commercial arrangements with the smelters. Improvements in the recovery of black tin from the ore (at present only 65—70 per cent.) are being investigated by the Tin and Tungsten Research Board; the adaptation of the flotation process to the separation of black tin gives promise of higher yields. Increased labour costs must be anticipated but friendly relations exist with the employees, all the work being done by contract. Many working costs can be decreased by better organisation, by improvements in tin-dressing plants, and by amalgamation of adjacent properties. Several amalgamation schemes were submitted to the Committee but no opinion is expressed as to the advantages to be gained.

Wolfram.—A large proportion of the 302 tons of wolfram produced in 1918 was obtained from tin mines; attempts have been made to develop three properties for wolfram only, but these have now ceased owing to the fall in price from 60s. to 30s. per unit.

Arsenic.—The 1918 output of white arsenic was 2349 tons derived mainly from the "arsenic soot" resulting from the roasting of tin ores.

* The Report is dated March 17, 1920.

Lead and Zinc.—The production of lead ores, found together with zinc on certain horizons of the Lower Carboniferous formations in the north of England, in North Wales, and Derbyshire, and of the Lower Palaeozoic formations in Wales, Shropshire, the Lake District and Lanarkshire, has decreased steadily from 80,850 tons in 1877 to 14,784 tons in 1918. This was due to low prices following upon the development of Spanish, Mexican, and Australian supplies and to the exhaustion of shallow workings. The output of dressed zinc was only 9025 tons in 1918, compared with an average of over 20,000 tons prior to 1908. Labour shortage caused a rapid decrease during the war and the present outlook is discouraging owing to high smelting costs and to the importation of Australian concentrates. There is need for greater co-operation between the mine owners and the spelter makers to overcome the difficulty of marketing small parcels of blende and of smelting blendes containing high proportions of calcium fluoride, barium sulphate, and lime; it was suggested that advantage would be gained by mixing the coarser British concentrates with the finer Australian concentrates. It is recommended that the Government should consider a guaranteed price for home-produced blende of £1 per ton above the cost of Australian concentrates in this country.

Barium.—The home output of barium minerals increased steadily up to 50,045 tons in 1913, and the 1918 output was 66,360 tons. It is probable that the home production mainly consisted of "off-colour" barytes and that the imports were of a higher quality. There is a demand for more high-grade barytes in the paint and paper trades than is produced in this country, but producers have difficulty in selling lower grade materials. Attempts are being made to improve the grinding, grading and bleaching of the product; one process being tried consists of wet grinding and continuous elutriation.

The industry is in an unsettled condition owing to the fear of foreign competition, and it has been suggested that it should be protected against dumping.

Fluorspar.—The 1918 production of fluorspar was 53,498 tons; of this, 30,000 tons was used in this country for fluxing purposes and in the glass industry, and the remainder was exported to Canada and the United States. A considerable quantity is produced from the tailings from lead-dressing plants and from waste dumps, etc.

Recommendations.—The mining industry suffers owing to the railway rates applicable to valuable ores and to the incidence of taxation upon the profits of a wasting asset. The relationship between lessor and lessee and between neighbouring lessees and the different systems upon which royalties are fixed present complicated problems which some new authority should have power to settle. Only two members of the Committee favour the nationalisation of the industry. It is recommended that a Department of Mines should be established to centralise the various duties relating to the mining of minerals other than coal, and that a Mines Tribunal similar to the Railway and Canal Commission should have power to decide, upon appeal, all questions relating to leases, etc., and to compulsory orders of the Department (*cf.* J., 1918, 477 R). The proposed Department should undertake geological work connected with the underground structure which at present is not the main function of the Geological Survey, and it should be made compulsory on mine owners to deposit, and to bring up to date both surface and underground plans, standardised somewhat on the lines of South African practice.

The existing Mineral Resources Development Branch of the Board of Trade should be provided with a suitable technical staff to advise upon technical questions and development schemes, and which should ultimately form part of the new Department. A more efficient and more comprehensive system for the collection and distribution of statistics is recommended.

The personnel of British mines has played such an important part in the expansion of mining in the Empire that exceptional measures to maintain the industry are justified, and it is recommended that the Government should take power to extend financial assistance to mining companies to assist them in times of depression and to undertake exploration and development work, the funds of the Development Commissioners being made available for this purpose.

In the appendices attached to the Report are given details of the mines, works and machinery regulations in South Africa, of the Australian schemes of State aid for mining, and of the annual output, yield and price of the various minerals. (See also pp. 194 R—195 R of this issue.)

COMPANY NEWS.

BRITISH COTTON AND WOOL DYERS' ASSOCIATION, LTD.

The annual meeting was held in Manchester on May 21. Mr. A. Hoegger presided. The chairman, in his address, referred to the criticisms levelled against British dye manufacturers and the Government on account of the inadequate supply of dyestuffs, and said that, in view of the complexity of the problem, there was no doubt that British makers of dyes had achieved remarkable results—results which those conversant with the industry would have considered barely possible. Nevertheless, there was much left to be done in regard to colour effects, variety of shades, brilliance, and fastness. Had it not been for the Swiss dyes available and the timely arrival of some "reparation" colours, quite a number of the company's branches would have suffered severely. Doubtless the very greatly increased demand for dyes and the scarcity of intermediates had been potent factors in the short supply. The first consignment of the dyes purchased in Germany by the committee of the Colour Users' Association (*cf.* J., 1920, 94 R, 116 R) had arrived, but only a small proportion of those due under the Peace Treaty had been received, and the proportion distributed was still smaller. With regard to the shortage of intermediates, steps were being taken to bring together dye-makers and British chemical manufacturers with a view to relieving the situation. He was still of the opinion that the first step in building up a successful dye industry should be to found a State-aided establishment for the manufacture of intermediates. The dye users had not suffered from the rise in the prices of dyes, as this had happened in all countries.

The accounts for the year ended March 31, 1920, show a net profit of £151,090 after providing for tax, duty, depreciation, etc. A dividend of 10 per cent. is declared on the ordinary shares, £68,541 is placed to the reserve fund, and £39,003 is carried forward. The issued ordinary share capital is £580,624. The company's investments include £31,311 in the British Dyestuffs Corporation, Ltd., £6000 in British Alizarine Co., Ltd., and £48,750 in National War Loan, etc. On March 31 last the total liquid assets were valued at £1,017,425, against which there were trade and loan creditors' claims for £501,114.

SYNTHETIC AMMONIA AND NITRATES, LTD.

Messrs. Brunner, Mond, and Co. have formed the above company, with a capital of £5,000,000, to take over from the Government the manufacture of nitrogen products from atmospheric nitrogen, and to develop this manufacture on a commercial scale. By agreement with the Government, the company will always be under British control, the directors are to be British-born, and the first directors are to be approved by the Government. The works will be situated on the site purchased from the Government at Billingham-on-Tees (*cf.* J., 1920, 139R), and it is proposed to erect at once a plant for the production of 100 tons of 100 per cent. ammonia per day, with provision for a rapid extension to 300 tons per day, equivalent to 150,000 rising to 450,000 tons of sulphate of ammonia per annum. The chief product, however, will be ammonium chloride, which will be manufactured simultaneously with sodium carbonate, and it is hoped that the agricultural community will eventually adopt this form of fertiliser, thereby enabling it to obtain supplies of nitrogenous fertilisers at a reduced cost. Explosives Trades, Ltd., has undertaken to purchase its requirements of ammonia from the company, and to erect plant, to the extent desired by the Government, for its conversion by oxidation into nitric acid and explosives derived therefrom. The technical staff of the company has made a thorough inspection of the works at Oppau in Germany, which has produced at the rate of 250 tons of 100 per cent. ammonia per day, of the nitrogen plant belonging to the United States Government at Sheffield, Alabama, and the General Chemical Company's plant at Laurel Hill, New York; also of the experimental plant working the process of M. Georges Claude at La Grande Paroisse. The experimental plant of Dr. E. B. Maxted, of Gas Developments, Ltd., together with the relevant information and patents, has been purchased.

As already intimated, the process selected by the company is essentially a modified form of the Haber process, and this has been worked out entirely without German assistance. All enemy patents bearing on the process have been placed by the Government at the company's disposal, and the royalties upon them will be paid to the Custodian of Enemy Property for account under the reparation clauses of the Peace Treaty. In general, the Government has undertaken to give the new company every possible assistance in the development of the process.

BRITISH SULPHATE OF AMMONIA FEDERATION.

A non-profit company, limited by guarantee, has been registered under the above title with the objects of trading in sulphate of ammonia, promoting its use at home and abroad, etc. The management is vested in a council, each member of which must be a British subject and a producer of at least 10,000 tons of sulphate of ammonia yearly, or represent a firm or group of firms, companies, etc., producing this amount. In addition there will be separate representatives from each of eight districts into which the country has been divided for the purpose, the number for each district being determined by the number of multiples of 10,000 tons of sulphate of ammonia produced within it. It is also intended that different methods of production (coke ovens, gas works, iron works, Mond process, shale works, etc.) shall as far as may be practicable be separately represented on the council. The secretary of the Federation is Mr. H. Jones, and the registered office, 30, Grosvenor Gardens, S.W. 1.

TRADE NOTES.

FOREIGN.

Swiss Exports of Artificial Silk.—In 1918 Switzerland exported artificial silk to the value of 1,960,000 francs, but owing to the general shortage of this material, the exported value rose to 16 million francs for the first nine months of 1919, the chief consumers being North America (7 million francs), France (2 million fr.), Spain (1,880,000 fr.), Italy (1 million fr.), and England (400,000 fr.). These figures do not include exported manufactures of artificial silk, which were of considerable value.—(*Z. angew. Chem., Mar.* 9, 1920.)

Washing Soda Prices in Germany.—New prices have been officially fixed for sodium carbonate cryst. varying from 28.30 marks per 100 kg. in lots of 10,000 kg. to 32.50 mk. for quantities of 50 kg, all at the factory. These prices have been based on an hourly wage of 2 mk., and in factories where this wage is higher or lower than 2 mk. prices can be raised or lowered at the rate of 70 pfg. per 100 kg. for every 10 pfg. increase or decrease in wages. Wholesale merchants are to sell at the above prices plus 0.80 to 14 mk. net, according to quantity (freight extra); middlemen may charge an additional 0.40 to 10.50 mk. (freight extra), and retailers 25 mk. per 100 kg. as from May 1 last. The above prices are inclusive of packing. Prices for other sorts of sodium carbonate have been fixed accordingly.—(*Chem. Ind., May* 5, 1920.)

Sweden's Foreign Trade in 1919.—The export of iron ore from Sweden in 1919 amounted to 2,420,000 tons, or about half the quantity for the previous year. The exports of iron and steel also decreased from 363,000 tons in 1918 to 223,000 tons in 1919. An improvement took place in the wood pulp and paper exports, but the amounts were still below the pre-war figures. Paper and pasteboard exports amounted to 140,000 and 20,500 tons respectively, and sulphite pulp to 900,000 tons. The figure for matches—28,500 tons—was approximately the same as for 1918, but the exports of machinery and instruments improved from about 113 to 142 million kronor (krona = 1s. 1½d.). As regards imports, coal remained stationary at 2,220,000 tons, mineral oils increased from 40,000 to 162,000 tons, and fatty oils amounted to 24,000 tons, an increase of 23,400 tons over 1918. The imports of iron and steel were 113,000 tons, compared with 100,000 tons in the previous year; steel manufactures and railway supplies also showed large increments. The value of imported machinery and implements was 60 million kr. (36 million kr. in 1918), and the imports of textiles and foodstuffs also showed large advances.—(*Bull. Dept. Trade and Com., Canada, April* 26, 1920.)

Costa Rica in 1918.—With a climate varying from tropical to temperate, and with rich soil and abundant rainfall, Costa Rica is capable of great agricultural development. Gold mining and lumbering have long been established, but manufacturing on modern lines is limited and likely to remain so. The chief industries are coffee growing, banana and cacao cultivation. Gold and silver are produced, and manganese was mined on the Pacific coast throughout the year. The imports, valued at £747,004 (£1,119,048 in 1917), included 104,405 kg. of drugs and chemicals, valued at £15,558, and were mainly supplied by the United States (90·46 per cent.), Spanish America (6·36 per cent.) and the United Kingdom (1·74 per cent.). The exports amounted to £1,924,774, compared with £2,276,433 in the previous year, and included:—Cacao, 958,236 kg. (£47,586); coffee, 11,451,719 kg. (£740,725); hides and skins, 284,316 kg. (£25,309); rubber, 11,011 kg. (£2015); and sugar, 322,704 kg. (£7278). Gold and silver worth £133,120 and 9893 tons of manganese ore, worth £61,875, were shipped to the United States during the year. During the war, balsa and cohune nuts were shipped for use in war industries.—(*U.S. Com. Rep., Mar.* 2, 1920.)

Madagascar in 1918.—During 1918 there was little activity in the mining industry of Madagascar, the production of gold and graphite showed large decreases, and the total trade of the colony showed a diminution as compared with 1917, largely owing to transport difficulties. The imports and exports in 1918 were valued at £3,947,615 and £3,542,812, respectively, compared with £5,279,344 and £8,606,972 in 1917. The imports included:—Candles, 76 metric tons (£12,405); cement, 1632 tons (£18,902); chemicals, 569 tons (£31,640); coal, etc., 19,155 tons (£141,207); hydrated lime, 307 tons (£3550); matches, 38 tons (£13,159); medicinal compounds, 61 tons (£19,413); manufactured metals other than machinery, 3068 tons (£469,267); olive oil, 84 tons (£19,342); petroleum and mineral oils, 748 tons (£28,880); paints and dyes, 299 tons (£33,310); soap, £165,607; sugar, 1332 tons (£51,518). Among the exports were:—Mangrove bark, 133 tons (£515); beeswax, 267 tons (£37,146); cacao, 81 tons (£18,773); cloves, 143 tons (£24,853); coffee, 321 tons (31,013); corundum, 174 tons (£3020); gold dust, 20,672 oz. (£74,552); graphite, 15,015 tons (£260,815); hides, 3934 tons (£242,149); minerals, 13,394 tons (£122,760); oil fruits and seeds, 552 tons (£6006); oils, volatile or essential, 11,389 lb. (£5831); raffia fibre, 4147 tons (£128,075); rubber, 10 tons (£2615); vanilla, 623,902 lb. (£163,798). France's share in the total trade of the colony amounted to 54 per cent., while the share of the United Kingdom and British colonies was 8 and 18 per cent. respectively, as against 8 and 8 per cent. in 1917.—(*U.S. Com. Rep., Suppl., Mar.* 3, 1920.)

Foreign Company News.—*Germany.*—The following figures are taken from the reports of the companies named covering the year 1919, the figures in parentheses being those for the previous year:—Fr. Bayer u. Co., net profit 29,077,840 marks (13,088,188), dividend 18 per cent. (20). Meister Lucius u. Brüning, amount written off 15,529,905 mk. (23,747,496), including 1,335,497 mk. (2,779,068) brought forward; balance 24,217,861 mk. (14,955,603), dividend 14 per cent. (12) on the share capital of 90 million mk. Chemische Werke vorm. H. and E. Albert in Amöneburg-Biebrich, trading profit 5,454,846 mk. (4,356,576), net profit 4,159,918 mk. (2,973,711), dividend 30 per cent. (20).

The patents of Profs. Erdmann and Bedmann relating to the hardening of oils are to be worked by a new company, called the "Oelwerke Hydrogen" in Ammendorf, near Halle. The provisional capital is 290,000 mk.—(*Z. angew. Chem., May* 14, 1920.)

Rumania.—A company, the "Industrie Chimique Roumanie," has recently been formed at Bucharest with a capital of 10 million lei (£400,000) for the purpose of manufacturing chemicals from local raw materials. As pre-war imports of chemicals from Germany amounted in value to £580,000, and as the necessary raw materials exist in Rumania, a ready market is assured. A partially-equipped factory has been obtained in Bucharest and another will be established for the manufacture of wood aclohol.—(*U.S. Com. Rep., Mar.* 16, 1920.)

According to H.M. Commercial Secretary at Tokyo, a company, the Tairiku Boeki Kabushiki Kaisha (the Continental Trading Co., Ltd.) has been formed in Tokyo with a capital of 10 million yen (yen=2s. 0½d.), in 200,000 shares of 50 yen each, with the object of opening up trade with Germany and capitalising and encouraging enterprises in both countries. The co-operation of two German experts has been obtained, and Japanese have been sent to study conditions in Germany.—(*Bd. of Trade J., Apr.* 22, 1920.)

REVIEW.

THE PHOTOGRAPHIC RESEARCHES OF FERDINAND HURTER AND VERO C. DRIFFIELD. *Edited by* W. B. FERGUSON. *Pp.* 374, *with* 16 *illustrations and numerous diagrams.* (*London: The Royal Photographic Society of Great Britain.* 1920.) *Price* 25*s. net.*

This volume marks the culmination of the efforts of the Royal Photographic Society to establish a memorial to Hurter and Driffield, and here for the first time all the important papers of these two pioneers in the application of science to photography have been collected together in a convenient form and in chronological order. Consequently the interest of this book is not only scientific but historic, and as these papers are scattered throughout the chemical and photographic literature in a most haphazard way the advantage of having them together in one volume may well be realised. It is noteworthy that although more than twenty years have elapsed since Hurter and Driffield devised their system of sensitometry, and although later work has rendered the validity of many of their assumptions doubtful, their methods are employed substantially unchanged at the present day.

The reprints of these papers are preceded by an article on the early work of the authors, which must have involved the editor in a very laborious study of the original manuscripts, now preserved in the rooms of the Royal Photographic Society, and this introduction not only explains the early ideas of Hurter and Driffield, but also makes the succeeding papers much more easy to follow. In addition to the reprints themselves, the volume also contains the criticisms of the authors' views which were made at the time by Abney and others, and their replies, thus providing a complete account of the growth of the science of sensitometry and such closely allied subjects as photometry and actinometry.

The papers are too numerous to mention in detail, but in particular Hurter and Driffield's paper, first printed in the *Journal of the Society of Chemical Industry*, of 1890, is now almost a classic, as it placed photography, up to this time carried on largely by rule-of-thumb methods, upon a firm scientific basis and opened the way for its future advancement. Following this reprint is a series of papers on photometers, the theory of photographic reproduction, the latent image, etc.; and the work concludes with an exceedingly valuable bibliography of all the more important papers which have been published upon physical and chemical problems bearing upon photography, which alone would prove invaluable to workers in this field, and which, combined with the complete history of the subject in the body of the work, provides a valuable addition to photographic literature.

G. I. HIGSON.

PUBLICATIONS RECEIVED.

MEMOIRS OF THE GEOLOGICAL SURVEY. SPECIAL REPORTS ON THE MINERAL RESOURCES OF GREAT BRITAIN. (*London: H. M. Stationery Office.* 1920.)

VOL. VI.—REFRACTORY MATERIALS: GANISTER AND SILICA-ROCK; SAND FOR OPEN-HEARTH STEEL FURNACES; DOLOMITE. *Second edition. Pp.* 241. *Price* 7*s.* 6*d. net.*

VOL. XV.—ARSENIC AND ANTIMONY ORES. *By* H. DEWEY, J. S. FLETT *and* G. V. WILSON. *Pp.* 59. *Price* 3*s.* 6*d. net.*

REPORT OF THE CHEMICAL SERVICES COMMITTEE (INDIA). *Pp.* 121. (*Simla: Superintendent, Government Central Press.* 1920.)

THE USE OF COLLOIDAL PREPARATIONS IN MEDICINE.*

H. H. DALE.

The science and practice of therapeutics exhibit, almost of necessity, a special liability to the influence of vogues and fashions, waves of exaggerated interest, from which even the more exact sciences are not wholly immune. New lines of treatment are suggested with growing frequency by developments in the neighbour sciences, and the conscientious physician must often find his judgment hesitating between a reluctance to deny to his patient the chance of benefit from some widely advocated treatment, and a desire to restrict his practice to measures of which the rational basis is fairly intelligible to him. It is impossible, however, that he should keep pace with all modern developments of physics and chemistry, and his modesty will forbid him to be too critical of a proffered explanation, on the mere ground that its meaning is not perfectly clear to him.

The attitude of many medical men to the colloidal preparations, now so widely advertised, seems to afford a good example of this situation. They know, in a general way, that the investigation of the properties of colloidal solutions, and of the part which these properties play in vital processes, is a centre of interest, one of the recognised "growing-points" of biological science at the moment. They read clinical records of therapeutic effects attributed to the use of colloidal remedies. There does not seem to be any clear connexion between the two, but an impression grows up that there is something mysterious about the colloidal condition, some efficacy as yet incompletely understood, and any therapeutic claim comes to have a chance of being treated with a peculiar respect if the preparation on behalf of which it is made is stated to be "colloidal."

In these circumstances any attempt to give a clear and simple statement of what is known about the colloidal state, of the properties which this physical condition entails, and of the bearing they might be expected to have on therapeutic problems, would be very welcome. It is with the hope of finding such a plain, balanced statement, therefore, that one opens the volume entitled "Colloids in Health and Disease," in which Mr. A. B. Searle has published his Chadwick lectures; and such hope is encouraged by Sir Malcolm Morris's statement, in a "Foreword," that the book contains "lucid expositions of ascertained results . . . written by an acknowledged master of the subject." It must be admitted that confidence is already somewhat shaken by the rest of the "Foreword." Perusal of the volume has apparently left its sponsor in a state of mind in which he considers it "an obvious *desideratum* that the drugs employed to combat disease should be in the colloidal state," because vital processes, including the immunity reactions, take place in a colloidal system. It has apparently left him content also with a definition of the colloidal state as "a form in which they may be isomorphic and isotonic with the elements of the body"—a statement in which it is curiously difficult to discover any meaning.

When one turns to the book itself the feeling of disappointment rapidly gains the upper hand. In the earlier chapters one feels that Mr. Searle set out with the good intention of giving a simple and lucid exposition, but he soon gets carried away by the unbalanced enthusiasm, which one had hoped his book would help to regulate and to replace by sane appreciation. We soon meet with the all-too-prevalent tendency to invoke the colloidal condition without reason, as when it is suggested that substances like soap reduce the surface tension between dirt and water, because they are in the colloidal condition (p. 34). But it is the physiological and therapeutic deductions which form Mr. Searle's main objective, and which provide the material for the greater part of his book; and it is not long before these awaken suspicion of the author's equipment for his task. He soon finds himself in unnecessary difficulties, caused by his determination to find colloids everywhere. Thus we are told, on p. 16, that peptones are colloidal, and "in the laboratory their solutions do not pass through animal and vegetable membranes." Not only peptones, but all the products of digestion are "essentially colloidal" (p. 43), for which reason, apparently, "there can be no general cure for all forms of indigestion" (p. 44). But this assumption, in the face of the evidence, that the products of digestion are colloidal makes it difficult to explain their passage through the mucous membrane of the alimentary canal, and necessitates the further unfounded assumption that "in the presence of a crystalloid, such as common salt, the passage of colloidal sols through the membranes is considerably increased." Hence—a veritable triumph of deduction—"the advisability of eating salt with so typical a colloidal gel as a boiled egg is seen to be based on a physiological requirement" (p. 43). But if salt, according to Mr. Searle's physiology, will get a boiled egg through the alimentary mucous membrane—and it is difficult to find any other meaning for his statement—digestion becomes a mere hobby.

There is no indication that our author is joking; on the contrary, he seems to have the seriousness of a devotee, and as he progresses through his lectures we lose, more and more, the scientific expositor in the apostle of a creed. In vain one looks for a consistent statement of the manner in which the colloidal state affects the therapeutic action of a substance. Vague generalities we find in plenty—as, for example, that "the fact that the blood is a typical complex colloidal fluid is now accepted, and this is the basis of the treatment of numerous diseases" (p. 27). We hear much, too, of a "normal colloidal state of the body fluids," which injection of suitable sols can maintain or restore. Sometimes the author seems inclined to pin his faith to the electric charge carried by the colloidal particles as the secret of their action, as when we are told that "for deep-seated affections better results may be anticipated from the introduction of suitably charged particles (colloidal sols) into the blood stream" (p. 19), than from radiation. But when he comes to discuss the results of the application of different colloidal preparations in practice, such theories of their action are apparently forgotten altogether. Even the experimental observations put forward as to the action of the different sols in the laboratory seem to be either irrelevant or even contradictory to the therapeutic indications given. For example, we are told on one page that colloidal platinum has no germicidal action (p. 73), on another that "colloidal platinum, though too powerful for use in medicine, has been employed to a limited extent for the same diseases as colloidal silver" (p. 97), which is recommended for the germicidal action which the platinum sol does not exhibit. The author soon finds himself reduced to the statement that one or another colloidal preparation has been used with "remarkable and surprising results," as shown by clinical records quoted from the medical journals. All kinds of effects have been observed, reported or found, occasionally of a startling nature, as when we read that "it is found that the amino-acids are readily able

* "The Use of Colloids in Health and Disease." By A. B. Searle, with foreword by Sir Malcolm Morris. (London: Constable and Co., Ltd., 1920.) Price 8s. net.

to absorb into their complex molecule a notable proportion of iron administered in the colloidal form, and from it to effect the synthesis of hæmoglobin."

It is truly amazing to find a statement of this kind made without citation of authority, but merely the bare assertion "it is found," in the midst of clinical records quoted in full detail, without any attempt at explanation of the results described in them. This sort of thing may be good advocacy, but it is not "lucid exposition." Mr. Searle had a fine opportunity to supply the need for a simple and careful statement of what is really known concerning the *rôle* of colloids in therapeutics; it is a matter for regret that he was unable to avail himself of it to better purpose.

And what, after all, does this knowledge amount to? All will agree, in the first place, that in dealing with living cells and organisms we are dealing with very complex colloidal systems. It may be admitted, further, that there are a few experimental examples of physiological actions produced by chemical substances, which can be attributed wholly to the electric charge which their ions carry—*e.g.*, the effects of the trivalent kations of certain rare earths on the action of the heart muscle. Note that this is an effect produced on the colloids of heart muscle, not by charged colloidal aggregates, but by ions. It may further be stated that there is as yet no known example of an effect of this kind, produced either by crystalloids or charged colloids, which has any therapeutic application, nor any known therapeutic effect which can be explained along these lines. In the present state of knowledge, therefore, there seems to be no warrant whatever for attributing a therapeutic action, produced by a colloidal preparation, to the electric charge carried by its particles.

It is true, again, that certain of the phenomena of immunity visible in the test-tube—agglutination, specific precipitation—show points of suggestive, though incomplete analogy with some of the phenomena shown by colloidal sols. We are not entitled to say more than that such reactions are apparently conditioned by the colloidal nature of the interacting substances; the specificity of the reaction has no analogy in any phenomenon depending on colloidal properties alone. The mere fact that antitoxins and other antibodies are colloidal, like all other proteins of the blood and tissues, affords no basis for the suggestion that other substances, if in the colloidal condition, will have an action of the same kind. Mr. Searle puts forward, as "now admitted," a suggestion that the body is rendered liable to invasion by germs by a disturbance of "the normal colloidal condition of any of the more important body fluids," and indicates as the aim of treatment the maintenance of this "normal colloidal condition." So far from this being "admitted," it may be doubted whether anyone acquainted with the facts of pathology would be able to attach any definite meaning to such a statement. Still less can it be taken for granted that the "normal colloidal condition" can be maintained or restored by the introduction into the body of colloidal chemicals foreign to its constitution.

There are, again, some interesting and suggestive analogies between the action of certain metallic sols in catalysing chemical reactions and the action of the specific, organic catalysts known as enzymes. As yet, however, there is no logical connexion discernible between these effects and the therapeutic results which have been recorded with some of the same preparations.

What, then, is left as a rational basis for the use of colloids in medicine? Not a great deal, it must be admitted, but sufficient to support a modest claim. In the first place, it may reasonably be suggested that they may have value, not because they are peculiarly active, but for the very opposite reason, that they provide a depôt or reservoir of inactive material, from which active material is slowly but steadily supplied as the substance passes into true solution. Salvarsan, for example, which is injected in alkaline solution, and is practically insoluble in water at the reaction of the blood, must circulate in colloidal solution, protected from aggregation by the plasma proteins. There is no definite evidence that this physical condition plays any direct part in the action on the spirochaetes of syphilis; on the contrary, neosalvarsan, which is truly soluble in water at the neutral reaction of the blood, has an immediate effect of similar potency. But in all such effects time is an important factor as well as intensity; and whilst the soluble neosalvarsan is to a large extent excreted rapidly, the insoluble salvarsan remains longer in the body, passing only slowly into true solution and acquiring thereby a more prolonged and effective action.

Similar considerations possibly apply to some of the metallic sols. Mr. Searle, in what looks like a momentary lapse from colloidal orthodoxy, points out that "the germicidal power of certain metallic salts depends to a large extent on the degree of ionisation." One hoped, in vain, to find him proceeding to the logical deduction that the germicidal action exhibited by certain metallic sols, such as that of silver, when directly applied to an infected surface, may be attributable to the presence of a small proportion of the silver in the ionised condition. A really good case could be made for the use of a colloidal preparation, for certain purposes, on these lines, in that its aggregates would furnish a depôt from which the low concentration of ions could be continuously maintained—a concentration sufficient to inhibit bacterial multiplication, but never rising high enough to irritate sensitive structures or injure the tissue cells. Such depôt action, by almost insoluble materials, is no new thing in therapeutics, nor is it peculiar to colloids. Ointments containing calomel, mercuric oxide, or metallic mercury must produce their well-known effects by such slow, persistent liberation of mercury ions; the mild antiseptic action exerted by bismuth subnitrate in its immediate neighbourhood must similarly be produced by such traces of substance passing into true solution. Very probably there are special purposes for which colloidal preparations will furnish the reservoir for this slow, continued action most conveniently; but it must be insisted that it is an action which does not depend on the charge on the colloidal particles, nor on any more mysterious property of the colloidal condition, nor even, so far as the part of the material at any moment active is concerned, on the colloidal condition at all, but on the presence of a very dilute true solution between the colloidal aggregates.

There is another property of colloidal sols which may have importance in a similar connexion, namely, the readiness with which they undergo adsorption on certain surfaces. In the case of silver, for example, which in the ionised condition is an extremely potent germicide, adsorption of the colloidal aggregates from a sol on to the surface of bacteria would presumably increase the concentration of ionised silver in the neighbourhood of each organism. Moreover, it would probably be very difficult to wash away the adsorbed material from the organisms.

Now there are obvious possibilities here of a very valuable localisation of effects *in vivo*. If it were found, for example, that a metal, introduced as a colloidal sol into the circulation, became preferentially deposited in the cells of inflamed or abnormal tissue, so that the effective ions were produced in the greatest concentration where they were most needed, just as salvarsan has been shown to be deposited in local excess in a syphilitic focus—if all this were well established, we should begin to have a really firm basis for the use of some colloidal preparations in appropriate conditions. One of the drawbacks of the present state of affairs, in which an advocacy prepared to assume anything addresses itself to a credulity prepared to accept anything, is that it diverts attention from promising and rational lines of inquiry. There are some effects reported by clinical observers which at present have no rational basis at all. We need not reject them on that account; but, on the other hand, it does not help progress to cite, in explanation, facts which have as yet no perceptible connexion with them. For example, it is well known that colloidal palladium catalyses reductions by hydrogen and decomposes hydrogen peroxide; but this knowledge does not yet help to explain, and should affect in neither direction the confidence with which one accepts, the statement that colloidal palladium stops epileptic fits. The clinical evidence must be critically examined and taken or rejected on its own merits; the statement that the preparation used was "colloidal" must not be allowed to justify belief in what would otherwise be viewed with scepticism. When once this sound attitude is abandoned, we are caught in a tangle of hypotheses without foundation and explanations which explain nothing; we find that the use of the word "colloidal" is expected to justify a claim, for any remedy, that it has all the valuable therapeutic action and none of the incidental dangers or drawbacks of the same substance in the ordinary form; and we find that the literature of the subject is beginning to acquire a jargon of its own, which is too liable to produce in the practical man an attitude of bewildered respect. The word "colloidal" suggests something flabby, amorphous, indefinite; but it is not an "obvious *desideratum*" that these qualities should be reflected in our methods of thinking and writing about colloids; on the contrary, it is peculiarly desirable here to keep our habits of thought and expression clear-cut and crystalline.

THE PEAT RESOURCES OF IRELAND.*

The recent numerous increases in the cost of coal, due to the introduction of shorter hours and higher wages for miners, coupled with decreased production, form a very important factor in the possibility of working economically the peat bogs of Ireland. From 1809 to 1814 about £40,000 was spent on the investigations of the Irish Bogs Commission, which performed excellent work in compiling information with regard to the nature and extent of these bogs and the possibilities of their drainage and cultivation. The Commissioners came to the conclusion that all the bogs could be naturally drained without any great expenditure. The total bog area is 3,028,000 acres, the depth varies from 5 to 18½ ft., and the anhydrous peat available was computed at 3700 million tons. The peat consumption of Ireland lies between 6 and 8 million tons per annum, whilst 90,000 tons of coal are raised and 4,650,000 tons imported into the country. Calculations show that the possible life of the peat deposits is 200 years, and that of the coalfields 20 years, assuming that only one kind of fuel is used and no coal is imported. At the present rate of consumption the peat would last for some 500 years, and the native coal for more than twice that length of time.

Recent trials carried out in Canada and Germany on the application of mechanical methods to the winning of peat have shown that a considerable measure of success in the cheaper production of peat has been attained, and that so far as Ireland is concerned it may be safely assumed that these conditions have now placed peat in a more favourable position to compete with coal. The mechanical dredging of the peat bogs would be attended by great difficulty should these contain much buried timber, but according to the investigations of Professor Cronshaw, of Galway, there is little likelihood of this trouble arising in the case of the Irish bogs. In an undrained bog the peat contains from 90 to 95 per cent. of water, whilst this amount is reduced to 90 per cent. by draining. Although this reduction in moisture is not apparently great, yet it will be seen that one ton of air-dried peat (containing 25 per cent. moisture) is produced from 15 tons of undrained or 7½ tons of drained peat, so that the amount of raw material to be handled in a drained bog is only half of that to be handled in an undrained bog. Hence the difference between success and failure may be decided by the effective draining of the bog. Cut by hand and air-dried, the moisture content of the peat diminishes to 25 per cent. under normal weather conditions. The sustained application of even very high pressure will not reduce the moisture content below 70 per cent., but this condition is attained in about 2 to 3 weeks by ordinary air-drying, whilst a further 5 or 6 days exposure will reduce this figure to 60 per cent. This is the wettest peat that manufacturers have *claimed* to utilise in gas producers, though Haanel denies the possibility of utilising such peat for this purpose, the optimum moisture content being stated by him to be 33 per cent. If dehydrated, peat reabsorbs water to the extent of 16 per cent., and hence this is the practical limit beyond which it is useless to dry peat. Notwithstanding the advance in science and in mechanical and industrial operations, the air-drying of peat by natural means is still the only recognised commercially successful method in use. The drying of peat by artificial heat does not become a practical consideration until the moisture content has been reduced to 70 per cent., and even then it is a very doubtful financial proposition, since to produce fuel with 33⅓ per cent. moisture, the equivalent of over 40 per cent. of the available peat must be utilised to evaporate the excess of water.

The average calorific value for air-dried peat is about 6850 B.T.U. per lb., and its ash content is 3 per cent. The latter increases from the surface downwards, as does the nitrogen from 1·0 per cent. to 2·5 per cent. at the bottom of deep bogs. In a by-product recovery producer it should be possible to recover 100 lb. of ammonium sulphate per ton of air-dried peat.

The season during which peat can be air-dried is limited to the six months from April to September, and this renders it necessary to produce in that season sufficient peat to last for the whole year. It thus happens that a great number of hands is required for a portion of the year, whilst the labour is idle during the winter. This forms a serious obstacle, and it must be met if the peat industry is to be established on a permanent basis. The foregoing considerations furnish a very strong incentive to inventors and others to produce some form of apparatus by which peat may be dried artificially on an economical basis and the industry carried on for twelve months instead of for only five or six as at present. So far no one appears to have succeeded, and even the Ekenberg process is still in the experimental stage.

All the peat in Ireland is at present hand-cut, though in Canada and on the Continent mechanical winning is being largely adopted. In the Anrep and Anderson machines the peat is macerated and the pulp spread out to a depth of 5 or 6 inches to dry. In Germany, tests carried out in 1915 showed that sufficient raw peat to produce 75 tons of air-dried peat was excavated and spread by one machine and five men in ten hours. Thus, the out-

* Abstract of a lecture given before the Royal Dublin Society, March 5, 1919, by Prof. P. F. Purcell. Special Report No. 2 of the Fuel Research Board, 1920.

put of air-dried peat per worker per day was 15 tons, whereas an Irish hand-cutter, catcher, and wheeler spread about 11 tons of raw material per day, or one ton per man per day of air-dried peat.

Attempts have been made from time to time to make paper, building material, alcohol, petrol, and cloth from peat, but the main uses of peat must continue to be for litter, cattle food and fuel (the latter including the various distillation products). Peat dust is also used for packing fruit.

As regards the application of peat to power problems, the moisture present may be utilised to replace partially the steam which would otherwise have to be blown into the producer in the manufacture of semi-water gas. This is a great advantage which the gas producer can claim over the steam boiler, especially as there is also the recovery of by-products to be considered. By burning peat under a water-tube boiler and using the energy in turbo-generators an overall efficiency of 16·4 per cent. may be attained, whilst when burnt in gas producers and used in large power units fired by gas the efficiency is only 9·8 per cent. If the producer gas is used in a gas engine driving a generator the efficiency may be taken as about 15 per cent. In arriving at a sound conclusion as to the best method to adopt for the utilisation of peat, account must be taken of labour, depreciation, maintenance, and capital charges, contrasted with the overall efficiency and the value of the recovered by-products.

NEWS FROM THE SECTIONS.

LONDON.

In place of the usual meeting at Burlington House, a joint meeting with the Institute of Chemistry was held at the Institute's quarters in Russell Square, W.C., on June 7. No papers were read, but there was an exhibition of chemicals and chemical apparatus, which was inspected with interest by a large number of members and fellows. On tho first floor was shown an exhibition of the Sheringham Light, by means of which a reflecting surface above the source of artificial light reduces the excess of rays in the red end of the spectrum, and by thus emphasising the effect of the blue and violet rays causes the light to approach very closely in character to that of daylight from a north window.

In the laboratories on the second floor were shown numerous exhibits of chemical glassware, fine chemicals and apparatus of various kinds:—

S.H.M. Co.: Prof. J. T. Hewitt showed samples of quinine derivatives and phenylhydrazine.

Boake, Roberts and Co.: An exhibit of acetylene derivatives, aldehydes and acetates.

T. and C. Clark, Ltd.: Enamelled iron apparatus.

Mr. C. A. Mitchell: Osborn's comparative microscope, an American device for comparing simultaneously two colours on microscope slides.

Arthur Johnson, Ltd.: "Chinagraph" pencils, for writing on glass, porcelain or polished metals, made in four colours.

Cannon Ironfoundries, Ltd.: Enamelled pans and vessels.

Adam Hilger, Ltd.: Interference refractometers and a polarimeter.

Dr. C. A. Keane: An exhibit of the Pfeiffer gas analysis apparatus.

Aluminium Plant and Vessel Co., Ltd.: Pails, bowls and other aluminium ware.

Cambridge Scientific Co., Ltd.: Optical pyrometer and distance thermometer.

Kestner Evaporator and Engineering Co., Ltd.: Charts and diagrams of double-effect evaporators.

Thermal Syndicate, Ltd.: Samples of the well-known "Vitreosil" silica chemical apparatus.

British Drug Houses, Ltd.: A selection of fine chemicals and chemical indicators.

Scientific Supplies Co., Ltd.: A large exhibition of British-made laboratory glassware of all kinds.

Dr. R. Lessing showed various specimens of contact rings packed in towers for use in fractional distillation.

W. J. Bush and Co., Ltd.: Exhibits of benzoic and salicylic acid derivatives.

Pharmico-Chemical Products, Ltd.: A selection of fine chemicals.

The annual meeting of the Section was held in the Society's Offices, Finsbury Square, E.C., on June 14. Mr. Julian Baker presided.

After a vote of thanks had been passed to Dr. S. Miall, the retiring hon-secretary, and he had replied, it was announced that the committee had elected Dr. G W. Monier-Williams as his successor in office. A ballot for the election of five new members of committee resulted in favour of Mr. A. Chaston Chapman, Prof. W. R. Hodgkinson, Dr. Bernard Dyer, Mr. A. H. Dewar, and Mr. J. Connah. The retiring members are Prof. J. S. S. Brame, Prof. A. R. Ling, and Messrs. A. E. Berry, H. E. Coley, and C. S. Garland.

MEETINGS OF OTHER SOCIETIES.

THE ROYAL SOCIETY.

The Bakerian Lecture was delivered on June 3 by Sir E. Rutherford on "Nuclear Constitution of the Atom." Earlier experiments having indicated that the passage of α-particles through pure nitrogen caused the liberation of long-range particles resembling hydrogen, the nature of the latter was further examined by studying their deflection in a magnetic field. The observations recorded are held to establish definitely that hydrogen is one of the disintegration products of atmospheric nitrogen, and that it is a constituent of the nitrogen nucleus. It was also concluded that short-range particles of atomic mass=3, approx., are expelled from the same nucleus, and independently of the hydrogen; they are also set free from oxygen, but in this case no hydrogen is liberated. These new atoms probably constitute an isotope of helium, the structural difference being that they contain three hydrogen nuclei and one connecting electron, whereas the helium atom consists of four hydrogen nuclei and two such electrons. Evidence was obtained that the expulsion of the new atoms from nitrogen and oxygen is accompanied by liberation of energy.

ROYAL SOCIETY OF ARTS.

At the outset of his lecture on "The Oil Resources of the British Empire," on June 4, Sir John Cadman deplored the recent "newspaper chatter" as to the imminence of British domination over oil supply, and he adduced evidence to show that, with the exception of India, there was nothing to prevent foreigners taking part in the exploitation of oilfields situated within the Empire. The United States, upon which country we must long remain dependent, produces 70 per cent. of the world's output, and controls at least 80 per cent. of the total contribution of North America, including Mexico, to the world's supply; the British Empire furnishes 2½ per cent., or 4½ per cent. if Persia be included. Although it is true that the United States is absorbing more and more of its own supply, and that consequently the surplus available for export is dwindling, pessimistic reports concerning rapid exhaustion of its reserves should be received with caution.

The author then recalled the interesting facts that the deposition of natural petroleum seems to be associated with the tertiary and the carboniferous horizons (when plant life thrived on the earth), and that of the known deposits 49·4 per cent. was produced from the former and 41·1 from the latter. Having in view the enormous extent of these formations and how exceedingly little has been done in prospecting for oil within them, any idea of a permanent famine appears out of the question.

The following statistics were given relating to the production, consumption, and importation of petroleum and petroleum products in the British Empire (tons):—

Production of Natural Petroleum in 1918.

	Production, 1918 (Tons).
United Kingdom	250,000
Canada	40,000
Trinidad	300,000
India	1,150,000
Egypt	250,000
Australia, New Zealand	10,000
Sarawak	80,000
Total British Empire	2,080,000
Persia	1,500,000
World's Production	70,000,000

Consumption and Production of Petroleum Products.

	Consumption.	Production.
1912	4,212,000	1,421,000
1913	4,713,000	1,519,000
1914	5,467,000	1,563,000
1915	5,184,000	1,629,000
1916	6,128,000	1,655,000
1917	7,485,000	1,774,000
1918	9,038,000	2,078,000

1918.

	Consumption.	Production.
Great Britain	242,500	5,395,000
India	1,146,000	1,292,000
Canada	43,500	1,717,000
Australia	10,300	110,000
New Zealand	600	67,000
South Africa	—	54,000
Egypt	263,000	424,000
Trinidad	291,000	112,000

***Imports and Consumption of Petroleum Products in* 1918.**

Imports of all petroleum products to the United Kingdom.		Consumption in the United Kingdom.	
Origin.	Quantity (tons).	Products.	Quantity (tons).
United States of America	1,800,000	Crude oil	30,000
Mexico	500,000	Kerosene	620,000
Dutch East Indies	120,000	M.T. spirit	650,000
British India	60,000	Lubricating oil	260,000
British West India Islands	130,000	Gas oil	120,000
Persia	90,000	Fuel oil	1,020,000
Total	2,700,000	Total	2,700,000

Then followed a brief review of the present position in regard to oil supply in each zone of the Empire, from which the following items are selected:—

United Kingdom.—The results from the test well at Hardstoft indicate a promising future for British oil. *Canada.*—There are great tracts of country where the geological age and conditions favour petroleum production. *New Zealand.*—The outlook does not at the moment appear very hopeful. *British Honduras.*—Indications of petroleum have been reported, and the Government is considering the question of carrying out a geological survey. *Nigeria.*—The geological conditions as to age and structure are promising. *Somaliland.*—Indications of oil have been met with, and examination of the territory is imminent. *Sarawak.*—The present production (*cf. s.*) should be considerably increased when the material necessary for development can be got to the fields. *British North Borneo.*—It is believed that promising fields exist. *Persia.*—The potential source of this area is prodigious, and a very large output may be expected. *Cyprus.*—It seems doubtful whether oil in commercial quantities will be discovered. *Malta.*—There are rocks of suitable age and structure, and it is probable that test drilling will be undertaken. *Mesopotamia.*—Very little is definitely known of the prospects, although the geological conditions are believed to be similar to those of Persia. As the Government is now considering claims and proposals, further remarks would be inopportune. *Palestine.*—Surface indications have been found, and testing operations will probably be undertaken at an early date.

The paper concluded with a brief historical sketch of the development of the petroleum industry.

THE CHEMICAL SOCIETY.

The lecture room at Burlington House, W., having proved to be entirely inadequate to accommodate the large audiences which attend the lectures, that on Helium, by Prof. J. R. McLellan, on June 17, was held in the lecture theatre of the Institution of Mechanical Engineers, by the courtesy of its Council. Sir J. J. Dobbie presided over an audience of nearly 250 and announced that the Emil Fischer Memorial Lecture would be given by Dr. M. O. Forster on October 21 next. He also made an appeal to British chemists to send donations (by July 31 at latest) in support of the memorial being raised by their French colleagues to the memory of C. F. Gerhardt (1816—1856), the well-known French chemist.

The subject matter of the lecture included data concerning the occurrence and content of helium in natural gas within the Empire, more particularly in Canada; the designs of the modifications of the Claude plant and process utilised, together with yields and possible applications. Prof. McLellan's latest experiments show that it is practicable to isolate on a commercial scale helium of 97 per cent. purity from the natural gas at Hamilton, Ontario, at a cost of less than 2½d. per cubic foot at Hamilton. A fuller account of the lecture will be given in these columns in due course.

Sir Richard Threlfall, who spoke on the vote of thanks to the lecturer, stated that his suggestion to use helium in airships was communicated to the Admiralty as early as October, 1914, and that he was lead thereto by press notices to the effect that the Germans were contemplating the use of an uninflammable gas. A search into the literature, especially into the investigations of Prof. C. Moureu on the dissolved gases in the springs of France, enabled him to show that the use of helium by the Germans was improbable, and then to present in outline a definite scheme of large-scale production from natural gas at Fredonia, Kansas, U.S.A., where the gas was known to be comparatively rich in helium. After a very full investigation, the Admiralty decided, in August, 1915, not to proceed with the scheme, but when America came in, all the information which had accumulated was passed on to that country.

At the meeting held on June 24 no definite decision was reached concerning the proposed increase in subscription.

FARADAY SOCIETY.

At a meeting held on June 14, in the rooms of the Chemical Society, Prof. A. W. Porter presiding, various papers, dealing mainly with electrical conductivity, were read. The first of these, by Dr. A. Fleck and Mr. T. Wallace, dealt with the conduction of electricity through fused sodium hydrate. The resistance was measured between two electrodes immersed in a bath, of 4 ft. diameter, containing about a ton of the alkali. The chief results obtained were:—1. That as the distance between the electrodes is increased, the resistance increases until a maximum value is reached, after which it remains constant. 2. The rate of change of resistance between 320° and 480° C. is 0·102 per cent. fall per 1° C. rise in temperature. 3. The decomposition voltage at 320° C. is 2·332 and the temperature co-efficient is $2{\cdot}25 \times 10^{-3}$ for each 1° C. rise in temperature. In the discussion which followed, the method adopted for measuring the resistance was criticised by some of the speakers.

A paper by Dr. H. F. Haworth on "The Measurement of Electrolytic Resistance using Alternating Currents" followed. The method described consists in the use of a bridge in one arm of which is placed the cell containing the electrolyte (which may be regarded as a resistance in series with a capacity) and a variable self-induction in series with it. The adjacent arm contains a variable resistance and another self-induction. The bridge is supplied with sinusoidal alternating current of a known (and variable) frequency and the balance is read on a vibration galvanometer. The balance is first obtained with the cell short-circuited and again after the cell has been introduced, and from the results the resistance and capacity are calculated. With increase of frequency a decrease in the apparent resistance of the cell is found, and by plotting the impedence of the cell for a number of different frequencies, the true resistance (*i.e.*, the resistance at infinite frequency) can be found.

The third paper was one on "The Measurement of Electrical Conductivity of Metals and Alloys at High Temperature," by Mr. J. L. Haughton, and consisted mainly of a description of an apparatus designed for this purpose. The principle on which the apparatus works is the comparison of the voltage drop along the specimen with that along a standard resistance, the same current flowing in both; the specimen is placed in a special type of furnace designed to ensure uniformity of temperature.

A short note of Miss N. Hosali introduced a series of 24 very beautiful models illustrating crystalline form and symmetry. These models are built up of steel wires and silk threads coloured so as to represent the different axes and planes of symmetry. The 24 models exhibited represent about 140 different crystal forms.

In addition to these papers several others were taken as read. Amongst these may be mentioned one on "The Theory of Electro-chemical Chlorate and Perchlorate Formation" by Messrs. N. V. S. Knibbs and H. Palfreeman. This paper described the results of the measurement of the conductivities of solutions of chlorate, chloride, perchlorate, and of mixed chlorate, perchlorate, and chlorate, the velocity constants of the reaction, and the resistance and potential effects in technical cells.

Mr. F. H. Jeffery's paper describes some experiments on the electrolysis of solutions of sodium nitrate, using a copper anode. He concludes that the following reactions take place at the anode:—(1) The cupric anion $Cu(NO_2)$ is formed. (2) This is decomposed by the water present, giving $Cu(NO_2)CuO$ and nitrous acid. (3) The undissociated portion of the nitrous acid decomposes, giving rise to nitric acid and nitric oxide.

Other papers contributed were "The Sorption of Iodine by Carbon," by Mr. J. B. Firth, and "The Pressure Variation of the Equilibrium Constant in Dilute Solution," by Mr. A. M. Williams.

PERSONALIA.

Mr. Julian Baker, chairman of the London Section of this Society, has been appointed to the editorship of the *Journal of the Institute of Brewing*, vacant by the resignation of Prof. A. R. Ling.

Dr. T. Slater Price has been appointed director of research to the British Photographic Research Association.

The chair of organic chemistry in the University of Liverpool has been filled by the appointment of Prof. I. M. Heilbron, now professor of organic chemistry at the Royal Technical College, Glasgow.

Mr. H. Richardson, of the Municipal College of Technology, Manchester, has succeeded Prof. W. M. Gardner as principal of the Bradford Technical College.

The Council of the Royal Society of Arts has awarded the Albert Medal for 1920 to Prof. A. A. Michelson, professor of physics in the University of Chicago, and who received the Nobel prize for physics in 1907.

Dr. Benjamin Moore, of Queen's University Ireland, and formerly professor of biochemistry in the University of Liverpool, has been appointed first professor of biochemistry in the University of Oxford.

At Sheffield University, Dr. W. E. S. Turner, who has been in charge of the new department of glass technology, has been elected to the recently created chair of glass technology; and Dr. Mellanby, professor of physiology in the University of London, has been appointed to the new chair of pharmacology.

The following decorations have been conferred upon British chemists for valuable services rendered during the war:—By the King of Italy: Officers of the Order of St. Maurice and St. Lazarus—Dr. T. M. Lowry, Prof. P. F. Frankland. By the King of the Belgians: Officer of the Order of the Crown—Dr. E. J. Russell; Commander—Dr. W. R. Dunstan.

Prof. Marston T. Bogert, president of this Society in 1912–13, has been elected president of the New York Section of the Société de Chimie Industrielle for the ensuing year.

The Chandler Medal of the American Chemical Society has been presented to Dr. W. R. Whitney, director of research to the General Electric Co. at Schenectady, formerly professor in the Massachusetts Institute of Technology.

Mr. Van H. Manning, whose resignation as director of the United States Bureau of Mines was recently announced, has been appointed director of the newly-organised Bureau of Statistics and Research of the American Petroleum Institute.

Dr. A. Kirpal has been appointed professor of chemistry in the German University at Prague.

Prof. F. Haber, director of the Kaiser-Wilhelm Institute for Physical and Electro-chemistry, is to succeed the late Emil Fischer at Berlin University. Dr. Haber has intimated his acceptance of this professorship subject to being allowed to retain his present position, and it is therefore proposed to elect a second ordinary professor of chemistry.

NEWS AND NOTES.

FRANCE.

Industrial Notes.—*Metallurgy.*—In spite of the many difficulties which have lately handicapped production, it seems as if maximum prices have at last been reached; although demand exceeds supply, prices have to be lowered to enable any business to be done. The decline in the prices of metals extends practically to all except aluminium, which remains firm at 10,500 francs per ton.

It was stated some time ago in German papers that France had undertaken to supply Germany with 200,000 tons of iron ore for each of the months of May and June. This promise was, indeed, made; but on the clear understanding that Germany should send fuel in return, and especially metallurgical coke. As Germany has not yet fulfilled her obligations to the extent stipulated in the Peace Treaty, it is hardly likely that the importation of iron ore into that country will exceed 50,000 tons for May.

Coal.—The production of coal during April, 1,762,000 tons, against 1,451,506 tons in March, is still much below normal. German coal is arriving at the rate of 1,000,000 tons a month, which is a great improvement. American coal comes in at the rate of 180,000 tons a month, and there are strong reasons to hope that before long this figure will be brought to 300,000 tons. Never has the British exportation of coal reached such a low level. It is estimated that the total for 1920 will be about 30 million tons below that for 1919.

The Chemical Market.—The great unsteadiness of prices in the chemical market is reacting strongly on the development of chemical industry since high cost of raw material leads to the use of cheaper substitutes, and the introduction of these often entails radical changes in both processes and plant. The situation is made worse by the wastage and absence of method noticeable in many works, and in many cases the quality of the manufacture is sacrificed to the imperative need for increased production. However, these obstacles are gradually being overcome by the combination of the leading chemical firms which realise more and more that co-operation is the keynote of progress.

There is a great demand for acetic acid, sulphuric acid, and formaldehyde, the 40 per cent. solution of the last-named being unobtainable even at 20 fr. per kg. Tartaric and citric acids, owing to the "dry" policy in the United States, are very scarce, and offers of 25—26 fr. per kg. and 30 fr. per kg., respectively, have been made. Mineral colours are also in great demand. The price of mercury has gone up to 37—38 fr. per kg.; the demand has much increased owing to its use in the synthetic production of alcohol and acetic acid. Potassium salts are rare, and the carbonate is barely obtainable at 750—800 fr. per quintal, which is a serious matter for glass manufacturers.

Transport.—The Government Bill for the reorganisation of the French railway system provides for the establishment of a supreme council, composed of representatives of the State, of the railways, and of commerce and industry, to co-ordinate the work of the companies in the national interest; at the same time the autonomy of the individual companies is to be preserved, thereby ensuring healthy competition. Financial resources are to be pooled. The staffs of the companies will be represented on the council and will be granted a bonus on profits. The Bill also provides for the development and increased efficiency of the rolling stock, and for the interconnexion of railway lines with ports, waterways and canals.

Cotton.—Active steps are being taken to develop cotton growing in the colonies. Cilicia, now under French control, seems a promising field, as its climate is like that of Egypt, and, it is stated, an area of 800,000 hectares (1,876,000 acres) is available for cotton growing, the probable yield being about 200,000 tons of cotton, which would almost meet the present consumption—250,000 tons.

The Olive Oil Industry.—Since the war the olive oil industry in the South of France has extended considerably, but has not yet attained the position it held in 1913, although at that time it was declining owing to the low price of the oil. The production of oil in 1913, 1917, and 1919 was 135,000, 280,000, and 68,000 hectolitres, respectively, the low return in 1919 being due to unfavourable weather conditions. The enormous increase in the value of olive oil has given a new impetus to the industry, and the improved methods of cultivation and crushing now employed should lead to increased crops. The home supply of olive oil is very greatly below French needs. Normally about 1½ million quintals (150,000 m. tons) is consumed annually, and in 1919 only 4½ per cent. of this was forthcoming. The general shortage of edible oils in France is due to difficulties in importing oil-seeds from abroad, to the impossibility of importing olive oil from Italy, Tunis, Algiers, and Spain, and to diminishing production at home, the area under these seeds in 1917 being but one-quarter of that prior to the war. In view of the present value of olive oil many new mills with improved crushing machinery are springing up in the olive districts, but there is no prospect of any being available for exportation. The "olive" oil exported in the past was rarely, if ever, pure Provence olive oil, but a mixture of French and foreign olive oils.—(*Bd. of Trade J.*, *May* 13, 1920.)

Resources of Senegal.—The chief agricultural product of Senegal is groundnuts, which has been exported since 1840, the shipment in 1915 reaching 306,221 tons. The cultivation of this crop, the best varieties of which are grown in the Cayor district, is extending as means of communication improve. Among other crops the oil palm grows fairly abundantly in Kazamanza and to the north of the peninsula of Cape Verde, and there are a few coconut plantations near St. Louis. The castor-oil plant is grown all over the colony, and gives a good yield of oil. After groundnuts, gum arabic is the next most important product, with an export, in 1919, of 250,000 kg. Wax, rubber, food plants, *e.g.*, rice, millet, manioc, are also produced.—(*Rev. Prod. Chim.*, *Mar.* 31, 1920.)

UNITED STATES.

American Chemical Society.—On May 10 the Society granted a charter to a new section to be known as the Savannah Section, with headquarters in Savannah, Georgia, U.S.A. The first president is Mr. J. J. McManus, and the secretary-treasurer, Mr. Herbert P. Strack.

At a meeting of the New York Section on June 11, a simplified form of boiling-point apparatus, or ebullioscope, was described which is specially designed for the use of brewers, who must now produce malt drinks containing less than 0·5 per cent. of alcohol. Although it is possible to prepare beverages made from grain with less than this percentage of alcohol, the practice generally followed is to make them with 2–3 per cent. and then to remove the excess of alcohol by running the liquid over a hot surface in a thin stream or sheet, or to heat the liquid in a vacuum. In most cases the excess alcohol is wasted, as recovery is expensive. A simple cryoscopic apparatus for the rapid testing of milk was described by Dr. J. Hortvet, of the Minnesota State Dairy, which is based on the fact that watered milk has a different freezing point to pure milk.

Degumming of Silk.—A process of degumming silk has been devised by which the raw material is submersed under a pressure of 7lb. for 30 minutes in distilled water containing a small amount of ammonia, borax, caustic soda, soda ash, or other alkali. The use of soap is obviated and the treated silk has a normal lustre.

Improvement in Cement Manufacture.—An American patent has been granted for an improvement in the wet process of manufacturing Portland cement, whereby a material which will prevent objectionable setting in the slurry is introduced. Such a material, for instance, 0·25 per cent. of sugar, is destroyed during calcination.

Surface Treatment of Concrete Floors.—It has been found that such compounds as magnesium fluosilicate, sodium silicate, and zinc sulphate give fairly satisfactory results when used for treating the surface of concrete floors to prevent excessive dusting. Treatment with aluminium sulphate has given a floor which remains in satisfactory condition after nine months of wear.

Rendering Pyroxylin less Inflammable.—A patent has been granted for a new process to decrease the inflammability of pyroxylin. The commercial article is dissolved in methyl alcohol containing 5 per cent. of acetone; the solution is then diluted with carbon tetrachloride and chlorinated in the presence of a carrier, such as zinc or tin chloride, until five to eight per cent. by weight of chlorine has been absorbed. The solution may then be evaporated and the chlorinated pyroxylin washed, neutralised, and dried in the usual manner.

CANADA.

Metallurgy in British Columbia.—The Consolidated Mining and Smelting Co. is increasing the capacity of its refinery from 20 to 50 tons of copper per day in order to treat the output of the Canada Copper Corporation's smelters at Allenby, which is expected to be 130 tons of concentrates (with a copper content of about 25 per cent.) per day. A rod mill is also being installed at Trail at a cost of about $200,000. In the past Canada imported practically all its bar and rod copper from the United States, the importation in 1918 reaching 14,796,200 lb., valued at $3,787,521; with the new rod mill in operation a large proportion of the rod copper used should be produced in Canada. Plans for the new concentrator for the Consolidated Co. to treat the copper-gold-silver ores from the company's Rossland mine are being pushed on with the utmost speed. At the Dolly Varden Mine, at Alice Arm, B.C., unusually rich silver ore, carrying heavy plate silver, has been struck. About 2¼ tons of this ore is being produced daily and sent to the Selby Smelter on San Francisco Bay.

Chemical Products, Ltd.—Trenton, Ontario, will soon become one of the largest centres of chemical industry in Canada, as a new organisation, known as Chemical Products, Ltd., has bought the plant formerly owned by the British Chemicals, Ltd., which was operated by the Imperial Munitions Board during the war for the manufacture of explosives, etc. The property comprises 255 acres, bounded on three sides by main lines of the three chief railways, and on the fourth side by the Trent River and Trent River Valley Canal. As Trenton (population 7,000) is also located at the head of the Bay of Quinte, the plant is well situated both for water and rail transportation. Chemical Products, Ltd., has been recently formed to succeed the Chemical Products of Canada, Ltd., organised in 1916, which produces aspirin, phenacetin, etc., at Toronto. Manufacturing operations have already commenced at Trenton, where the plant is being laid out in four sections. In the first unit sulphuric acid will be made, largely for the production of acid phosphate for fertilisers, and nitric acid for general purposes. Plant No. 2 will be devoted to the manufacture of refined sodium nitrate and magnesium sulphate, plant No. 3 for salicylates and derivatives and plant No. 4 for ammonia and coke-oven by-products. Plant operations are in charge of Mr. A. H. C. Heitman, who was the first to produce aspirin on a commercial scale in Canada for the Cott-A-Lap Co., at Walkerville, Ontario. The Trenton Co. is capitalised at $2,000,000, and is prepared to manufacture 75,000 tons of acid phosphate per annum, utilising phosphate rock from Central Ontario as raw material. The annual production of the other products is estimated to be: Sulphuric acid, 38,160 tons, sodium nitrate 6,000 tons, salicylic acid 456,000 lb., and aspirin 1,080,000 lb.; a large export trade is expected in all these products.

AUSTRALIA.

Iron Ore at Yampi Sound.—It is stated on the authority of the State Mining Engineer (Mr. A. Montgomery) of Western Australia that enormous quantities of unusually pure iron ore occur on Koolan and Cockatoo Islands at the north-east side of the entrance to King's Sound, and near Yampi Sound, which affords a spacious, deep-water harbour. The deposits are sedimentary beds of dense micaceous hæmatite, and the outcrop at one part measures 130—140 ft. across. If the "probable" ore below high-water mark be taken into account, the estimated quantity of 97,300,000 tons would have to be increased several hundredfold, thus making the occurrence one of the greatest in the world; in addition large quantities of alluvial ore could be dredged from the harbour near the cliffs. The combination of a huge iron-ore deposit of first-rate quality and workable by quarrying, with a deep-water harbour where ships could be loaded directly from the quarries, is almost unique. The ore is very pure and free from deleterious ingredients, both phosphorus and sulphur being well within the limits for high-class ores. It is suggested that as much ore as possible should be sent to the Eastern States of Australia for smelting, as no coal suitable for this purpose has been found in Western Australia, and coal should be carried back to Yampi Sound as a return freight and stored there for coaling ships coming for cargoes of iron ore for the United Kingdom. The deposits must be worked on a large scale to be profitable, and it is suggested that a combination of iron and shipping interests in Great Britain would be most likely to be successful in this respect. Cheap shipment should go far to compensate for the cost of the long voyage to British markets.

SOUTH AFRICA.

Industrial Notes.—*Cement.*—The African Portland Cement Co., Ltd., is being floated for the purpose of manufacturing portland cement at Port Elizabeth.

Transvaal Gold Output.—The following figures relating to gold production have been issued by the Chamber of Mines for the years 1919 and 1918 respectively:—Tons milled, 24,412,432 (25,267,302); yield, £35,383,974 (£35,768,688); fine oz., 8,330,091 (8,420,659); total working cost per ton, 23s. (21s. 8d.); total working profit per ton, 5s. 6d. (6s. 1d.); dividends, £6,075,765 (£5,237,633).

South-West African Mineral Output.—In South-West Africa the diamond output for the year ended March 31, 1919, was valued at £860,000, compared with £833,953 for 1917, and £749,000 for 1918. Approximately 7500 tons of copper ore was exported to complete contracts, after which export was stopped. The quantity of ore available for export at the end of March was approximately 150,000 tons. Five tin mines are working, two of which were re-opened in October, 1918. Seventy-four tons of tin was exported during 1918.

Leather and Tanning Industry.—The tanning industry has been much extended. Four additional factories have been opened at Port Elizabeth for the manufacture of leather goods, and there are extensions in the same direction at Oudtshoorn. A new boot factory has been completed at Great Brak River, where the output is rapidly increasing. There is also a tannery and boot factory at Somerset East. A boot factory at Bedford has commenced operations in conjunction with the local tannery. The tannery at Kingwilliamstown dealt with approximately 70,000 hides last year. The large military contracts have ceased, and the factories are now manufacturing for civil requirements. Leather and leather goods valued at £39,158 were exported during 1918, an increase of £4462 compared with 1917, and of £36,875 compared with 1913.—*Official.*

Agricultural Journal.—It is announced that the *Agricultural Journal of the Union of South Africa*, the official organ of the Department of Agriculture, which ceased publication after August, 1914, is about to reappear under its old title, and will be published monthly in two languages, commencing April, 1920.

GENERAL.

Imperial Mineral Resources Bureau.—Dr. R. Seligman, who represents the Society of Chemical Industry on the Aluminium, Magnesium, Potassium and Sodium Technical Committee of the Imperial Mineral Resources Bureau, has kindly supplied the following notes relating to the work of the Committee:—As originally appointed, the Committee consisted of Dr. J. W. Evans (chairman), Dr. Seligman, Mr. M. Morrison, representing the Institute of Metals, with Sir R. Redmayne, and Lord Morris as *ex officio* members. The first step was to add ten new names to the list of members, including several well-known in chemical industry. In order to prevent overlapping the Governors of the Bureau have decided that potash should be transferred from this Committee to the Chemical Industries Committee, and the members of the Aluminium Committee appointed to deal with potash have been co-opted on the Chemical Industries Committee for this special purpose. The main work done by the Aluminium Committee to date has been the consideration of the development of the important bauxite deposits in British Guiana. It has examined the proposals of the Government for opening up these deposits, and has made recommendations with a view to securing the interests of British chemical industry as well as those of the firms interested in the manufacture of aluminium. The meetings of the Committee have been suspended for several months pending the collection by the officials of information and statistics dealing with the subjects which come within the Committee's purview. The meetings are to be resumed shortly.

Sugar Research.—The British Empire Sugar Research Association has appointed a sub-committee, consisting of Prof. A. R. Ling (convener), Prof. T. Gray, and Messrs. W. Douglas, Hugh Main, James Ogilvie, and L. J. de Whalley, with power to co-opt, "to consider and advise on the question of the normal weight of sugar to be used for the quartz compensating polarimeter in use for technical sugar work." All chemists interested in this question should apply to the secretary of the Association, Mr. G. W. Giffard, at 5—7, Old Queen Street, S.W. 1, for a memorandum drawn up by the sub-committee.

Research Association for the Iron Trade.—Steps have been taken by the Institution of British Foundrymen to form a Research Association for the gray and malleable cast iron trades under the auspices of the Government Department of Scientific and Industrial Research. It is proposed to have the offices and laboratories (the latter now existing) with bureau of information in Birmingham, and Mr. T. Vickers, secretary of the Metallurgical Society, has been appointed technical organiser.

There are 2800 foundries in Great Britain, of which 285 are in Scotland and 50 in Ireland. In the Midlands there are 828, and Birmingham has the most foundries of any English town, viz., 118. Yorkshire has the largest number of any county—415. Labour is supporting the iron-founding research scheme, for it is generally felt that the industry is much in need of scientific assistance.

The Spitzbergen Treaty.—The treaty regulating the status of Spitzbergen and conferring the sovereignty on Norway has been drawn up, and the Powers concerned (United States, British Empire, Denmark, France, Italy, Japan, Norway, Netherlands, and Sweden) have notified their agreement to its terms. The treaty provides, *inter alia*, that the nationals of all the High Contracting Parties shall have equal liberty of access and entry to the archipelago and may carry on there without impediment all maritime, industrial, mining, and commercial operations on a footing of absolute equality. In addition, Norway undertakes to grant equality of treatment with regard to methods of acquisition, enjoyment, and exercise of the right of ownership of property, including mineral rights, to provide mining regulations that exclude any privileges, monopolies, or favours for the benefit of the State or the nationals of any one of the High Contracting Parties, including Norway. The Norwegian Government can levy an export duty not exceeding 1 per cent. of the maximum value of minerals exported up to 100,000 tons, beyond which figure the duty will be proportionately diminished. —(*Bd. of Trade J., Apr.* 29, 1920.)

The Bohemian Glass Industry.—The glass factories are now overwhelmed with orders, partly on account of the conditions of exchange and partly owing to the large business which resulted from the fairs at Leipzig and Lyons. In trade circles, however, the opinion is held that after two years of such activity over-production is bound to follow. Japan is to be regarded as a dangerous competitor; in 1914 that country had 463 glass factories and about 9000 workers, in 1917 there were 832 factories and 17,000 workers. In consequence of this competition, the Indian and most of the markets in the Near East are probably lost for good. New works have been erected in Belgium, the Ukraine, Rumania and Poland, and in north-west Bohemia alone 19 large new companies have recently been founded. All these facts point to a quick reaction for the local glass industry.—(*Z. angew. Chem., Apr.* 20, 1920.)

Chemical Industry in Hungary.—The Hungarian sugar industry, which before the war exported considerable quantities of sugar cane, now barely produces more than 8 per cent. of the home requirements. Owing to high prices manufacturers of spirits are likely to offer higher prices for sugar beets than the sugar manufacturers can, unless the Government prohibits the sale of roots for the purpose of manufacturing spirits. The shortage of leather is being acutely felt and prices are high.

Before the *debâcle* in 1918, Hungary was very nearly independent of outside sources of supply of chemicals, but the partition of the country has deprived it of its largest and most important chemical works. At the present time, it is stated, the following branches would be able to supply the country's needs were the necessary raw materials available: Artificial fertilisers, vegetable and mineral oils, fats, rubber, starch, alcohol, pharmaceutical products, and dyes. To ensure the provision of adequate supplies of raw materials it is suggested that agreements should be concluded to this end with other countries, particularly with German Austria; that agriculture must be resusci-

[illegible] and that chemical works should be granted facilities by the State in respect of supplies of alcohol. At the present time the provision of chemical supplies of all kinds is rendered almost impossible by prohibitive prices due to profiteering.—(*Handelsmuseum, Apr. 7, May, 13, 1920.*)

Proposed Changes in the "Militar-Versuchsamt."—A Bill has been introduced into the German National Assembly to authorise the conversion of the "Militar-Versuchsamt" (Military Experimental Station) into a "Chemikalisch-Technische Reichsanstalt" (National Institute of Technical Chemistry). The "Versuchsamt" has been engaged for the past 3[illegible] years on work in applied physics and chemistry, including mechanical and metallurgical technique, and in its new form it is proposed to charge it with investigations of raw materials, researches on problems of general industrial importance, investigations into the prevention of accidents, fire and explosions, and the protection of the workers. In addition, the Institute will be associated with certain Government Departments dealing with the utilisation or destruction of munitions of war etc. Any work to be undertaken will be limited to that not already covered by other technical institutions.—(*Chem.-Zeit., Apr. 29, 1920.*)

Aluminium Manufacture in Norway.—The aluminium works of the Hovangsaldens Norsk Aluminium Co., which has hitherto manufactured electrodes and carbide, is reported to have started the production of aluminium and to have already marketed some of its products. As the supply of calcined clay from the French-owned works at Hovangen is still very unsatisfactory, owing to fuel and transport difficulties, the Hovangen company has acquired a bauxite mine in South America, and it is expected that high-grade ore will shortly be available. The present price of aluminium ingots is 3·40 kroner per kg. (about 1s. 8d. per lb. at normal exchange).—(*Z. angew. Chem., Apr. 27, 1920.*)

The Narvik Iron Works, Norway.—The question of the erection of a large State-supported iron and steel works, which was postponed by the Storthing last year, is still under discussion, and the Norwegian Ministry of Industry now proposes to give the State subsidy to one large plant at Narvik, the contribution to be in the form of a guarantee for a loan of 25 million kroner, representing half the working capital of the company (Aktieselskab). [illegible] The Narvik Steel and Rolling Mill is so planned that it may be utilised later for electric production. An annual output of 180,000 tons of coke, 125,000 tons of pig iron, 125,000 tons of steel billets, 27,000 tons of phosphate, and 87,000 tons of rolling products is aimed at. Pig iron will be produced by standard methods and then converted into steel and rolling products. The works is well placed for trade with North Russian ports and the United Kingdom, and will be of great importance in the development of northern Norway.—(*Bd. of Trade J., May 13, 1920.*)

Position of the Swedish Fat Industry.—The production of stearin has apparently arrived at a stationary stage, that of glycerin is in excess of the demand, and that of oleine is below it. The manufacture of glycerin in Sweden has much increased of late, but it is doubtful if an export trade will eventuate as most other countries now produce an excess. The prospects of the margarine industry continue unfavourable; in 1919, owing to the falling off of the home demand, the production was barely one-half of that at the end of the war. The number of soap factories working in Sweden is apparently too great for the needs of the country, the total capacity output being sufficient to supply a population of 50 millions. Hence the plants are not worked to anything like full capacity, and production costs are high. The number of factories producing lubricating oil, fish oil, etc., many of which were started during the war, is also in excess of requirements. The future of this Swedish industry is very problematical.—(*Z. angew. Chem., Apr. 16, 1920.*)

The Carbide Industry in Switzerland.—The present position of the Swiss carbide industry is very unfavourable. Manufacture is for the most part at a standstill and several works have been closed down. The causes are lack of coal and a very small demand. Foreign countries cannot buy owing to the conditions of exchange. In Germany, moreover, carbide is being sold at 135 mk. per 100 kg., and the cost of coal in Switzerland makes competition impossible. France, too, has imposed an import duty which amounts to 2000—2200 fr. per railway wagon. The future appears very uncertain, and it seems probable that, owing to the conditions of water power and electricity supply, the manufacture will develop into a seasonal one, i.e., be restricted to a few months in the spring and summer. The cost of current will increase, and the old price of [illegible] per kw.-yr. is not likely to be seen again. Electrical undertakings started during or after the war already charge more for a continuous supply. It is possible that a few big electricity undertakings may undertake the manufacture of electro-furnace products, using surplus current at certain times of the year.—(*Schweiz. Chem.-Z., May 17, 1920.*)

Olive Oil Production in Spain.—Recent crushing in Spain has produced 327,000 metric tons of very good quality olive oil, for which 4s. to 4s. 6d. per gall. is being paid. It has been estimated that about 200 million galls. will be available for export after the home consumption has been satisfied. In order to prevent shortage of oil for home consumption and also to enable the poorer classes to obtain it at a reasonable figure, exporters are required to place at the disposal of the Spanish Government an amount equal to that exported at the price of 4s. per gall. It is, however, impossible to buy oil at this figure; oil deposited with the Government is being sold at approximately 5s. per gall., and much dissatisfaction is felt. The Government will shortly be obliged to take vigorous steps in order to make it possible to buy oil, which is a necessity to the Spanish people, at the lower figure. The production of olive oil in previous years was: 1914, 207,765; 1915, [illegible]; 1916, 2[illegible]; 1917, 427,335; 1918, 255,202 metric tons. Eighty per cent. of the production comes from Andalusia.—(*U.S. Com. Rep., Mar. 23, Apr. 15, 1920.*)

Resources of Tunis.—Alfa, which grows wild on the high dry plateau of Tunis, is potentially a very important article for the export trade, as it is estimated that a production of 300,000 tons a year could be obtained if it were cut annually (cf. J., 1918, 311 R). Second only in importance to agriculture is the mineral industry, which is at present seriously hampered by lack of labour and shipping. The production of lignite has increased, thus compensating to some extent for the shortage of foreign coal, but the output is expected to diminish on the return to normal conditions. The deposits of manganese at [illegible], near the Algerian frontier, which contain from 45—50 per cent. of metal, have been increasingly exploited; the other beds as yet remain unworked. The mineral production in 1917 and 1918 in metric tons was as follows:—Phosphates, [illegible], 818,[illegible]; iron ore, 803,958, 428,751; lead, [illegible]; zinc, 14,835, [illegible]; manganese, [illegible]; lignite, 32,632, 30,000. The large amounts of olive oil produced in the country are mostly shipped to the South of France for refining, and the residues from the oil pressings are used locally for the manufacture of olive foots soap for laundry purposes.—(*U.S. Com. Rep., Suppl., Jan. 26, 1920.*)

Cork Production and Consumption.—According to an estimate prepared by the Association of Portuguese Cork Traders, the world's production of cork is nearly 150,000 metric tons, distributed as follows:—Portugal 45 %, Spain 30 %, France and Italy 5 %, Algeria and Tunis 20 %. The best sorts are derived from Portugal. In Morocco, Algeria and Tunis there are extensive cork forests awaiting exploitation. The chief consumers of cork are England, France, South America, the United States, and Germany. In Portugal 25—30 % of the production is worked up in the country and in Spain [illegible].—(*Handelsmuseum, Mar. 11, 1920.*)

Resources of Spanish Morocco.—A report furnished by the Austro-Hungarian consulate at Barcelona (now being disbanded) speaks in very high terms of the agricultural and mineral resources of Spanish Morocco. Thorough investigation has proved the extraordinary fertility of the soil for the cultivation of wheat, barley, cotton, etc., and the mineral resources are also very considerable, particularly in regard to hæmatite iron ore; these ores are very rich, *e.g.*, those in Uixan contain up to 66 per cent. of iron. The deposits at Beni-bu-Ifrur are estimated to contain over 30 million tons. During 1917, 250,000 tons of iron [illegible] ore was loaded for England in the harbour of Melilla. The Spanish concessions in Morocco occupy approximately 3,300 sq. miles, and although they were granted by international agreement in 1912 their development is very backward.—*Handelsmuseum, Mar. 18, 1920.*

Beet-Sugar Production in Spain.—According to a report issued by the Spanish customs authorities, the production of beet-sugar from 31 mills during the seasons July to November 1918 and 1919 was 253,115 and 153,349 tons respectively [illegible] 1919, 353 m.).—*U.S. Com. Rep., Mar. 4, 1920.*

Cuban Sugar Crop in 1920.—It is predicted that the value of this year's sugar crop in Cuba will be £188,160,000, the production being estimated at 4,200,000 tons and a price of 10 cents. 3d. per lb. assumed. The crops and their values for previous years were:—1917, 2,896,146 tons, £84,178,719; 1918, 3,210,754 tons, £64,287,425; 1919, 3,995,288 tons, £94,253,889. The sugar exported during 1919 was distributed as follows:—United States 2,989,386 tons, Canada 81,396 tons, Spain 27,174 tons, Mexico 1127 tons, South America 130 tons, Europe 785,277 tons. With the exception of a few thousand tons, Cuba exports her entire production of raw sugar.—(*Bd. of Trade J., May 20, 1920.*)

Resources of Cardenas, Cuba.—Sugar constitutes the chief industry of the district of Cardenas, Cuba, and is now in a flourishing condition. The cultivation of henequen recently undertaken is also flourishing, and large areas of the poorest land have been planted with it. Three companies are engaged in this industry, and, in view of its increasing area, a large modern decorticating plant for extracting the fibre has recently been completed at Cardenas. The cordage produced finds a ready market, as it is said to be of the best quality. This district contains extensive deposits of high-grade manganese ore which were worked in 1918, but are now lying idle owing to the drop in prices. Oil was discovered in the province of Habana in 1918, and boring is said to have yielded promising results. Asphalt deposits occur near the oil-wells, and a product of good quality is now being obtained in limited quantities. The total foreign trade passing through the port in 1918 consisted of imports valued at £1,314,665 and exports valued at £7,385,772, as against £1,393,696 and £6,710,395 in 1917. The United States furnished 87 per cent. of the imports, and Great Britain supplied 7 per cent.—(*U.S. Com. Rep., Suppl., Mar. 12, 1920.*)

Coconut and Cohune Production in Mexico.—The coconut and cohune nut industries are not highly developed in Mexico, [illegible] the trees grow wild [illegible] Pacific coasts [illegible] information [illegible] for [illegible] Michoacan [illegible] districts [illegible] and [illegible] con-[illegible] grown in [illegible] of Michoacan, [illegible] and it is reported that 120,000 kg. [illegible] is produced in the [illegible] 1918.—[illegible]

Production of Nitrate of Potash in Chile.—H.M. Consul at Antofagasta reports that several of the nitrate works are commencing to produce potassium nitrate. During the past two years the total output was only about 11,000 tons, but production is now to be increased, and sales have been made—so far only to the United States—of 11,500 tons for delivery up to June, 1920.—*Bd. of Trade J., May 13, 1920.*

Output of Antimony and Wolfram Ores in Bolivia.—H.M. Minister at La Paz reports that exports of antimony ores from Bolivia increased from 186 metric tons in 1916 to 17,428 in 1917 and 27,418 in 1918, [illegible] in 1919. Shipments [illegible] rising production [illegible] The production of [illegible] between 1913 and the [illegible] when it was at the rate [illegible] per year, having increased [illegible] As with antimony the production [illegible] since the return of peace.—*Bd. of Trade J., May 13, 1920.*

Petroleum Deposits in Neuquen, Argentina.—Petroleum was discovered late in 1918 in the mining district of Plaza Huincul, Neuquen, and samples have been favourably reported upon, the oil containing a high proportion of light hydrocarbons and a minimum quantity of asphalt, which implies the absence of sulphur. The commercial distillation of the crude oil is under examination by a technical committee appointed by the Minister of Agriculture. The Argentine Government has recently put forward a Bill by which all petroleum wells will become State property and will be prospected or exploited either by the State, or on its account by provincial Governments or private firms.—*U.S. Com. Rep., Mar. [illegible], 1920.*

Vegetable Oil-bearing Products of Trinidad.—The only vegetable oil product of commercial importance in Trinidad is coconut oil, the output of which is about 14,000 gals. per annum, with a possible maximum of 150,000 gals. The production is largely influenced by the price of copra, for if this is high the tendency is to export copra instead of extracting the oil locally. Coconut oil is produced in six factories in Trinidad, the combined output of the three largest, situated in the Mayaro district on the east coast, being about [illegible] gals. a year. Castor oil, crab-bean oil, and gruterman's oil are also produced in the island, although not in quantities of commercial importance.—*U.S. Com. Rep., Mar. 16, 1920.*

Mica Deposits in Sao Paulo, Brazil.—Mica of superior quality is found abundantly at Itapecerica, Iguape, and near Serro do Mar. Ruby mica has been produced in large quantities for export at a mine Larras, near Itapecerica, but many other grades are found in the State. The mica exported is taken by England, France, Italy, Germany and the United States. The exports in 1914, 1917, and 1918 were 880, 23,696, and 25,329 lb. respectively.—*U.S. Com. Rep., Mar. 27, 1920.*

REPORT.

Report on the Trade of Canada and Newfoundland, together with Detailed Reports on the Trade of Ontario and Western Canada for the Year 1919. *By* F. W. Field *and* L. B. Beale, *H.M. Trade Commissioners at Toronto and Winnipeg respectively. Pp.* 204. [*Cmd.* 720. 1s. 6*d.*] *London: H.M. Stationery Office.*

Production.—The production of nickel was maintained in 1919 at about half the rate for the last war year, or slightly under the average rate for the last three pre-war years; copper production was also considerably reduced. Gold and silver production showed a decrease, largely owing to labour troubles, and shipments of lead and zinc ore, obtained chiefly from British Columbia, declined in the early part of the year, recovering later on with increased mining activity, but the output was below that of recent years. Asbestos mining was fairly steady throughout the year, but that of other products, such as cobalt, molybdenite, chromite, graphite, and magnesite felt the effects of the restricted market. Coal production declined, though the decreased output from Nova Scotia was compensated by increased production in Alberta. The competition of foreign coal and labour troubles were largely responsible for the decreased output. The estimated total value of the mineral production of Canada in 1919 was $173,000,000, as against $211,000,00 in 1918.

Notable expansion has taken place in the pulp and paper industry; the production of newsprint paper was 561,911 short tons in the first nine months of 1919, compared with 683,088 tons for the whole of 1918; it is estimated that within ten years the annual production of this paper will amount to 2 million tons. The textile industries of the Dominion continue to progress, and although the recently acquired export trade may not be retained permanently, it is believed that the home market is secure. The demand for explosives and other war munitions aided the establishment of many large chemical works in Canada, and the list of manufactures is continually increasing. The production of soap shows a large increment in recent years, and the output for 1919 is unofficially estimated at about double that for 1915 ($6,445,939).

Export Trade.—A striking feature of the Canadian export trade in recent years has been the increase in the value of exported manufactured goods as compared with the fiscal year 1913–14. This increase was largely due to the export of munitions, and the decline in the export of manufactures in 1918–19, as compared with the previous year, is mainly accounted for by the return to peace conditions. The total value of Canadian produce exported in 1918–19 was $1,216,443,806, and the decline in value during the seven months to October 31, 1919, was about $19 millions from that of the corresponding period of 1918. Notable increases are recorded in exports of agricultural and animal products, in wood, wood products, paper and manufactures thereof, and to a less extent in iron and steel manufactures, which are an important factor in the industrial situation; but these gains were more than offset by declines in ores, non-ferrous metals and metallic products, and in chemicals and chemical products. By means of Government credits, trade missions, and various export trade organisations, every effort is being made to increase Canada's export trade, and prospects are held to be promising.

Import Trade.—To a total value of imports amounting to $916,429,335 (excluding specie), the United Kingdom contributed $73,035,118, and the United States $746,920,654. The Canadian Association of British Manufacturers and the British Agents' Association of Canada look after British trade interests in Canada, but it is pointed out that United Kingdom exporters should pay much more attention to advertising media, to the provision of invoices satisfactory to the Customs Department, to the appointment of suitable agents, and to catering more closely for Canadian requirements. The tendency of United States firms with trade connexions in Canada is to establish separate units in that country, and United Kingdom manufacturers should carefully consider whether their agency arrangements for Canada should be treated as part of their United States arrangements or not (*cf.* J., 1920, 136 R). It is stated that there is no lack of business if British manufacturers can accept orders at reasonable prices and under satisfactory conditions.

Iron and steel products, ranging from ores to manufactures, constitute the most important group of imports; in 1918–19 they were valued at $161,000,000, of which the United Kingdom supplied $6,000,000 worth ($15½ millions came from British sources in 1913–14), almost all the remainder coming from the United States. Among clay products, British-made firebrick always had a high reputation, but at present the market is overstocked. The British position in the earthenware and chinaware trades is more satisfactory, although it is less good in the glass trade, where the difficulty of securing deliveries from the United Kingdom has resulted in the loss of many orders. Practically all the glass and glassware imported in 1919 came from the United States. Various heavy chemicals, formerly imported, will now probably be produced in the Dominion. Acids were imported during the first six months of the current fiscal year to the value of $463,671, including $222,178 from the United Kingdom, the rest being furnished by the United States. The imports of drugs, medicinal and pharmaceutical preparations during the same period were valued at $1,900,000, of which the United Kingdom furnished $522,000, or about half the amount from the United States. Some of the drugs, dyeing and tanning materials, imported from the United States are re-exports of products originating in the British Empire.

Ontario.—This Province produces 46 per cent. of the mineral output of Canada and 30 per cent. of the wool clip; it is the centre of many industries and takes about 55 per cent. of the Canadian imports. In view of the growing pressure of Japanese and other competition, a number of suggestions embodying advice to United Kingdom exporters is given. The general industrial condition of Ontaro is good, but the production of nickel, copper, iron pyrites, and other "war" minerals is likely to be less both in quantity and value during 1919, for the reasons previously stated. The output of silver has decreased, but that of gold has increased, whilst the demand for nickel is expected to become normal once the accumulated stocks in the hands of the Allies have been absorbed. Molybdenite is not produced now, and the output of lead is much smaller. The production of petroleum in Ontario was 288,692 barrels in 1918, and the estimated production for 1919 is about 238,000 barrels. The area has large resources in timber and pulpwood, there being 125,000 sq. miles of forest lands, with a production of 735,691 cords, valued $7,430,355 (in 1917). The work of the Hydro-Electric Power Commission of Ontario is making rapid progress, the area now supplied with electric power by the Commission being about 35,000 sq. miles. Many United States companies have made inquiries during the past year with regard to the establishment of branch works in Ontario, especially in regard to engineering, electrical equipment, chemical and other factories. The pulp and paper industry has developed greatly during the past ten years and is still growing rapidly; the total capital engaged exceeds $200,000,000, and the value of the annual output is over $100,000,000. In 1919 this industry ranked fourth in the list of Canadian exports, with a value of pulp and paper of $83,872,566 and pulpwood $15,386,000, being surpassed only by foodstuffs, explosives, and provisions. Up to the present Canada has made no tinplate, some 50,000 tons of tinplates and 125,000 tons of black and galvanised sheets being imported; but in 1920 a Welsh company will make it in extensive branch works at Toronto. During the past few years Japanese earthenware, china, etc., has replaced the German and Austrian lines formerly imported, but the demand for the British article is excellent, although sufficient supplies cannot be obtained. The dye trade is shared largely between the United Kingdom and the United States, the competition from the latter country being very keen. There is a good demand for chemicals from the United Kingdom in spite of competition from Canadian and United States products. Cyanide, soda ash, paints and colours are now manufactured in Ontario, but there is a good outlook for druggists' sundries, gelatins, and glues from the United Kingdom.

Western Provinces.—The mining industry of Western Canada is developing greatly; in 1919 its contribution of $60,000,000 represented 40 per cent. of the total Canadian production. British Columbia produced minerals in 1919 valued as follows: Gold, $3,217,000; silver, $3,871,000; coal, $11,786,000; and copper $8,631,000; it contains the three largest developed copper mines in the Empire, with a potential production of 70 million lb. a year. The establishment of an iron and steel industry near Vancouver is contemplated. Coal is practically the sole mineral produced by Alberta, the output for 1919 amounting to 4,750,000 tons. Lignite is produced in Saskatchewan, and an important mining field, chiefly copper and gold, is being developed in Manitoba. Petroleum is believed to exist in Alberta and British Columbia; surveying and drilling are now being carried out.

General.—A report on the trade of Canada with India shows a striking increase in the import trade from the latter country—$4,133,847 in 1915 and $8,395,290 in 1919. Reports from Imperial Trade Correspondents in Nova Scotia, New Brunswick, Quebec, Alberta, British Columbia (Victoria and Vancouver), and Newfoundland are also given. The minerals and mineral products of Nova Scotia were valued at $52,813,300, and consisted largely of coal and iron and steel products. Approximately 9 million tons of coal could be made available each year from the 1100 sq. miles of coal areas in this province, and large developments in the lumber and iron and steel industries are expected. In 1919 the total value of the imports into Newfoundland was $33,297,184, of which Great Britain furnished 7·2 per cent., the United States 49·8, and Canada 38·4 per cent., as against 27·5, 34·8, and 32·6 per cent. respectively in 1912–13. The local lumbering industry has been much stimulated by high prices, and a new large coalfield opened recently in the West Coast area is awaiting financial support to commence operations. Appendices are devoted to statistics of Canadian imports in 1914 and 1919, of Canadian Government credits to certain European countries, etc.

(*Cf.* J., *Review*, 1919, pp. 232, 245, 254, 268, 299, 308, 329, 376, 417, 435; and 1920, pp. 36, 56, 112, 136, 147, 200.)

CORRIGENDA.—In the issue for June 15, p. 203 R, col. ii., under "The Sugar Situation and Germany," in the third and fourth columns of statistics, the years should read 1918–19 and 1919–20, respectively.

Also page 197 R, col. i., last line, in lieu of 35, read 115.

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Home Grown Sugar, Ltd.

Replying to Mr. C. White, Sir A. Boscawen stated that the company known as Home Grown Sugar, Ltd., was registered on February 13, 1920, with a nominal capital of £1,000,000, divided into one million ordinary shares of £1 each. The total number of shares issued, all having been allotted for cash, is 500,000, of which a maximum of 250,000 has been allotted to the Government, which has guaranteed a dividend of 5 per cent. per annum on the capital subscribed by the public up to 250,000 shares until March 31, 1930. After repayment to the Ministry of Agriculture of any sum paid under the guarantee, the directors may call upon him to sell his shares upon payment of their full value, plus a deferred dividend of 5 per cent. upon such shares from the date of allotment. The directors, other than the managing directors, are each paid £300 per annum, and an additional £100 per annum is paid to the chairman. The Government has no voice in the appointment of the directors, but the Minister of Agriculture can appoint a director of the company to act as the Government's financial representative (*cf.* J., 1920, 15 R).—(June 8.)

Coal Tar Products (Export Licences).

Mr. Bridgeman, answering Mr. Kiley, said that applicants for export licences for certain coal tar products are required to produce a certificate from the actual manufacturers to the effect that the goods in question can be exported without detriment to domestic consumers.—(June 8.)

Employment of Women and Children in Factories.

The Women, Young Persons and Children (Employment) Bill was read a second time on June 10. The provisions of the Bill contain three conventions which were agreed to at the International Labour Conference held at Washington in November, 1919 (*cf.* J., 1920, 4 R), and relating respectively to the prohibition of the employment of any child under 14 in any industrial establishment and to the night work of young persons and of women employed in industry. A provision, not included in the conventions, is designed to permit the continuance of the war-time practice of employing women and young persons in shifts averaging eight hours daily on any weekday other than Saturday between 6 a.m. and 10 p.m.

Dried Milk (Freightage).

In answer to Mr. A. Short, Sir E. Geddes said that he was aware that the freightage charges on dried milk exceed those on ordinary milk by 80 per cent. for large and 130 per cent. for small consignments; the present charges on particular commodities cannot be altered pending the report of the Rates Advisory Committee.—(June 14.)

Fertiliser Shortage.

Sir A. Boscawen, in answer to Mr. Carew, said that the shortage of basic slag and other fertilisers is primarily due to the greatly increased demand; supplies for the coming season were expected to show a substantial increase. The Minister of Agriculture is taking every possible step to augment supplies, and has recently appointed a committee to consider improved methods of manufacture and use of basic slag. Except in the case of potash, of which there is now a world shortage, there is no reason to expect a shortage of other fertilisers during the coming season, provided that their export is still controlled, for which purpose a Bill is now before Parliament.—(June 14.)

Sulphate of Ammonia (Export Restrictions).

Mr. Houston asked whether the restrictions on the export of ammonium sulphate had had the result of forcing the manufacturers of this article for home consumption to form a ring or association, thereby causing works which produce for export to be closed down. Sir R. Horne replied that the export restrictions referred to were imposed at the instance of the Ministry of Agriculture and are administered by the Board of Trade in order to ensure adequate quantities of fertilisers at reasonable prices for home supply of agriculture. In view of this and of the introduction of the Fertilisers (Temporary Control of Export) Bill, the question should be addressed to the Parliamentary Secretary to the Board of Agriculture.—(June 14.)

Gas Regulation Bill.

The second reading was passed, without amendment, on June 8, and considered in Committee on June 16. On the latter date, Mr. Bridgeman moved a financial resolution relating to the proposed appointment by the Board of Trade of a chief examiner and three gas referees for the whole of the country. It was proposed that the payment of the necessary expenses and salaries of these officials should be made by a levy on all the larger gas undertakings, and that this should not exceed £15 for ever 100 million cb. ft. of gas made. Further, that the Treasury should finance these payments for the first two years, at the end of which the expenditure should be repaid by the companies. The question was put and agreed to.

Wood-distillation Factory, Ludlow.

Mr. Hope stated, in answer to Sir B. Stanier, that the wood-distillation factory at Ludlow is one of the group of five factories now advertised for sale. The stores at Ludlow consist of cordwood—the raw material for the factory—and are reserved for sale to the purchasers of the factories.—(June 16.)

Export Duties on Tin.

In answer to Mr. Jesson, Mr. Bridgeman said that export duties are imposed on tin ore and smelted tin in the Federated and Unfederated Malay States, but not in the Straits Settlements. The duty on tin ore is reduced if a guarantee is given that it will be smelted in the Straits Settlements, Australia, or the United Kingdom. In Nigeria there is a royalty on the export of tin, and in Bolivia an export duty on tin ore.—(June 16.)

Re-export of Sugar.

Mr. McCurdy, replying to Captain Rankin, said that it was necessary to restrict the consumption of sugar in the United Kingdom to about 1,100,000 tons a year; free private exportation in excess of this quantity would lead to enhanced world prices. No disadvantage accrues to this country by permitting the re-exportation of this sugar to other countries in diminution of the amount which they would otherwise require to import from elsewhere. —(June 16.)

Fertilisers (Temporary Control of Export) Bill.

In moving the second reading of this Bill (*cf.* J., 1920, 186 R), Sir A. Boscawen said that it was purely a temporary measure; the difference between the export and trade prices of sulphate of ammonia (£50 and £23 10s. per ton respectively)—the chief fertiliser concerned—was such that unless the export could be controlled there would undoubtedly be a serious shortage in this country, and 86 per cent. of the trade had agreed to the terms of the Bill. The present arrangement of securing equitable distribution through a special department of the Ministry of Agriculture would be upset at once if unrestricted exportation were allowed.—(June 16.)

Gas Mantles (Foreign Competition).

Mr. Bridgeman informed Captain Bowyer that the Government was fully alive to the importance of this industry, and he hoped to be able to make a statement concerning policy at an early date.—(June 16.)

Nauru Island.

The second reading of the Nauru Island Agreement Bill was moved by Col. Leslie Wilson on June 16. This island is said to possess the largest reserves of high-grade phosphate in the world, the lowest estimate placing the quantity in sight at 80 to 100 million tons. The deposits were leased from the German Government by the Pacific Phosphate Co., a British undertaking. As a result of the war the Supreme Council has granted a mandate for the island to the British Empire, and an Empire syndicate has since bought out the company for £3,500,000. The present measure provides that the members of this syndicate shall have first claim on the phosphate at cost price and in the proportion of their contributions to the purchase price, viz., Great Britain and Australia 42 per cent. each, and New Zealand 16 per cent., and that the surplus may be sold elsewhere at market rates. The agreement applies also to the rights of the same company in Ocean Island, where 15 million tons of phosphate is estimated to exist.

A long debate followed, in which it was generally conceded that the arrangement was satisfactory from the business standpoint, but much opposition was offered on the score that it was against the principles of the League of Nations, one article of which prescribes equality of opportunity in mandated territories for all members of the League. The motion to reject the Bill was defeated by 217 votes to 77.

COMPANY NEWS.

BRUNNER, MOND AND CO., LTD.

The annual ordinary general meeting was held in Liverpool on June 16. Mr. Roscoe Brunner, chairman of directors, who presided, moved the adoption of the report and accounts, the payment of 7 per cent. on the preference shares and a dividend at the rate of 11¼ per cent. per annum on the ordinary shares (10 per cent. in the previous year), both less tax. The motion was subsequently carried.

The balance sheet for the year ended March 31, 1920, shows a credit to profit and loss account of £1,129,150, against £1,012,081 for the previous year. There is a book profit of £2,100,000 on the sale of the ordinary shares held in J. Crosfield and Sons and W. Gossage and Sons, the purchase price of which was £4,000,000. The assets have increased by £2,250,000 and the cash position has improved to the extent of over £500,000. The net profit was £117,000 higher at £1,129,150. The company now holds about 91 per cent. of the total capital of the Castner-Kellner Co. (*cf.* J., 1920, 21 R), and 97.5 per cent. of the shares of the Electro-Bleach Co. have recently been acquired (*cf.* J., 1920, 98 R, 136 R). In consequence of these transactions the issued capital has been increased by £1,497,241, and now stands at £10,967,621.

After referring to the services of the staff and to the registration of Synthetic Ammonia and Nitrates, Ltd. (*cf.* J., 1920, 209 R), the chairman said that the prospects of trade would be bright if supplies of fuel and raw materials could be assured, and if the vicious cycle of increase in wages and increase in prices could be put an end to. The diminished output of fuel per man might partly be due to increased development work in the mines, for this had ceased during the war, but the total number of workers employed was now greater and the total output less than before the war. The competition between employees in different industries to secure as much or more than their fellows in other occupations was leading to chaos. The increases in wages already given by the company exceeded pre-war rates by 216.6 per cent. for the lowest-paid day men and 225 per cent. for the lowest-paid shift men. The trade unions representing the workers in chemical factories were now demanding a further advance of £1 per week, and if this were agreed to it would entail the dividend on the company's ordinary shares being reduced to 4½ per cent. There was a limit to the power of any seller to raise prices, and if the dividend were reduced to this extent the share values would fall below par and new capital could not then be raised. In his opinion the time had come for all employers to say "No" to demands for advances in wages.

Sir John Brunner moved a resolution, seconded by Mr. Robert Mond, authorising the directors to distribute £100,000 to such universities or other institutions in the United Kingdom as they might select for the furtherance of scientific education and research. The resolution was opposed, and as the voting by a show of hands was so even, the chairman announced the withdrawal of the resolution, at the same time remarking that it was "a desperately mean thing for a big company to do." It is understood, however, that the matter will be reopened at a later date, when the directors hope to be able to bring the shareholders to their point of view.

BRITISH GLASS INDUSTRIES, LTD.

At an extraordinary meeting held in London on June 10, it was resolved to increase the capital of the company to £5,000,000 by the creation of 3 million new shares of £1 each. Of the new capital, £2,100,000 represents the capitalisation of £2,100,000 held by the company in cash which has been derived from premiums on the issue of shares. Existing shareholders are to be allotted three additional £1 shares for every two now held.

In his address, the chairman, Mr. C. W. Milne, stated that the twenty-six separate organisations owned or controlled by the company are earning about £600,000 per annum in profits, and when extensions have been completed, and many are nearing completion, the approximate profits should be at least £1,500,000. The present output of glass bottles, containers, tumblers, etc., was at the rate of 170 millions per annum, and this would be about three times greater when the programme was complete; the actual production of electric bulbs—13 millions per annum—would be doubled before the end of the year (*cf.* J., 1920, 64 R).

NEW PACCHA AND JAZPAMPA NITRATE CO., LTD.

Dealing with the prospects of the current year at the annual general meeting held on May 19, in London, Mr. N. G. Burch, the chairman, said that matters had greatly improved since September, 1919, and since then over 1 million tons had been sold by the Association of Nitrate Producers at improving prices. Inasmuch as the company's stock had cost it over 9s. a quintal, the prices at which the first large sales were made were not profitable, and this fact, coupled with expenses due to stoppage, explained the loss incurred during the year. Work was resumed on the Jazpampa *maquina* in March last, and provision had been made for burning oil after the coal stock had been exhausted. The company had large stocks on hand, and it was hoped that the Paccha *maquina* would restart production soon. Production costs and railway freights had increased, labour was scarce, and the export duty was very high. However, ocean transport facilities had improved, and the present price for nitrate was very favourable. In regard to artificial nitrate production, the chairman said that he thought it would be a long time before the market for the Chilean material would be seriously challenged by any form of synthetic product.

SAN LORENZO NITRATE CO., LTD.

The accounts of this company for the year ended December 31, 1919, reflect the bad conditions, *e.g.*, suspended output and loss on exchange, obtaining in the nitrate trade during that period. The trading profit fell from £23,200 to £3500, and the net result was a loss of £11,040, comparing with a net profit of £15,600 in the previous year; no dividend is payable for 1919 (25 per cent., tax free, for 1918), and the carry forward is reduced from £14,500 to £3500.

In addressing the annual general meeting at Liverpool, on May 27, the chairman, Mr. W. H. Hasler, referred to the brighter prospects now showing, chief among which, from the company's point of view, was the very large amount of *caliche* in sight. When the company was formed in 1902 it was estimated that there were 6 million quintals (quintal = 101·42 lb.) in sight; since that time 5,462,457 q. had been produced, and it was now estimated that 6¼ million q. remain. As the result of investigations, it has been concluded that the various claims which have been put forward concerning improved methods of manufacture are unlikely to be substantiated. Hence it has been decided not to venture on a new system, but to modify the existing plant, at an estimated cost of £50,000, so that it could turn out 50,000 q. yearly.

LAUTARO NITRATE CO., LTD.

Mr. H. A. Rau, who presided at the 32nd annual meeting of the company on June 16, in London, stated that between November, 1918, and September, 1919, the company was only able to sell 2000 tons of nitrate, but as neutral tonnage had become available in the last three months of the latter year, it was possible to show a gross trading profit of £101,223, or about one-third of that made in 1918. The total gross profit for the year was £150,254, and after deducting £49,503 for income tax and French dues, £45,000 for excess profits duty for 1918 and 1919, and £25,000 for amortisation, there was a net profit of £23,222 (capital £550,000). The payment of a first and final dividend of 16 per cent., free of tax, was proposed, leaving, after allocating £40,000 for reserves and contingencies, £66,587 to be carried forward, as against £171,356 brought in. During the year 1919 the total exports from Chile did not exceed 911,000 tons, as compared with a normal pre-war export of 3 million tons. With regard to the question of synthetic nitrogen products and the future of the industry, the chairman said that it could not be concealed that the danger from this source must be considered as existing already to a degree that may eventually become very threatening. He then urged the need for the Chilean Government to modify the system of export duties and to regulate these according to the price of nitrate; and also for a better method of centralising sales than obtains at present.

Boot's Pure Drug Co., Ltd.—It is reported from America that the United Drug Co., of that country, has acquired a controlling interest in Boot's Pure Drug Co., Ltd. The purchase price is stated to be £1,500,000.

New Company.—*Sand, Glass and Foundry Materials (Amalgamated), Ltd.* has been formed to acquire and develop under one control and management a group of mineral deposits, the materials derived from which are in great demand in the glass, iron, steel and building trades. The minerals and properties are mainly situated in South Yorkshire, and have been favourably reported upon by Prof. W. G. Fearnsides and Prof. P. G. H. Boswell. The minerals, freehold, and plant to be taken over, valued at £285,578, are being purchased for £196,323, of which £100,000 is payable in ordinary shares. The capital is £300,000 divided into 300,000 ordinary shares of £1 each, and the remaining 200,000 shares are now offered for subscription at par. It is stated in the prospectus that special attention will be given to scientific research, and that research and management will go hand-in-hand.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for June 10 and 17.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of firm or agent.	MATERIALS.	Reference number.
Canada	Rubber	824
"	Steel tubing, cylinders for compressed gas, brass, copper and aluminium tubing	830
"	Lithopone, barytes, litharge, glue	874
"	Chemicals	876
"	Steel sheets	878
"	Sanitary earthenware	880
"	Asbestos brake linings and packings	882
"	China, earthenware	885
"	Bottles	*
Malta	Candles, soap	835
Austria	Condensed milk, animal fats	836
Belgium	Oil varnish	839
"	Petroleum derivatives, essences, palm oil, coconut oil, cod liver oil	842
"	Cod liver oil, essences	844
Denmark	Bricks, fireproof materials	848
Greece	Chemicals, leather	851
Italy	Chemicals, drugs, dyes, rosin, mineral oils, benzine	852
"	Machinery and requisites for the paper industry	897
"	Antifriction, bearing and babbitt metals, alloys	898
Serb, Croat, Slovene State,	Catalogues of paper, leather, chemicals, drugs	901
Spain	Perfumery	904
do. (Canary Isles)	Glassware, paper	855
Switzerland	Steel, oils	905
Algeria	Sulphates of copper, potash and ammonia	860
"	Pharmaceutical products	861
"	Salts of potash and soda, bicarbonate of soda, iodides, quinine	907
"	Iron, amianthus	908
Morocco	Candles, soap	862
China	Glass, perfumes	†
United States	Planished steel sheets	864
Argentina	Glass	912
Brazil	Chemicals, drugs, dyes	914

* The High Commissioner for Canada, 19, Victoria Street, London S.W. 1.

† The Statistical and Information Department, London Chamber of Commerce, 97, Cannon Street, London, E.C. 4.

TARIFF. CUSTOMS. EXCISE.

Australia.—The Proclamation of October 15, 1919, whereby the import of certain food containers was prohibited, has been amended, and the prohibition now extends to any package, container or appliance used for manufacturing, keeping or holding moist or liquid food substances.

Austria.—The rates of import duty have been modified on, *inter alia*, alcoholic liquors (with some exceptions), chicory, pyrites, coal tar oils of the benzol series with sp. gr. above 0·950, certain skins, cement, iron and steel bars, rods and sheets, tinplate, calcium acetate and carbide, barium chloride, and methyl alcohol.

Yellow and red lead, copper sulphate, war glue and paper size pay duty again at the ordinary rates.

Belgium.—It is proposed to amend the customs duties by means of "coefficients of increase," and to bring into force new rates of duty without awaiting legislative sanction.

Canada.—The tariff regulations affecting the Special War Revenue Act, 1915, effective from May 19, are set out in the issue for June 17. Among the articles affected are cut glassware, patent medicines, spirits, essences, perfumes, wines, and malt liquors.

Cyprus.—Under the new law which confers a preference on the products of the Empire when imported into Cyprus, dyes, matches, soap, china, earthenware, and malt liquors pay duty at two-thirds of the full rate.

East African Protectorate.—The import duties on potable distilled liquors have been increased.

Finland.—A licence tax and additional export duties have been levied on, *inter alia*, timber, wood pulp, paper, matches, tar, pitch, and on certain hides and skins.

France.—As from May 22, the export and re-export of petroleum, schist and other mineral oils are prohibited.

Hungary.—Customs duties when paid in Hungarian paper money are subject to a surtax of 1900 kronen for every 100 kronen of such duty, as from June 1.

Italy (New Territories).—The Italian customs tariff is extended to the occupied territories of Venezia Giulia, and Venezia Tridentina. Among the articles subject to an additional manufacturing surtax when imported into the occupied territories are beer, spirits, sugar, glucose, gunpowder, seed oils, acetic acid, and soap.

Lithuania.—Among the articles subject to export duty are horsehair, bristles, certain oil-seeds, cumin, soap, and wrapping paper.

Netherlands.—Export prohibitions have been temporarily raised from bone grease, artificial fertilisers, ammonium nitrate, chalk, copper sulphate, copper oxide, cubic nitre, nitric oxide, nitre, sulphates of lime, potash and ammonia, zinc chloride, soft soap, soap powder, molasses, vaseline, terpineol, terpene hydrate, and anæsthenine.

Netherlands (East Indies).—Export licences are required for gold, silver, medicines, gunpowder, cinchona bark, quinine and its salts.

Poland.—Compound pharmaceutical preparations, specifics, etc., may only be imported and sold with the permission of the Ministry of Public Health and under certain specified conditions.

Portugal.—Further regulations affecting imports are given in the issue for June 10. Among the articles affected are cast tin, tinplates, and textiles.

Sweden.—Export prohibitions have been raised as from May 12, from benzol oils, terpineol, safrol, menthol, heliotropin, cumarin, musk and other unspecified scented substances, natural or artificial, for use in the manufacture of perfumery.

Tunis.—Among the articles the import of which is subject to special restrictions or prohibitions are opium, spirits, sulphur, mineral oils, salt, saccharin, compound medicines, and matches.

TRADE NOTES.

FOREIGN.

The Soap Trade of Italy.—The Italian imports and exports of soap are about equal; but, as there has always been a shortage of fats in Italy, the raw materials are imported and the finished products exported. Of the raw materials, England and the United States supply the caustic soda, Australia and La Plata supply the coconut, sesame, arachis and palm oils and animal fats, the United States supplies the cottonseed oil, whilst the resins come from France, Greece and Spain. In 1919, Italy imported 2967 tons of common and 74 tons of perfumed soap, of which England supplied 1906 and 403 tons respectively. The exports in the same year amounted to 2086 tons of common and 180 tons of perfumed soap.—(*U.S. Com. Rep., Apr.* 19, 1920.)

The Rubber Trade in Italy.—With the exception of one or two "war" years, the value of raw rubber imported into Italy has risen steadily; in 1909 it was 20 million lire, and in 1918, 83 million lire, During this period the value of imported manufactured rubber goods declined from about 33 to 19 million lire, notwithstanding high prices. These figures, and the known increased demand for certain rubber goods, show that apart from the direct effects of the war, the industry has been developing satisfactorily. Germany formerly controlled this market, and is expected to make a strong bid to recover her footing; and competition is also feared from America and England. To consolidate and further the interests of the Italian industry, thirteen firms have recently combined under the leadership of Pirelli and Co., of Milan.—(*Schweiz. Chem.-Z., Apr.* 17, 1920.)

Swiss Chemical Trade in 1919.—During the year 1919, Swiss chemical trade was characterised by a downward tendency owing to customers holding back for the expected fall in prices. The dye industry was affected by the troubles experienced in the *Entente* countries in passing from war to peace conditions, but the outlook is now somewhat brighter. Imports were affected adversely by the very defective arrangements in French, Belgian, and Dutch ports, of which, however, Antwerp was the best. Regular traffic up the Rhine was interfered with by the continued drought, so that the time of delivery from England and overseas was as bad as in the worst years of the war. Supplies are not forthcoming from Germany in spite of the conditions of exchange; very little merchandise is available there; transport conditions are bad and the reliability of many German manufacturers doubtful. It is anticipated that Swiss dye exports this year will equal those for 1919, but in certain quarters it is predicted that they will be less than in pre-war times, for then the export figures included many re-exports from Germany. Pharmaceutical works are suffering from the diminished consumption of medicinal substances due to the re-establishment of peace and to the existence of large stocks held in England, America, and France. In Germany also there is a sufficiency of drugs, etc., and as the rate of exchange brings their prices below those current in neutral or *Entente* countries, the outlook for the latter is scarcely promising.—(*Schweiz. Chem.-Z., Apr.* 30, 1920.)

Market for Chemicals and Drugs in Turkey.—Nearly 50 per cent. of the chemical products consumed by the Turkish market before the war was supplied by Germany, which also furnished the major part of the synthetic products required. This position was attained by a careful study of the markets, adequate representation and propaganda work, and, in the case of special products, compliance with the requirements of the French pharmacopœia, which is officially recognised in Turkey. Except for a little quinine and a few pharmaceutical specialities, British chemicals were unknown in Turkey until 1908, when they obtained a market in the face of keen competition. Before the war, French chemical products represented 20 per cent. of the consumption, and, in addition, 75 per cent. of all pharmaceutical specialities came from France. France has now taken the place of Germany, and if British chemical manufacturers wish to regain their pre-war footing, they must adopt a method of packing based on the metric system and comply with the requirements of the French Pharmacopœia.—(*Bd. of Trade J., May* 13, 1920.)

Foreign Company News.—*Germany.*—The Badische Anilin- u. Sodafabrik reports a net profit of 27,025,045 marks (10,848,442 mk. in 1918) after writing off 60,867,018 mk. (40,604,423). The dividend payable is 18 per cent. compared with 12, 20, 28, and 20 per cent. in the years from 1918 to 1915, respectively. The report states that in a few cases prices have begun to recede, but it is not possible to foresee any immediate general decline. The present favourable state of business affords no ground for conclusions as to future prospects.

Chemische Fabrik auf Aktien vorm. J. Schering in Berlin reports good trade throughout the whole of the past year, particularly in regard to export business. The net profit was 1·88 million mk. (1·66 in 1918), and the dividend is maintained at 18 per cent.

Chemische Fabrik Griesheim-Elektron in Frankfurt a.M. has written off 4,227,085 mk. (5,458,762), and from the net profit of 6,962,303 mk. (3,151,371), and the amount brought in, 1,437,204 mk., is paying a dividend of 12 per cent.

Chemische Fabriken vorm. Weiler-ter Meer, Uerdingen, made a net profit of 2,582,627 mk. (1,147,680), and is paying 12 per cent., compared with 10 per cent. for 1918.

A.-G. fur Anilinfabrikation in Berlin. The gross profit for the past year was 24,877,536 mk. (13,700,319), the net profit 10,265,383 (4,972,770), and the dividend payable 14 per cent.

Kalle & Co., A.-G., Biebrich. The directors state that manufacturing, distribution, and stocks were under Allied control during the entire year 1919, and communication with customers was rendered very difficult. The fact that the year, on the whole, was a good one was due to the good export trade. Prospects for 1920 are in so far favourable as there is a strong demand everywhere for the company's products. The net profit was 2,438,414 mk., compared with 740,146 mk. in 1918; dividends total 14 per cent.—(*Z. angew. Chem., May* 28, *June* 8, 1920.)

Trade of Chosen in 1919.—In 1919 the imports and exports of Chosen were valued at £28,224,760 and £22,123,413 respectively, as against £15,994,367 and £15,543,524 in the previous year. Amongst the imports in 1919 were: Cement, £160,149; coal, £1,432,110; explosives, £65,559; matches, £145,227; kerosene, £812,644; copper ore, £8,744; porcelain and earthenware, £151,456; salt, £325,846; sugar, £407,054. The exports included: Soya beans, £2,065,818; coal, £63,818; copper ingots and slabs, £193,834; copper ore containing gold and silver, £319,203; ginseng, £175,681; graphite, £54,869; cowhides, £324,895; iron and mild steel, £1,107,365; manures, £311,634; gold ore, £122,794; iron ore, £242,613; tungsten ore, £38,175; and silk, £589,269. The bulk of the trade is with Japan, and the large increase in the total trade, which has quintupled since 1914, points to the general economic prosperity of the Koreans.—(*U.S. Com. Rep., Mar.* 27, 1920.)

Drug and Chemical Trade of China.—Many herbs and plants having medicinal properties are grown in China, including those producing liquorice, rhubarb, ginseng, cassia oil, aniseed and gum benzoin. It is estimated that China exports drugs and medicines each year to a value of over £600,000. In addition, there are large imports of drugs and chemicals; the value of the chemicals imported in 1916, 1917 and 1918 was £300,000, £400,000 and £300,000, respectively, and medicines to an approximate value of £1,200,000 were imported in each of these years. The chief heavy chemicals imported are soda and sulphur.—(*U.S. Com. Rep., Mar.* 25, 1920.)

The Tanning Industry of Lima, Peru.—The tanning industry of Peru is carried on almost entirely by Italians, who use primitive methods. Few tanneries are completely equipped, and some have no machinery at all. The largest tannery in Lima uses about 700 skins a week, of which 300—400 are usually cowhides and the rest sheepskins and goatskins. In 1918, Lima exported 1,482,623 kg. of cowhides, valued at £106,430, 29,772 kg. of sheepskins, worth £563, and 221,980 kg. of goatskins valued at £10,699. The average annual export of cowhides of all kinds is roughly 4,822,000 lb., say some 300,000 hides. It is estimated that local tanners make a profit of over 100 per cent. a year on their invested capital.—(*U.S. Com. Rep., Feb.* 19, 1920.)

Salvador in 1918.—The chief crop of Salvador is coffee, grown on elevated land, whilst the lowlands produce sugar, cacao, indigo, rubber, sisal, balsam, etc. Dyewoods are found in the forests and large areas of balsam trees grow near certain parts of the coast. There are rich mineral deposits, including gold, silver, copper, iron, lead, zinc, and antimony. In addition, petroleum deposits have been located, particularly near Antiquisaya and San Miguel, which are the most important. Of the total imports, valued at about £1,208,539 in 1918, the United States supplied 56 per cent., and the United Kingdom 25 per cent. The values of some of the chief imports in 1918 were: Cement, £11,853; drugs and chemicals, £22,462; explosives, £12,823; fertilisers, £736; gasoline, £7185; edible oils, £2282; illuminating oils, £8125; linseed oil, £3935; lubricating oils, £2923; crude petroleum, £3289; paints, £6181; soap, soap-making material and candles, £26,292; and zinc, £2550. The exports, valued at £2,479,960, were chiefly taken by the United States (85 per cent.), the share of the United Kingdom being only 0·8 per cent. The values of the chief exports in 1918 were:—Balsam, £26,520; gold and silver, £267,576; indigo, £127,719; rubber, £2657; sisal, £29,638; sugar, £121,411.—(*U.S. Com. Rep., Suppl., Mar.* 17, 1920.)

Guatemala in 1917 and 1918.—In spite of the dislocation of the economic life of Guatemala caused by earthquakes and fever, trade has become practically normal. The total imports in 1918 were worth £1,326,800, compared with £1,436,600 in 1917, and the exports were valued at £2,263,800 in 1918, as against £1,565,400 in 1917. The values of some of the chief imports for 1917 and 1918 were: Copper, tin, lead, and alloys, £2074 and £21,591; drugs and medicines, £42,392 and £55,652; glass, crockery, and earthenware, £18,322 and £14,959; iron and steel, £133,486 and £67,921; petroleum, £18,841 and £50,565; paper, stationery, etc., £34,167 and £47,852. Most of the imports came from the United States, with the exception of woollen goods, mainly supplied by Great Britain, and silk and petroleum, supplied by Japan and Mexico respectively. In 1917 and 1918 the exports, which were mainly sent to the United States, included castor oil, £1215 (1918 only); mineral products, £9358 and £49,202; skins and hides, £104,854 and £54,328; sugar, £90,018 and £99,816. The chief industries in Guatemala are sugar and coffee, but at present, owing to scanty supplies, the export of sugar is prohibited.—(*U.S. Com. Rep., Suppl., Feb.* 14, 1920.)

REVIEW.

The Hydrogenation of Oils. Catalysers and Catalysis. By Carleton Ellis. *Second edition, revised and enlarged. Pp.* xvii.+767. (*London: Constable and Co., Ltd.* 1920.) *Price* 36*s. net.*

The greatest result of the classic researches of Sabatier and Senderens on the catalytic activity of metallic nickel has developed from the application by Normann of metallic nickel to the hydrogenation of fatty oils in the liquid state. In the early days of the process many technical difficulties had to be overcome, and much information as to the preparation and properties of the catalyst acquired, and it was also necessary to produce hydrogen in large volumes cheaply and in a high state of purity. Such early difficulties being surmounted, development has been extremely rapid, and the process of hydrogenating fats is now carried out almost in every part of the world. The information concerning it scattered through patent specifications and other literature is so voluminous that its collection in book form has become a necessity. It cannot be affirmed that the time has yet arrived when it is possible to eliminate from this mass old and probably inaccurate matter, and in the volume under review the author has contented himself with a description, more or less condensed, of plants and processes as these are described in publications. From this point of view the work has been well done, and the many annotations in the text make it easy to refer to the originals for fuller information.

Although the book has not been divided into sections its contents might be grouped under four headings, viz.: Methods of hydrogenation, in which processes and plants are described; catalysts and their production, including much of the matter published in the interesting controversy concerning the possible action of oxides of nickel as catalysts; hydrogenated fats and their use in the preparation of foodstuffs, soaps, lubricants, etc.; the manufacture of hydrogen in quantity by various methods, with notes on the handling and storage of the gas. The book has 767 pages, of which almost 100 are taken up by an appendix containing very full abstracts from the official reports of two important patent actions in which, whilst there is much that is interesting as reading matter, there is a great deal that is so purely legal that it might well be left out of a technical work of this character.

The book is a useful collection of information bearing on the subject, but its bulk is already so great that it may be safely asserted that future publications on the subject will be concerned with a critical analysis of the process and the principles underlying it, with the elimination from the text of a great deal of matter which is already, even for so recently introduced a process, out of date.

John Allan.

PUBLICATIONS RECEIVED.

Chemical Fertilisers and Parasiticides. *By* S. Hoare Collins. *Industrial Chemistry Series, edited by* Dr. S. Rideal. *Pp.* xii.+273. (*London: Ballière, Tindall and Cox.* 1920.) *Price* 10*s.* 6*d. net.*

The Peat Resources of Ireland. *A Lecture given before the Royal Dublin Society on March* 5, 1919, *by* Prof. Pierce F. Purcell. *Department of Scientific and Industrial Research. Fuel Research Board, Special Report No.* 2. (*London: H.M. Stationery Office.* 1920.) *Price* 9*d.*

BEQUEST TO THE SOCIETY BY THE LATE DR. R. MESSEL.

In the obituary notice of the late Dr. Rudolph Messel which appeared in the *Review* of May 15, it was stated that his dearest wish was to accumulate funds for the endowment of science and education in his adopted country. This statement has now been amply verified by the terms of his will, upon which probate was recently granted, and for the information of members the following passages from the original testament, made in 1915, and from a second codicil, dated July 16, 1919, dealing with this most generous bequest to the Society are herewith appended:—

". . . as to the residue of the said money and my residuary estate generally I direct my trustees to divide the same into five equal parts and I give such parts as follows:—

"I give four of such parts to the Royal Society Burlington House and the remaining part to the Society of Chemical Industry Broadway Chambers Westminster and without imposing any trust or obligation I think fit to set forth my desires with regard to the fund given to each of these Societies as follows:—

"(i.) The fund should be kept separate from the other funds of the Society and be known under my name or otherwise as the Society may think fit.

"(ii.) The capital of the fund should be kept intact.

"(iii.) The Society should apply the whole of the income of the fund in such manner as it may think most conducive to the furtherance of scientific research and such other scientific objects as the Council of the Society may determine and should not apply any part of the income for such charitable objects as the granting of pensions and the like.

"1. To my friend Prof. Henry Edward Armstrong F.R.S. my platinum still in which I carried out with W. S. Squire my experiments in connection with the decomposition of sulphuric acid and I request without seeking to impose any trust upon him that he will upon his death leave it to the Society of Chemical Industry.

"2. To the said Society of Chemical Industry my platinum crucible which formerly belonged to Dr. H. Sprengel my Otto Von Guericke's 'Experimenta nova Magdeburgica de vacuo spatio 1672' my English translation of the de Magnete of Dr. William Gilbert given to me by my friend the late Sylvanus Phillips Thompson my 'Jubilee of Discovery of Mauve' by Sir William Perkin and my gold catalytic cigar lighter made by Tiffany of New York and given to me by Dr. William Nichols of New York."

The testator also left £5000 to the Royal Institution of Great Britain and £1000 to the Chemical Society.

THE ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

The Report of the Council for the year ended May 31, 1920, states that the Association has continued to make satisfactory progress. The membership has increased to 150 firms, representing a capital of over £80,000,000, and in addition there are nine affiliated associations. The personnel of the Council remained the same as in the previous year, and the officers included Mr. R. G. Perry, chairman; Dr. E. F. Armstrong, vice-chairman; Sir William Pearce, M.P., treasurer; the Right Hon. Lord Moulton, president. The Right Hon. J. W. Wilson, M.P., and Dr. C. C. Carpenter were elected vice-presidents.

After referring to the activities of the Council in regard to Parliamentary matters, and to the work of its representatives on the Advisory Committee of the Import Restrictions Department (which has now practically ceased to exist), the report proceeds to discuss the work of the Chemical Mission to Germany in the spring of 1919, the report on which has been supplied to British chemical manufacturers and Government Departments only, a critical summary being issued to the public press. The Council records its thanks to all members of the Mission, and in particular to the chairman, Mr. E. V. Evans, and the editorial committee for the preparation of the extremely valuable report.

One of the results of the report was to call attention to the unsatisfactory state of affairs with regard to the education and training of chemical engineers in this country, and also to the lack of co-operation existing between the makers and users of chemical plant. The training of chemical engineers is considered of such importance that the Council has requested the Publication Committee of the German Chemical Mission to draw up a report on the subject, and it is hoped that this report will be available at an early date. Steps have also been taken to bring together British manufacturers of chemical plant and the members of the Association. The outcome of meetings and discussions which have taken place is the proposal to form an Association of Chemical Plant Manufacturers, which will be affiliated to this Association. It is hoped and expected that this arrangement will lead to a fuller understanding by the engineers of the peculiar needs of the chemical industry, and that it will be to the mutual advantage of both makers and users of chemical plant.

In commenting on the dye situation, the Council in its last report stated that "its early efforts in the interests of chemical industry and British dye production have succeeded to some extent in improving what is still a by no means satisfactory outlook." This statement again exactly represents the present position. An attempt has been made to deal with the position—as it must ultimately be dealt with—as a whole. Following a conference which the chairman and general manager (Mr. W. J. U. Woolcock, M.P.) had with the then President of the Board of Trade (Sir A. C. Geddes), a further conference, presided over by Mr. Percy Ashley, was held, at which dye users, dye makers, and producers of intermediate and raw material were represented. This conference decided that a further effort should be made to co-ordinate the work of the three parties concerned, and a committee comprising two representatives of each, with the general manager, is now at work with this object in view.

A list of intermediates has been compiled, which is divided into three parts—(*a*) intermediates already manufactured, (*b*) intermediates required but unobtainable, and (*c*) intermediates unobtainable in sufficient quantities. The list has proved of great value in encouraging the manufacture of intermediates on a sufficiently large and comprehensive scale, and the Council hopes that, in the course of time, the three divisions may be abolished and only the first remain.

The difficult situation arising out of the refusal of the Board of Trade to grant licences for the export of anthracene led to conferences between the dye makers and anthracene producers. These discussions have resulted in the formulation of a scheme whereby, it is hoped, the production of anthracene will be increased to meet both home and foreign demands, and an agreement reached as to the price at which the product is to be sold. In the latter connexion evidence is being given before the Profiteering Committee on Dyestuffs, and negotiations are still proceeding which should result in the solution of all the difficulties involved.

The policy of bringing together people interested in particular subjects, with a view to the discussion of problems of interest peculiar to themselves, has been pursued during the past year with, it is believed, advantage to all concerned. In this connexion an experiment was inaugurated last year whereby the producers of pitch were kept in close touch with market conditions. This scheme has proved so successful that the makers have decided to continue the arrangement for the coming year.

In the Fine Chemical Group particular attention has been devoted to the adequacy of the supply of British research chemicals as distinct from chemicals used as reagents. In the early part of this year Dr. M. O. Forster and Prof. A. W. Crossley kindly supplied a list of the former. Each item in it has been carefully considered and classified. It is proposed to issue a brochure for distribution to wholesale houses and research chemists showing which of the manufacturers of fine chemicals is prepared to supply each item on the list.

In view of the fact that in the past standard specifications for chemical products have too often been drawn up solely from the standpoint of the users, the Association is collaborating with other bodies, such as the British Engineering Standards Association, to ensure that the interests of chemical manufacturers shall not be overlooked. A committee of the Association has already done useful work with regard to a specification for creosote for telegraph poles, etc.

Although the Information Bureau has been most successful in supplying information on technical matters, and in continually introducing new buyers to members, the Council regrets that fuller information has not been placed at its disposal for the use of its representatives on various Government committees.

The Council expresses its gratitude to the Traffic Committee, under the chairmanship of Mr. J. Lukes, for the extremely difficult and important work which it has performed during the year. The subjects dealt with have been very numerous, including the recent proposals of the Ministry of Transport and the conveyance by rail of dye intermediates. Mr. Luke gave evidence before the Rates Advisory Committee in its public inquiry into the general revision of railway rates and charges, and with reference to the forthcoming stage of this inquiry, which will deal with the classification of merchandise, it is suggested that members of the Association, including the tar distillers, should prepare an adequate statement of their requirements for submission to the Advisory Committee. The Association was also interested in the action *Midland Railway Co. and Others v. Brotherton and Co. and Another* (*cf.* J., 1920, 187 R), and the report, in expressing sympathy with the defendants, remarks that the judgment of the Court only shows how strongly entrenched the position of the railway companies is in matters of dispute with traders.

The Secretary of the Department of Scientific and Industrial Research announces that the Research Association for the Silk Industry has been approved by the Department as complying with the conditions laid down in the Government scheme for the encouragement of industrial research. The secretary of the committee engaged in the establishment of the association is Mr. A. B. Ball, the Silk Association of Great Britain and Ireland, Kingsway House, Kingsway, W.C.2.

THE PRODUCTION AND SUPPLY OF SYNTHETIC ORGANIC CHEMICALS IN THE UNITED STATES.

H. T. CLARKE AND C. E. K. MEES.

Chemical industry is founded upon scientific research, since it is only through research that the science of chemistry can be developed, and the growth of any chemical industry is necessarily dependent upon the development of the science which underlies it. In the section of chemical industry which is concerned with organic chemistry the connexion between research and the industry is direct and obvious. It is not improper, in fact, to consider the amount of scientific knowledge available in any branch of organic chemistry as a species of *capital* which must be increased to correspond with an increase in the industry, just as financial capital must be.

We might consider any particular section therefore as requiring for its development as an industrial venture so much financial capital (expressed in dollars) and so much intellectual capital (expressed in chemist-years of research). This intellectual capital can generally be derived partly from the accumulated knowledge stored in chemical literature, but invariably some, and generally most, of it must be accumulated directly by experimental research for the particular purpose in view. Perhaps we might say that the accumulated knowledge of the German dye works would be roughly equivalent to about 10,000 chemist-years. Of this perhaps one-third is available to the outside world in the literature and in patents, and one-third is obsolete or useless, representing work directed towards ends not now advantageous.

If any nation, therefore, desires to develop a specific chemical industry which may rival the corresponding German industry, it will be necessary to invest not only the required financial capital, but also an amount of chemical research which will be of the order of, say, 3000 chemist-years. (These figures are, of course, mere guesses.) Since the German works employ at least 1000 chemists, they are adding 1000 chemist-years to their knowledge every year, and in order to overtake them more than 1000 chemists engaged in the rival organic chemical industry will be necessary.

This argument assumes, of course, that chemists of different nations are on the average equal in ability and organisation, an assumption which, in the absence of evidence, is at any rate safer than any based on belief in special national superiorities. The research work carried out in the technical laboratories of the chemical industries is, however, dependent on the supply to those laboratories of two types of raw materials, purely scientific chemical knowledge and trained men suitable for research. For the supply of both of these the technical laboratories are dependent on the chemical departments of the universities which not only train the students but also carry out the research work in pure science on which all applied chemistry must ultimately be based. We see, therefore, that organic chemical industry is dependent on the technical research laboratories which, in turn, are dependent on the universities. In order to render organic research possible it is also necessary to have readily available the materials with which to carry it on. No one who has ever worked in a German chemical laboratory has failed to realise the immense advantage of having ready to hand all the chemicals produced, not only by the large-scale industries, but by the manufacturers of specialities required for laboratory use alone.

Organic chemistry is thus dependent upon a cycle of production. The laboratories produce new theories and new syntheses as the result of their research work; these are adopted by the factories and there developed into new processes by which new products are obtained and placed upon the market. In return a small portion of these new products, and the intermediates involved in their preparation, are turned back to the laboratories for use in future syntheses. Since, however, the research chemist as a rule requires materials of a degree of purity generally unnecessary in technical practice, these chemicals must pass through a centre where they are purified before distribution; and since a multitude of substances other than those so obtainable are required by the laboratories, such a centre is naturally formed by the manufacturer of special research chemicals.

When at the outbreak of war in 1914 the importation of chemical products from Germany was cut off, after an initial period of inactivity the chemical industries of the United States began a rapid growth, and the technical laboratories in which the manufacturing processes were worked out naturally developed in a corresponding degree. But these laboratories, as well as those in the Universities, were soon in great difficulties owing to the lack of a supply of research chemicals; and, owing to the necessity of preparing the starting materials necessary to practically every piece of research work undertaken, progress in the development of processes was very slow.

In the university laboratories the situation became almost desperate, and no solution was found until Dr. C. G. Derick, head of the chemical department in the University of Illinois, initiated and successfully carried out a scheme of enlisting a group of capable students to prepare during vacation time a supply of chemicals needed by the students who were to follow them. The work was conducted with a regular accounting system, so that the value of the preparations, which were then purchased by the University, could be known. This admirable scheme deserves to be imitated in other universities, for it afforded the students a unique training in the manipulation of chemicals on a scale impossible, on account of its expense, in any regular teaching course. The scheme was subsequently taken over and developed by Dr. Roger Adams, under whose direction supplies of chemicals were provided for other universities, for the Government, and for the American Expeditionary Force.

But the efforts of Illinois were naturally insufficient to meet the wide and increasing demand, and since it was clear that the supply of synthetic organic chemicals was a "key" section of chemical industry, it became urgently necessary for an industrial firm to undertake not only the synthesis of the less common organic compounds, which might be required for research work, but are not manufactured on a large scale, but also the purchase, purification, and distribution of the intermediates and finished products produced by the organic chemical industries.

The difficulties of such an undertaking were obvious and considerable. There could be no prospect of any immediate pecuniary return, and the preparation of a large number of pure chemicals on a small scale involves very high costs, particularly in regard to labour. Not only were the prevailing rates of remuneration in 1915 considerably higher in the United States than in Germany, but by 1918 they had doubled. Most of the materials necessary for the work were more expensive than before, and in many cases were unobtainable. To complete the difficulties, trained chemists of the required calibre were practically unobtainable owing to the prior claims of the military authorities.

Notwithstanding all these difficulties, the matter was of such patent urgency to the country that constant efforts were being made to induce some first-class firm to undertake the experiment as a matter of patriotic duty rather than for any financial profit; and after some consideration the Eastman Kodak Company decided, in the autumn of 1918, to endeavour to supply this link missing in the chain of production of the American chemical industry. The offer of the company was received with enthusiasm by the American Chemical Society and by all the more important of the organic chemical manufacturing firms, who have placed at the disposal of the undertaking not only their finished products but the intermediates which they prepare exclusively for their own use.

As just stated, men of adequate training were to all intents and purposes not to be found, so, with the exception of the chemist in charge and the errand boy, the department of synthetic chemistry was staffed entirely with young women. Nothing but praise can be spoken of the way in which these girls performed their work, which must have taxed them heavily both physically and mentally.

But as time went on difficulties made themselves evident. That which caused the greatest concern was the unforeseen danger of accidents. In such work accidents are apt to have most serious consequences, and while it is by no means certain that these are more liable to occur with girls than with men, there can be no question that a disfigurement from such a cause is a very much more grievous thing for a girl than for a man. Up to the present no accidents of any moment have occurred on account of fires, but the serious accidents have almost all been caused by corrosive liquids. No expression can be too strong for the admirable spirit shown by the staff in the face of these troubles. Not a sign of panic or inclination to leave the laboratory has ever been shown, and in almost all cases girls who had been badly burnt returned to the work after they had recovered. In view, however, of this situation it was decided, after rather more than a year's work, to replace such girls as left the laboratory by men, who were by that time again becoming available, and at the present time only three girls remain on the purely laboratory staff.

The actual duties of the department fall under three heads. Of primary importance is the synthesis of compounds which are not prepared technically but are required for laboratory purposes; secondly, the purification of technical materials obtained from the chemical manufacturers; and, thirdly, the distribution of such technical chemicals in the form in which they are purchased. By undertaking this last duty the laboratory can be of service not only to chemists and their purchasing agents at universities, but also to the manufacturers themselves, to whom a retail trade in small quantities is abhorrent, but who, on ground of public spirit do not care to refuse assistance. An understanding has now been formed between such manufacturers and the laboratory of the Eastman Kodak Co., whereby inquiries for small quantities are referred by the former to the company and inquiries for large amounts are referred by the latter to the manufacturers.

Raw materials are obtained principally from the manufacturers of dyes and dye intermediates, but large supplies are also furnished by the producers of perfumery chemicals, explosives, pharmaceutical and other chemical specialities. Many of these firms have supplied not only products which they manufacture for their own exclusive use, but in several instances have furnished materials specially prepared for this work or obtained by their research laboratories. Assistance has also been rendered by firms making specialities of a few of the less common products, as well as by certain individual workers in university and other laboratories. Thus Dr. W. D. Turner, in charge of the laboratory of technological chemistry of the University of Missouri, has had stocks of certain materials prepared for us by his students. This system, which has also been adopted at the Massachusetts Institute of Technology, is unquestionably most advantageous for such laboratories, inasmuch as it enables students to handle relatively large quantities of expensive materials without undue cost to the teaching institution. But the most important connexion the Synthetic Laboratory possesses is that with the Department of Organic Chemistry of the University of Illinois, which not only supplied the original nucleus of the present stock, but has from the beginning acted as distributor of the materials prepared there.

With respect to the purification of technical products, it was attempted to prepare as many as possible of these in a pure form, but in certain instances this has been found impracticable, particularly in the case of the sulphonated dye intermediates, where satisfactory criteria of purity have in many cases not been established. In a few other instances attempts at purification have had to be abandoned on account of the expense involved, since the price of the pure products would be prohibitive. This has occasionally also been the case when the yields of pure material were exceptionally low. In a large number of instances the quality of commercial chemicals is sufficiently high to permit them to be employed for general laboratory synthesis. The plan has accordingly been adopted of classifying chemicals into three grades:—(1) Those of the highest purity obtainable; (2) those not perfectly pure, but sufficiently so for synthetic purposes; these are termed "Practical" chemicals. This class also includes a few substances synthetised in the laboratory in which small amounts of impurities are known to be present, as well as a series of inorganic compounds commonly employed in organic synthesis.

The main duty of the laboratory naturally consists in the production of the pure chemicals either by purification or by synthesis. In many cases the purification is essentially a relatively simple matter of recrystallisation or fractional distillation, but it frequently involves a considerable expenditure of time.

(3) The majority of the products consists of those research chemicals which are not produced in either pure or technical quality elsewhere. Such materials form a large proportion of the list of organic chemicals issued by Kahlbaum prior to 1914; but a study of this list shows that there was in Germany a far larger number of technical products upon which to draw than in this country. The influence of the availability of commercial substances upon the prices in this list forms an interesting study. As may well be imagined, the cost of production in the laboratory is much greater than in the works, and in consequence the prices of pure materials are largely influenced by their source. An instructive comparison is afforded by the products of the nitration of chlorobenzene and bromobenzene respectively. In both cases the ortho and para mono-nitro derivatives are formed simultaneously, and in the laboratory the separation of these isomers is a much simpler matter in the case of the bromo compounds than with the corresponding chlorine derivates. On the other hand, the latter compounds were available from technical firms, but the bromine compounds were not; while neither of the meta-nitro derivatives were produced on a large scale.

Kahlbaum's Price List.

	Marks per Kg.		Marks per Kg.
Chlorobenzene	11·00	p–Nitrochlorobenzene	15·00
Bromobenzene	19·00	p–Nitrobromobenzene	40·00
O–Nitrochlorobenzene	15·00	m–Nitrochlorobenzene	100·00
O–Nitrobromobenzene	110·00	m–Nitrobromobenzene	45·00

	Marks per Kg.
2·4 Dinitrochlorobenzene	7·50
2·4 Dinitrobromobenzene	11·00

At the present time the price list contains over 700 items comprising about 650 distinct chemical substances. Of the three divisions the pure chemicals constitute about two-thirds of the number, the "practical" chemicals one-fifth, and the "technical" chemicals one-seventh. On an average the prices are slightly more than twice those of the Kahlbaum list of 1912, reckoning the mark as equivalent to 25 cents.

Up to the present the work has been conducted at a very considerable financial loss, the first year's working showing a loss exceeding $14,000, although no rent or other overhead charge was debited to the undertaking This was purely due to the initial months when methods were being developed.

At the present time the staff of the department is able to produce a monthly supply of chemicals sufficient for the sales, and at the same time to add steadily new chemicals to the list at a cost involving only a small loss.

It has from the outset been the aim of the laboratory to make as large a number of chemicals available in as short a time as possible, and this policy has connoted small stocks of chemicals of a somewhat higher cost price than if large stocks of fewer materials had been prepared. Three points have been kept in view in selecting new substances to be added to the list. First, urgency of demand; second, availability of raw material; and third, ease of preparation. Whenever an inquiry is received for a chemical not in stock, an attempt is made, if in any way feasible, to prepare it. If, however, experimental difficulties are encountered, the problem is set aside to be worked upon during spare moments rather than given an intensive study. In this way solution may be reached only after some months, but it has been obtained without interfering with the preparation of more accessible materials. Instances of this are phloroglucinol and *p*-cresol. Small stocks of each of these were obtained from outside the laboratory at the beginning, but soon became exhausted; and it was only after several months of desultory experimentation that suitable processes were developed. Problems of this kind which are still being carried on are the preparation of *p*-nitrophenylhydrazine, of nitron, and of piperazine. The solution of any of these may be reached at any time. Occasionally we are invited by workers in universities to suggest such problems which urgently require solution, and, as can be imagined, such co-operation is most welcome. On the other hand, it is our desire to co-operate with the chemical public by furnishing, on application, details of any process developed in the laboratory and employed for the preparation of Eastman chemicals; and any discoveries of particular interest will be published either in the Journals or in patent form.

A rather disconcerting feature from the financial point of view has been the very large investment represented by the stock required by such an undertaking. Owing to the high average value of the chemicals and to the great number listed even the smallest stock represents a considerable amount of money. In a profitable undertaking this might not be serious, though in any case such a stock must have a very slow "turnover," but in a venture with so small a margin as is possible in this case the large investment necessary would clearly make it difficult to establish an adequate stock without considerable financial resources behind the undertaking.

Since organic chemical industry is in this country still in process of development, the supply of technical products is in a somewhat unstable condition, and not only are crude materials subject to violent fluctuations in price, but in certain instances they appear in and disappear from the market in a manner which adds extra difficulties to the work. On the other hand, the United States is singularly fortunate in its natural chemical resources, many of which are now being developed, and it is our aim to take full advantage of this by rendering available for research these new materials, which five years ago were but chemical rarities of high price. Foremost among these new resources is normal butyl alcohol, of which a large number of derivatives have been prepared. In 1912 this substance was listed by Kahlbaum at 27·50 mk. per 100 gm.; it can now be obtained for $3·00 per kg., or at half this price for the commercial grade. Among the derivatives we have prepared mention may be made of butyl ether, for which we have developed a process. It is a fragrant liquid boiling at 141° C. which should be useful as a solvent and as a less volatile substitute for ethyl ether in extractions or for the Grignard reaction. Another is butyl oxalate, which is formed with as much ease as the ethyl ester is prepared with difficulty. Yet another is butyl mercaptan, which is identical with the odorous principle of the skunk; this pleasant substance is employed in mines for the detection of fire-damp.

Another new product is the mixture of esters of normal homologues of acetic acid which was produced during the war by the Hercules Powder Co. as a by-product in its process of manufacturing acetic acid and acetone from sea-weed. We have laid by a considerable stock of this material from which, by a tedious process of fractional distillation, pure ethyl propionate and ethyl butyrate have been isolated.

Ethylene chlorohydrin, a useful reagent in synthetic work, was obtainable before the war, but at the high price of 16 marks per 100 gm.; owing to the introduction of "mustard gas," a process for the large scale manufacture of this material was developed by the Dow Chemical Co., and it can now be obtained for $9·00 per kg. Trimethylene glycol was another reagent which was formerly obtainable in small quantities; it was supplied by Schuchardt at 9 marks per 10 gm., but is now available in large quantities as a by-product in the manufacture of glycerol, and can be obtained in "practical" quality for $12·00 per kg.

A considerable future undoubtedly awaits the chemistry of compounds prepared from ethylene and its homologues, since these gases are now by-products in the petroleum-cracking industry. By the absorption of propylene by sulphuric acid under suitable conditions, with subsequent hydrolysis, isopropyl alcohol is formed, and this substance is on the market in a high state of purity and far lower in price than before the war.

Through the recent work of E. A. Werner, a convenient method for the preparation of the methylamines is now known; and although this preparation on as large a scale as is feasible in the laboratory is kept running continually, we find ourselves unable to keep pace with the demand. Undoubtedly, if a larger proportion of the time of the department were devoted to the commercial production of a few such items for which there is a greater demand, the department would sooner approach a self-supporting basis; but this is a course of action we are determined not to take. In the near future, however, the department will be installed in more suitable quarters, where it is hoped that larger production with equal staff will be possible, and with the increase in demand which may be expected during the current year it may at the end of our second year be on a stable basis, where the running costs of the undertaking are met by the sales, leaving a small margin which can be applied to the increase of the number of the chemicals supplied, and especially to the production of those rarer chemicals for which the demand is limited but which are none the less of the greatest importance for the furtherance of chemical research. The object of the work will not be attained until the link in the cycle of American chemical science is completely established, and American chemists are in as favourable a position with regard to supplies of chemicals for research as they are in University facilities or in manufacturing strength.

ALUMINIUM AND ITS ALLOYS.

At the invitation of the Royal Society of Arts, a course of three Cantor Lectures on this subject was delivered by Dr. W. Rosenhain on April 12, 19, and June 7.

The lecturer began by pointing out that at the present time aluminium is almost the only basis available for manufacture of light alloys. Of other possible metals, alloys consisting mainly of magnesium are disappointing, whilst beryllium is not yet available. After describing briefly the process for the production of aluminium by electrolysis of pure alumina dissolved in molten cryolite, it was pointed out that there is no satisfactory method for refining aluminium, and that its purity is dependent on that of the materials used in its manufacture—notably the alumina and the carbon electrodes. Consumption of the latter is approximately equal, weight for weight, to the metal produced, and special petroleum coke having a low ash is essential for their manufacture. The necessity for cheapening the cost of aluminium was emphasised. In this connexion mention was made of the new nitride process whereby bauxite, carbon, and nitrogen are made to react at a high temperature with formation of aluminium nitride, which on treatment with soda yields sodium aluminate, with ammonia as a valuable by-product. The cost of preparation of pure alumina by this process is said to be very much less than by the present method. In dealing with the properties of aluminium, it was pointed out that its weakness lay in its mechanical properties, and therefore, for structural purposes where strength is required, alloying with other metals is necessary. The value of an alloy for structural purposes is dependent on the relation between strength and density, and the ratio,

$$\frac{\text{Tensile strength (tons per sq. in.)}}{\text{Weight of 1 cb. in. (lb.)}},$$

or "specific tenacity," may be taken as a measure of this value. A more striking representation of the value is given by the length of a bar of an alloy which will support its own weight hanging freely from one end. Thus a 30-ton steel will support approximately 3 miles of itself, and may be called a "3-mile" alloy, whereas recent progress in wrought aluminium alloys at the National Physical Laboratory has produced a "14-mile" alloy. The aluminium alloy known as duralumin, used by the Germans for their Zeppelin airships, is a "9-mile" alloy. The higher the "specific tenacity," or greater the length supported, the less the weight required within limits in any given structure for equal strength.

The alloys of aluminium present the difficulty that with the exception of zinc, and possibly magnesium, the range of solubility in the solid state for other metals—*e.g.*, copper, nickel, manganese, iron, tin—is low, and the addition of comparatively small percentages of these metals leads to the formation of hard compounds as free constituents, causing rapid decrease in ductility. Zinc is retained in solid solution by aluminium to the extent of as much as 40 per cent., and it is the zinc-aluminium solid solution which has provided the basis material for development of the "14-mile" wrought alloy above mentioned, as well as the best casting alloy for general purposes. Confining himself to the most important alloy systems, Dr. Rosenhain described the constitution, microstructure, and properties of the copper-aluminium and zinc-aluminium alloys, both cast and wrought, and traced the development, at the National Physical Laboratory, of the alloy "3/20" (copper 3, zinc 20, aluminium 77 per cent.), which in the hot-rolled condition attains a tensile strength of 26-27 tons per sq. in., with an extension of 18 per cent. on 2 in.

As a result of the addition of as little as 0·5 per cent. of magnesium, many alloys, including those of aluminium with copper and with copper and zinc, undergo a remarkable age-hardening after quenching, which is analogous to the hardening and tempering of steel. By utilising this property in the case of the "3/20" alloy above mentioned, a wrought alloy of slightly less density was developed at the National Physical Laboratory, and subsequently produced on a commercial scale. This is capable of attaining a tensile strength of 40 tons per sq. in., and giving a proof load of 26—28 tons per sq. in., with an extension of 12 per cent. on 2 in. The remarkable effect of nickel on the rolling properties of certain aluminium alloys was then discussed, as well as the development of an alloy of aluminium with magnesium, nickel and copper, possessing valuable properties, both cast and rolled. Strength in compression and shear, resistance to fatigue and shock, and the important question of corrosion were also dealt with.

The demands of the Air Service during the war were chiefly responsible for the development and greatly extended use of aluminium alloys. Research work has added considerably to our knowledge of their properties, and these alloys have found many applications in the construction of aircraft, automobiles, submarines, and tanks.

In regard to cast alloys, an outline was given of the reasons for the selection of the alloy, copper 2·5, zinc 12·5, aluminium 85 per cent., which proved so successful for general castings, crank-cases, pump-bodies, carburettors, etc. In the form of 1 in. diam. chill this alloy gives a tensile strength of 12 tons per sq. in. Substitution of aluminium alloys, with their much higher thermal conductivity, for cast iron for pistons and cylinders of aero-engines lowers the working temperature of pistons from the neighbourhood of 400° C. to 200°—250° C.; higher compression ratios become possible, and an increase in power of the order of 20 per cent., with 20—25 per cent. decrease in petrol consumption, results. Special alloys able to retain their strength at high temperatures are required for pistons and cylinders. The copper-zinc-aluminium alloy above mentioned loses strength rapidly when heated, and is unsuitable. Dr. Rosenhain traced the development of an alloy of aluminium with magnesium, nickel, and copper which in the form of 1 in. diam. chill has a tensile strength of 12 tons per sq. in. at 250° C., as against 4 tons for the zinc alloy previously mentioned. To provide satisfactory bearing surfaces, aluminium alloy cylinders require to be lined, and steel liners to be screwed or shrunk in. Piston troubles, "burning" (so called), growth and distortion, were discussed, and the deleterious influence of tin on impact strength at high temperatures was pointed out. In connexion with the wrought alloys, lengths of rigid airship girders constructed of channel and bracings of "3/20" alloy and of the high-tensile alloy above mentioned were exhibited. Results were given of tests on channel sections showing the greatly increased resistance to compression of the high-tensile alloy compared with other alloys. The production of very thin alloy sheet and the possibilities of its use in place of linen fabric for wing-covering were discussed in connexion with the all-metal aeroplane, examples of which were captured from the Germans during the war.

Dealing with future developments, the lecturer pointed out that the increased specific tenacity of aluminium alloys over that of steel made possible the reduction of weight of structures, *e.g.*, roofs and bridges could be constructed of greater span, and the starting and stopping losses of vehicles could be minimised by use of aluminium alloys for the underframes and other parts.

MEETINGS OF OTHER SOCIETIES.

INSTITUTE OF METALS.

The tenth annual May lecture was delivered on June 10 last by Prof. C. A. F. Benedicks, of Stockholm, the subject being "Recent Progress in Thermo-electricity."

The lecturer referred briefly to the deficiencies of the gas-kinetic electron theory of metallic conduction of electricity and indicated how such deficiencies were avoided by his "phoretic" electron theory of metallic conduction. This theory contemplates the conduction of electricity in metals as originating in the transportation of electrons through the metal *via* the contacts between adjacent atoms, and its development has led Prof. Benedicks to the discovery of what he termed the homogeneous thermo-electric effect in metals.

The history of thermo-electricity may be divided into three periods: first, a period of active, uncritical experimenting from 1821—1838; second, the period 1838—1885, characterised by keen criticism of thermo-electric phenomena. During this period the law of Magnus, that no thermo-electric current occurs in a perfectly homogeneous metal, was definitely accepted. Apparent departures from this law were ascribed to want of homogeneity in the material of the metal. During the third period, extending from 1898 to the present day, evidence has been advanced questioning the validity of the Magnus generalisation.

The existence of a thermo-electric current in an apparently homogeneous conductor is readily demonstrated by providing that a rapid temperature gradient occurs in the metallic conductor. This is best achieved by employing what the lecturer termed a "strangled" cross in the electric circuit. Two portions of the metal in question rest lightly upon one another in the form of a cross, and a closed electric circuit is secured by connecting one end of each constituent to a galvanometer. By heating one of the remaining limbs of the cross, a rapid temperature gradient occurs in the strangulated region of the circuit. Employing such a device, the lecturer demonstrated various phenomena indicating the existence of a thermo-electric current in a homogeneous metallic conductor. The existence of a thermo-electric effect of this nature and of the correct sign in pure homogeneous mercury has been confirmed. The observed effect is proportional to the cube of the temperature difference, whereas in a heterogeneous circuit the effect should be proportional to the first power of the temperature difference. The lecturer has also established the reality of the inverse phenomenon, viz., an electro-thermic effect in a homogeneous conductor of a more general nature than the Thomson effect. The passage of an electric current through a constricted or strangulated section of a homogeneous conductor was found to be accompanied by the production of a difference of temperature between the two portions of the constricted or strangulated region. This temperature difference was found to be proportional to the current density through the strangulation. The existence of these thermo-electric effects in homogeneous materials permits the schedule of such effects to be completed in the following manner:—

	In homogeneous bodies.	In heterogeneous bodies.
Thermo-electric effects, *i.e.*, thermal current produces electric current.	Benedicks, 1916	Seebeck, 1821 →
Electro-thermic effects, *i.e.*, electric current produces thermal current.	Thomson, 1856	Peltier, 1834

ROYAL PHOTOGRAPHIC SOCIETY.

At the meeting of the Scientific and Technical Group on June 8, Sir William Pope presented the second of a series of papers by himself and Mr. W. H. Mills on "Photographic Sensitisers." The "carbocyanines," considered in this paper, are formed by the condensation of two molecules of a quinoldinium alkyl iodide in the presence of formaldehyde; they differ from the isocyanines previously described (this J., 1920, 468 A) in that the two quinoline groups are attached at the 2,2′ positions by the 3-carbon linking :CH·CH:CH·, instead of by the simpler link :CH· at the 2,4′ positions, and also in sensitising further into the red end of the spectrum. The best known member of the group is the 1-1′ diethyl compound, which is in use under the name Sensitol Red (German, Pinacyanol). About 20 carbocyanines were described, variations being made both in the number, position, and composition of the substituting radicles, and the wedge-spectra of plates sensitised by them were shown in colour on the screen. As in the case of the isocyanines, substitution in some positions has a considerable depressing effect on the sensitising action. In the subsequent discussion Sir William Pope suggested that the essential characteristic of the carbocyanines is the 3-carbon linking, :CH·CH:CH·, and not the position of connexion to the quinoline groups.

Mr. G. I. Hogson described and exhibited a neat device for obtaining non-intermittent graded exposures of known values. The photographic plate is moved by means of a governed dictaphone motor under an opening of any desired shape; the actual speed of movement and any irregularities in it are obtained by means of an electrically operated time marker, controlled by a metronome, which marks off definite time intervals on a smoked glass attached to the table which carries the plate.

NEWS FROM THE SECTIONS.

CANADA.

The annual meeting of the Canadian Section was held in the University of Toronto, on May 27–28, in conjunction with the third annual Convention of Canadian Chemists. Dr. W. L. Goodwin, chairman of the Section, presided at the opening session of the Convention, which was devoted to the reading of three papers: "The Inner Life and Habits of Metals," by Messrs. H. J. Roast and C. F. Pascoe; "The Bicarbonate Reaction and its Application to the Manufacture of Carbon Dioxide," by Mr. G. H. Tomlinson; and "Canadian Opportunities in Industrial Chemistry," by Mr. S. J. Cook. A paper entitled "Notes on Decolorising Blacks," by Mr. C. F. Bardorf was taken as read.

The annual meeting of the Canadian Section was held at the second session. In his report, the hon. secretary, Mr. Alfred Burton, described the good progress made by the Society in Canada, and intimated that it was proposed to abandon the present organisation into sections and branches, and to substitute five independent sections which would deal directly with headquarters in London; these sections would be as follows:—Montreal, Toronto, Ottawa, Canadian Pacific and Maritime. The personnel of the Executive Committee of the Canadian Section for the new session would be:—Chairman, Dr. H. van der Linde; hon. sec., Mr. A. Burton; Drs. W. L. Goodwin, R. F. Ruttan, W. L. Miller, W. L. Lang, F. T. Shutt, and Messrs. M. L. Davies, C. R. Hazen, M. L. Hersey, H. J. Roast, L. J. Rogers, H. M. Lancaster, and A. F. MacLean.

Dr. Charles H. Herty then delivered an address on "Chemistry under a Constitutional Government," in which he compared the great progress of chemical industry under the late autocratic German *régime* with the comparative ignorance and neglect shown to it by legislatures in more democratic countries. Dr. Herty's solution of the problem is to enlighten the public through the agency of the ephemeral press. The address was very heartily received. Two more papers were then read, one on "The History of the Varnish Industry," by Mr. N. Holland, and the second on "Capital and Labour; and Chemists," by Dr. J. Waddell.

On May 28, the Canadian Institute of Chemistry held its annual meeting, Prof. J. Watson Bain presiding. Mr. H. J. Roast, the secretary, read the annual report, which recorded excellent progress, and then the by-laws were discussed. A resolution moved by Dr. Ruttan urging the Dominion Government to remove the excise duty from pure ethyl alcohol for hospital, laboratory, and industrial uses was carried unanimously. The afternoon was devoted to the inspection of works in the locality, and the annual dinner brought to a close a most successful meeting.

PERSONALIA.

Dr. T. M. Lowry has been appointed to the new professorship of physical chemistry at Cambridge University.

Dr. W. N. Haworth has succeeded Dr. S. Smiles as professor of organic chemistry at Armstrong College, Newcastle-on-Tyne.

Dr. Marston T. Bogert, professor of organic chemistry in Columbia University, has been appointed a member of the United States Traiff Commission.

The office of Pro-Vice-Chancellor of the University of Bristol has been filled by the appointment of Dr. F. Francis, professor of chemistry in the University.

By an Order in Council, dated June 24, 1920, Prof. Sir John Cadman, Mr. W. B. Hardy, and Prof. Sydney Young have been appointed members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

Dr. J. S. Flett, at present Assistant to the Director in Scotland, has been appointed Director of the Geological Survey and Museum, in succession to Sir Aubrey Strahan, who retires this month. The retirement of Mr. G. W. Lamplugh, Assistant to the Director in England, is also announced.

The late Mr. J. W. Hyatt, of Short Hills, New Jersey, was awarded the Perkin medal by the American Section of this Society in 1914 for his services to applied chemistry. He was the inventor of celluloid and held a large number of patents, many of considerable industrial importance.

Dr. Max Bodenstein, of the Technical High School at Hannover, has been appointed to the chair of physical chemistry in the University of Jena.

The death is announced of Prof. Ludwig Gattermann, professor and director of the University Chemical Laboratory in Freiburg i/B, on June 21 last, aged 60.

Friedrich Bayer, son of the founder of the firm of Fr. Bayer and Co., Leverkusen, died on June 22 in his 68th year. The deceased had held various important positions in the works, and for the last eight years was a director of the firm.

NEWS AND NOTES.

UNITED STATES.

A "Tyrian Purple" from Costa Rica.—In Costa Rica a dyestuff is being obtained in a small way from shell-fish, which doubtless belongs to the same family as that which supplied the Tyrian purple of the ancients along the Mediterranean. It is used principally in dyeing silk thread, which, when passed through the liquor and subsequently exposed to sunlight, takes on a fast purple colour.

Fire-proofing of Cotton Bales.—At the recent meeting of the American Cotton Association a bale of cotton, which had been treated by a new chemical process, was on exhibition. This process renders the bale flash- and spark-proof, and at the same time seems so to condition it that country damage is largely avoided. Ordinarily 20,000 bales of cotton are destroyed before the crop is marketed, and most of this is due to flash or spark fires.

Lactic Acid in Human Dietary.—Edible lactic acid is rapidly replacing the more expensive citric and tartaric acids in many American industries. In soft drinks 1·75 lb. of lactic acid replaces 1 lb. of citric crystals and 1·5 lb., one pound of tartaric acid. The cost of edible lactic acid (56 per cent. by volume and 50 per cent. by weight) is about 35 cents per lb., whereas citric acid fetches $1.00 and tartaric acid about 85 cents. It has been found that the addition of a small quantity of edible lactic acid to beer of very low alcohol content improves the beverage by combining with the amides and amino acids.

Synthetic Camphor.—To combat the Japanese camphor monopoly, three large chemical companies have started the large-scale manufacture of synthetic camphor from turpentine. This step has been taken because the supply of camphor allotted to the United States by the Japanese Government is considered inadequate and the price too high. As approximately nine-tenths of the world's supply of turpentine is distilled in the United States, it is believed that the manufacture of synthetic camphor will develop into an important industry. The present price of spirits of turpentine is $2 per gallon. It may not be possible to undersell the Japanese product now, but it is hoped to counteract the Japanese monopoly and improve the market.

The Beet-Seed Industry.—The United States Beet Seed Co. has decided to continue its activities during 1920 in Idaho, but on a smaller scale than hitherto. In fact, unless the results obtained in 1920 are more successful than during 1919 the company may be unable to continue at all. The production of seeds during 1919 was less than half the normal, and the stecklings wintered for seed growing in 1920 are poor. The acreage for planting out these stecklings is 1600, as against 3000 in 1919. During the three months September, October, and November, 1,762,500 lb. of beet seeds, valued at about £513,000, was imported into the United States from Germany. During eleven months in 1919 only 113,140 lb. was re-exported. Japan was the best buyer.

SOUTH AFRICA.

Discovery of Tin Ore.—Prospectors have discovered the presence of tin ore ((cassiterite) over an area comprising Helderberg, between Stellenbosch and Somerset West, and the Kuils River Mills of the Koeberg District. The geological formation is a grey granitic base rock, on which lie the Malmesbury beds consisting of slates, phyllites, quartzites, and limestones. These Malmesbury beds can be correlated with the Devonian rocks of the West of England, and therefore the geological formation of this Cape district is similar to that of the Camborne district, Cornwall.—(*Official.*)

Occurrence of Chromium.—Chromite deposits are fairly widely distributed in the Lydenburg district of the Transvaal. In the bushveld plutonic rocks east of the Lu Lu Mountains there is a more or less continuous chain of outcrops, in which the ore, associated with a black, very basic hypersthene, is found in bedded layers up to 5 ft. thick with a dip of 8° to 15° in a belt 1½ miles wide. At Ward Steelpoort a lode of chromite 6ft. wide, with which are considerable quantities of magnesite, is being worked, and the ore can be sold in Pietersburg for 35s. a ton at a profit of 13s. 9d. In the Rustenburg district the mineral is found associated with magnetite in serpentinised pyroxene in several localities extending for 28 miles between Rustenburg and the Crocodile River. It usually occurs as lustrous black aggregates of granular ore carrying 35% Cr_2O_3 and up to 1 dwt. of platinum per ton. The ore weathers easily, and is therefore difficult to concentrate, hence production in quantity is unlikely. In North Lydenburg, however, deposits containing up to 54% Cr_2O_3 have been found, but development is retarded owing to lack of transport facilities. Natal chromite contains only 25—28% of chromic oxide, whereas that found at Selukwe, in Rhodesia, contains between 41% and 51%. The latter deposit occurs in a talcose schist, but the rock was originally a peridotite in which the chromite was a product of igneous segregation. The peridotite has metamorphosed into talc, dolomite, serpentine, and chlorite, in which the chromite is found as large lenticular masses mostly between 150 and 450 ft. long. About 130 of these masses have been mapped, and the "chrome mine" which has been working 8 to 10 of them for 9 years has exported 300,000 tons of crude ore. Rhodesia produced 55,485 tons of ore, worth £139,099, up to January, 1910. The production in recent years has been as follows: 1915, 60,525 tons, value £143,510, or 47s. per ton; 1916, 87,406 tons, value £335,935, or 77s. per ton; 1917 (to June 30), 32,000 tons, value £142,817, or 89s. per ton. The latest available selling price is £9 10s. per ton for 40% ore and 2s. per unit above 40%, delivered in England. In view of the fact that many South African chromites contain up to 1½ dwt. of platinum per ton, examination of alluvial deposits in the neighbourhood of chromite might lead to the discovery of the metal in payable quantities.—(*S. African Eng., Apr.* 30, 1920.)

AUSTRALIA.

Power Alcohol.—In the past the excise duty of 1s. per gallon on industrial denatured spirit has rendered its manufacture unprofitable, but now that it has been removed the industry is likely to develop rapidly. An Australian company has already been formed to manufacture "natalite" in Papua, where 100 square miles of territory have been reserved for the industry. Plants and trees will be used as the raw material, and these, it is estimated, will yield 73 galls. of alcohol per ton. When the projected plant is complete the company anticipates an annual output of 5½ million galls. of "natalite," to be eventually increased to 18 millions. A retail price of 2s. per gall. is foreshadowed. The company intends to form co-operative undertakings throughout the Commonwealth with the object of inducing farmers to raise crops of sorghum, estimated to yield 80 galls. of alcohol per ton, and to share in the profits. If this scheme be carried out, the country will be independent as regards liquid fuel; last year it paid £2,500,000 for imported motor spirit alone.—(*Times Tr. Suppl., June* 12, 1920.)

Graphite in Western Australia.—The Western Australian Minister of Mines announces that an English company is making preparations to work the very extensive deposits of graphite in that State. He was advised that this deposit was one of the biggest in the world, and that in view of the fact that the world's requirements were something like 300,000 tons per annum, and that most of the big sources of supply were dwindling, the enterprise should prove of great value.—(*Official.*)

NEW ZEALAND.

The Kauri-Gum Industry.—During the year ended March 31, 1919, kauri gum to the value of £18,847 was purchased by the Department for the Administration of the Kauri-Gum Industry, and sales amounting to £14,226 were made, solely to the United States. Since that date, shipments have been sent to the United Kingdom, and with more shipping available, exports in this direction will probably increase. The first plant in New Zealand for the extraction of oil from kauri-gum peat (the soil of the buried kauri forest) was started up at Redhill in December, 1919. The oil yields motor spirit, a solvent oil, a turpentine substitute, and paint and varnish oils. There are thousands of acres of this oil-soaked peat in the North Auckland Province, so that the industry has a good future, especially as the winning of the peat is cheaper than that of the gum, though distillation costs are approximately equal. The result of fractionating 95 gallons of the peat oil was: Light oil (spirit), 4·75 galls.; medium oil (carbolic), 10 galls.; heavy oil (creosote), 24·25 galls.; resinous tar and pitch, 22 galls.; water, 31 galls.; loss in handling 3 galls. A ton of peat, which showed 10 per cent. of kauri gum, yielded 64⅓ galls. of oil. The New Zealand Peat Oils, Ltd., has a lease of 3000 acres of this land near Kaimaumau, in Mongonui County, and developments are reported to be satisfactory.—(*Bd. of Trade J., May* 27, 1920.)

FRANCE.

Industrial Notes. — *Metallurgy.* — Reconstruction work in France has been progressing very steadily ever since the armistice, and it is no exaggeration to say that the mines have recovered 75 per cent. of their pre-war output capacity. If actual production has not kept pace with the rate of recuperation, the causes are to be found in scarcity of labour and difficulties of transport. The total production of pig iron in France in 1919 was 2,412,149 metric tons, of which 55,422 tons was made in the electric furnace. The works in Eastern France contributed 469,954 tons or 19·4 per cent. to the total production, and those of Alsace-Lorraine 1,112,443 tons, or 46 per cent.

There is little warrant for the belief that the present depreciated values of metallurgical products will lead to a general and permanent fall in prices. The latter will reach their normal level only after the problem of adequate fuel supply has been solved and production has become commensurate with demand.

It is reported from Strasbourg that an agreement has been arrived at between the Lorraine firms and British metallurgists by which iron ore from the Briey basin will be exchanged against British coke to arrive in France *via* Havre and Dunkirk.

Fuel.—Provided the present rate of reconstruction in the North of France be maintained, it is estimated that the Nord basin will supply some 3 million tons of coal in 1921. American coal is still arriving, and latterly Canadian coal has appeared on the French market.

The use of *mazout* or heavy fuel oil has been proved a success by the Orléans Railway Co., all technical difficulties having been overcome, but, unfortunately, it has to be recognised that extensive use is ruled out at present by irregularity of supply, scarcity of tonnage and excess of demand over supply. A good strike of petroleum is reported from between Marignier and Giat in the Bonneville district of Savoy.

The Chemical Market.—The comparative firmness of this market, in face of general depression, is due to the fact that supply is still very short of demand, and to the fear that the market may soon be flooded with surplus stocks from Japan or the United States, thus preventing any upward tendency in prices. There is still a great shortage of acids, compounds of potassium, sodium, manganese and magnesium; in some cases the dearth is connected with packing, as casks, carboys and cylinders are in very short supply. Among other chemical products in great demand are:—Boric and phosphoric acids, sodium sulphite; benzene, nitrobenzene, aniline, and their derivatives; toluene, meta- and para-cresol; and fertilisers are also scarce, especially those of organic origin. In the bleaching and dyeing trade, the shortage of indispensable chemicals is very keenly felt and prices are extremely high. Nitrate of soda is more abundant owing mainly to the more conciliatory spirit displayed by Chilean producers. The fixation of atmospheric nitrogen is still engrossing great attention. Besides the works at Grande Paroisse, which utilises M. Claude's process, "La Société Norvègienne de l'Azote" has just established in conjunction with the Kuhlmann company and "La Compagnie Nationale des Matières Colorantes," *La Société des Forces Electriques de la Vallée de Gavarnie,*" which will utilise local water power for the production of synthetic ammonia and nitric acid.

GENERAL.

British Cotton Industry Research Association.—This Association was constituted exactly a year ago, and a report covering the first nine months of its activities has just been issued. Mr. Kenneth Lee has succeeded Mr. H. R. Armitage as chairman, who resigned owing to ill-health; Prof. A. W. Crossley took up the duties of director at Easter this year; Dr. A. E. Oxley has been appointed head of the physics department, and Dr. J. C. Withers is in charge of the abstracting and indexing of scientific and technical information in connexion with the Records Bureau. The Council has approved of the proposal put forward by the Textile Institute that the various textile industries should join in financing the publication of abstracts, and has accordingly made an initial grant of £300 for one year to the Institute for this purpose. The Association has been admitted to the Federated Superannuation Scheme for Universities whereby members of University staffs will be able to move freely on to the staff of the Association without invalidating their claims to superannuation. A property known as "The Towers" has been acquired in East Didsbury to house under one roof all the departments of the Research Institute, and the Council is about to issue a special building appeal for £250,000. The chief aim of the Association is stated to be the solution of fundamental problems, the application of the results being left, in the main, to those engaged directly in the industry. In order to secure a future supply of trained men, a joint committee has been formed with the Empire Cotton-Growing Committee of the Board of Trade with the object of granting scholarships to graduate students; so far, three botanical scholarships have been established. The number of individual members of the Association is 1408.

Italian Chemical Journals.—It is announced that the *Giornale di Chimica Industriale* will, as the result of an agreement between the Società di Chimica Industriale and the Associazione Italiana di Chimica Generale ed Applicata, appear in future under the title of *Giornale di Chimica Industriale ed Applicata.* In its new form the journal represents the continuation of both the "Giornale di Chimica Industriale" and the "Giornale di Chimica Applicata," the latter of which was published as a second series of the "Annali di Chimica Applicata." The new journal, being also the organ of the Associazione Chimica Industriale of Turin and of the Associazione Nazionale Industriali Chimici, adequately represents applied chemistry and will be to this field what the *Gazzetta Chimica* is to that of pure chemistry.

Projected Leather Research Institute for Saxony.—The Government of Saxony has asked the local Parliament to vote a single contribution of 500,000 mk. and a yearly subsidy of 50,000 mk. for the establishment of a research institute for the leather trade and industry.—(*Chem.-Zeit., June* 17, 1920.)

Technical Education in Germany.—The number of students in the various technical colleges in Germany is now 18,686, compared with 12,200 before the war and 5000 thirty years ago. The present total includes 5975 mechanical engineers (3118 in 1913-14), 2842 electrical engineers (1307), 3333 chemists, biologists and pharmacists (1544), and 577 students of mining and metallurgy (576). Charlottenburg, with 3168 students, has the largest number, followed by Munich with 2811 and Hanover with 2572. The number of women students in the winter session 1919-20 was 284 (116 in 1914-15), of which 161 (32) were studying mathematics, biology, chemistry and pharmacy.—(*Chem.-Zeit., June* 17, 1920.)

Proposed Institute for Lignite and Mineral Oil Technology in Germany.—According to a recent memorandum issued by the leading technical chemists of Germany, it is proposed to establish an Institute of Lignite Technology and Mineral Oil Chemistry at the Technical High School, Charlottenburg, the object of which will be to investigate the better utilisation of lignite and its by-products, and the heating value and methods of combustion of the different varieties of mineral oil. It is planned to set up a chair of lignite technology and a chair of mineral oil chemistry to which would be handed over the research work of the existing Mineralölversorgungs-Ges., m.b.H. The originators of the movement have formed a society for the promotion of the proposed Institute with a minimum subscription of 1000 mk. payable in 10 yearly instalments. A capital of 2 million mk. has already been subscribed by a small number of interested people.—(*Chem.-Zeit., June* 10; *Z. angew. Chem., May* 21, 1920.)

German Potash Production in 1919.—Owing to transport difficulties, strikes, shorter hours of work, etc., the German potash production dropped from 10 million quintals of pure potash (K_2O) in 1918 to 8·12 million quintals in 1919, when the output, in quintals of K_2O, consisted of:—Carnallite, 49,841; kainite, 3,727,633; manure salts (20—40 per cent.), 2,070,813; chloride of potash, 2,164,353; and sulphate of potash, 107,384 (quintal = 0·1 metric ton). The relative proportions of the different products to the total output remained substantially the same. At the end of 1919, the production, after the loss of 13 works in Alsace, was divided among 198 potash works, 151 of which gave the actual and 47 the estimated output. A further 8 works have joined the syndicate, making the total now 206.—(*Chem. Ind., June* 23, 1920.)

Gold and Platinum in Germany.—The high prices of these metals in Germany—gold costing 60,000 marks per kg. and platinum 300,000 mk. per kg., as compared with 2800 mk. and 6000 mk. in 1914—has aroused much interest in the question of their occurrence in the country. Gold was obtained both by mining and washing in former years, and analyses of samples from certain of the disused mines shew a gold content of more than 50 gm. per ton, whilst examination of old dumps indicates that these contain notable quantities of the metal. A deposit of green lead ore (green pyromorphite) hitherto unworked would, according to recent analyses, yield 0·002 per cent. of gold. Platinum was first discovered some years before the war in the Rhenish greywack. Unfortunately, the attempts to recover it proved ineffective, so that new methods will have to be employed, for which cheap electric power or cheap fuel will be necessary. It has been shown that the platinum is not confined to the Devonian greywack, where it was discovered, but that it also occurs in the diabases of Nassau and in the schists of Devonian age.—(*Schweiz. Chem.-Z., Apr.* 17, 1920.)

The Dye Industry in Basle.—The coal-tar dye industry in Basle dates back to 1856, and has so developed that it now employs some 3000 unskilled workmen and a staff of 700, which includes 120 chemists. The exportation of dyestuffs increased in value from 14 million francs in 1896 to 33·5 million francs in 1912, whereas Germany exported values of 72 million mk. in 1896 and 142 million mk. in 1913. Imported raw materials and semi-manufactures were valued at 15,075,000 fr. in 1912, to which fuel worth 1,623,000 fr. should be added. The power utilised includes 1568 steam- and 11,111 electrical h.p. The improvement of water transport will react favourably on the progress of the industry, as will the establishment of a co-operative acid factory near Basle and a soda works near Zürich, whilst the amalgamation of the dyestuff and artificial fertiliser industries in the district will provide the basis for a large production of the necessary acids. In regard to trade policy, the industry demands minimum restrictions on the importation of raw materials, and seeks "most favoured nation" treatment in all countries importing its wares.—(*Rev. Prod. Chim., May* 31, 1920.)

Copper Mining in Russia.—Before the war the Russian production of copper was about 25 per cent. greater than that of Germany, but while Russia could easily supply her own needs, owing to her poor industrial development, Germany could only furnish 20 per cent. of her own requirements. During the 18th century Russia supplied a great part of Europe with copper and continued to export large amounts until about 1840, after which period the output fell so low that considerable quantities had to be imported. The output fell by one-half, and at times the imports were three times the home production. The causes of the decline are ascribed to the abolition of serfdom, the raising of the mining tax, and a very low import duty. After the import duty had been raised to 2·5 roubles per pood in 1886 (rouble = 2s. 1½d.; pood = 36 lb.), smelting began to increase in the Urals and the Caucasus, so that from 1885 to 1893 the output rose from 4853 to 5681 tons, against an import of 14,300 tons in 1893.

Copper ore is found in the Urals, Caucasus, Poland, Finland, Siberia, Altai, and Russian Turkestan. Smelting is carried on in the Urals, Caucasus, and Altai mountains, and electrolytic refining in Western Siberia. Thanks to high import duties the home industry made rapid progress in the decade before the war. In 1907 the production and imports were 9500 and 13,200 metric tons respectively; in 1909, 22,000 and 500 t.; and in 1913 the output rose to 47,200 t. There was, however, a shortage of electrolytic copper, the annual demand for which was about 17,000 t., and the home supply some 6000—7000 t. short of this figure. The war affected the industry very severely. In spite of the great demand, production fell from 34,300 t. in 1913 to 26,500 t. in 1915, and importations rose from 6300 t. in 1913 to 42,500 t. in 1915 (31,500 t. from the United States), and 64,500 t. in 1916. Some of the Caucasian mines were destroyed by the Turks; others, particularly in Siberia, suffered from lack of fuel, bad transport, scarcity of labour and of explosives which formerly came from Germany. No official statistics are available for recent years; the industry has been paralysed by the political changes, and in June, 1918, it, together with all other industrial enterprises, was "socialised." Hence the war and its consequences have dealt the Russian copper mining industry a heavy blow, notwithstanding some promising discoveries of new deposits, *e.g.*, in the Altai district a body of ore was disclosed measuring 900 m. long and 6 m. wide containing 40 per cent. of copper, and in 1918 a large seam was discovered in the Kursk Government containing 58 per cent. of metal.—(*Schweiz. Chem.-Z., Mar.* 30, 1920, *from Technik u. Wirtschaft*, 11, 1919.)

Petroleum Production in Mexico.—On November 1, 1919, the Mexican wells that were producing petroleum numbered 305, with a daily output of about two million barrels, but as the estimated capacity of any well is only of relative accuracy it may safely be said that the present Mexican production is approximately one million barrels a day. During 1919 about 75,700,000 barrels of petroleum was exported. The Mexican Government, in pursuance of its policy of encouraging petroleum refining, has granted numerous concessions for the establishment of refineries, many of which are now under construction. During 1918, 3,795,000 tons of crude oil was refined in the country, fuel oil taking first place among the refined products, with a total output of 2,883,000 tons; 2,653,000 tons of refined petroleum products was exported in 1919.—(*U.S. Com. Rep., Apr.* 13, 1920.)

"Pita" Fibre in Brazil.—Owing to the war-time shortage of jute, attempts were made in Brazil to utilise as a substitute the "pita" fibre obtained from *Fourcroya gigantea*. Technical spinning tests showed that as the breakage of pita fibre was 25 per cent,. against a maximum breakage of 15 per cent. for jute, textiles woven with it could not be made use of commercially. However, pita has been successfully used in the manufacture of twine and rope in several factories, but it is more liable to rot than jute when exposed to damp. Some is exported to the United States, where it is used in the manufacture of finer fabrics, such as mercerised cotton goods, suitings, etc., for which it appears to be suitable. The cultivation of the fibre is very expensive and difficult, so much so that quantities of Italian hemp and jute are again being imported. In several districts, as in the State of Parahyba, the plant is not cultivated; it grows freely in a wild state and supplies are drawn from natural resources. As a reduction in the Brazilian customs tariff on imported rope is being contemplated, it is probable that the native article, whether made from imported jute and hemp or native-grown pita, will have to face severe competition, especially from the British-made article.—(*Bd. of Trade J., May* 20, 1920.)

Rubber Production and Prices.—In contrast with most other commodities, the output of raw rubber increased so much during the war that there is now a surplus. From 1913 to 1915 the output and consumption balanced fairly closely, but since then stocks of raw rubber have been accumulating. From 1905 to 1919 the output increased from 60,000 to 334,000 tons, and in the latter year there was a surplus amounting to 86,000 tons, including floating stocks of manufactured goods. The price has fallen in sympathy with the increase in production as shown by the following figures:—

	1915.	1916.	1917.	1918.	1919.	1920.
Hard fine Pará	3/9	3/3	2/8½	2/7	2/7½	2/7
Caucho Ball ...	3/-	2/2	1/6½	1/8	1/8	1/10

These price movements are interesting in view of the fact that they are all lower than the pre-war rate, which in 1911 was 7s. The effect of this fall has been to give rise to a suggestion to curtail output or to form an amalgamation of British and Dutch planters.—(*Schweiz. Chem.-Z., May* 12, 1920.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Incandescent Gas Mantles.

In reply to Mr. Doyle, Sir R. Horne said that it was true that the imports of gas mantles had increased in value from £1880 in November, 1919, to £25,619 in the two succeeding months, and that the import value from February 1 to May 8 of the current year was £35,804. The Government was watching the position carefully, and it was hoped to make a statement soon with regard to this and cognate cases.—(June 21.)

Oil Supplies (Agreement).

Mr. Kellaway, answering Mr. Doyle, stated that certain reciprocal arrangements had been entered into with France with regard to oil supplies. No restriction had been placed on the use to which oil covered by this agreement was to be put. He was unable to say when the particulars of the reciprocal agreement would be given to the House; no agreements were in force with other European Powers.—(June 21.)

Income Tax (Deductions).

Replying to Mr. Greenwood, Mr. Baldwin, for the Chancellor of the Exchequer, said that donations made by a trader for the purpose of extending the provision of university education, including training in research, in departments of science and technology relating to any particular industry, would not be regarded as money expended exclusively for trade purposes, and were therefore not admissible as expenses in calculating profits for income-tax purposes. (*Cf.* J., 1920, 186 R.)—(June 22.)

Brewing and Distilling Supplies.

In answer to Mr. Raffan, Sir W. Mitchell-Thomson said that the quantities of materials used by brewers in the United Kingdom during the year ended September 30, 1919, were: Malt, 556,157 tons; unmalted corn, 2397 tons; rice, rice grits, flaked rice, maize grits, etc., 17,551 tons; sugar, including syrups, glucose, and saccharum, 76,588 tons; and the estimated quantities used in distilleries during the same period were: Malt, 113,875 tons; unmalted grain, 22,125 tons; molasses, 4421 tons; sugar, 66 tons; other materials, 900 tons.—(June 22.)

Coal Production (Distribution).

In a written answer to Capt. Bowyer, Mr. Bridgeman stated that the coal available for home consumption in 1919, after deducting the amount used in operating the coal mines, was estimated at 162 million tons, the chief uses being: Railways (for locomotives), 13,000,000 tons; gas works, 17,750,000 tons; electricity and water undertakings, 7,500,000 tons; blast furnaces, 15,750,000 tons; domestic (including coal supply to miners), 42,500,000 tons; all other purposes, 65,000,000 tons.—(June 22.)

Sugar.

Sir W. Mitchell-Thomson, in reply to Sir B. Chadwick, stated that the Royal Commission on the Sugar Supply had purchased this year's Mauritius crop of vesou sugar, which is estimated at 200,000 tons, at 89s., 90s., and 91s. per cwt., according to quality. There was no evidence that a large part of the world's sugar crop could not be marketed owing to transport difficulties in the producing countries.—(June 23.)

Answering Mr. Seddon, Mr. McCurdy said that the financial reserves of the Royal Commission on Sugar Supply were reduced during 1918 by about £4,000,000 owing to the maintenance of the level of the retail price of sugar in this country below the level of the world's sugar prices. It was estimated that the total production of the United States, including Porto Rico, the Philippine and Sandwich Islands, would not exceed 1,900,000 tons, compared with a consumption in 1919 of 4,067,000 tons. There was no evidence of the existence of a sugar trust in America.—(June 24.)

Oil (Mesopotamia).

The following information was given by the Prime Minister in a reply to Major Entwistle:—The ownership of the Mesopotamian oil deposits will be secured to the Arab state as part of the administrative arrangements under the Treaty and mandate. No final decision has been reached regarding the method of working the fields, but rights legally secured before the war will have to be considered. The Anglo-Persian Oil Co. is a participant in a group claiming such rights. In any case the Arab State, whose interests have been carefully safeguarded, will receive royalties either on all the oil won or on the profit made from all the oil sold. At present it is impossible to say what claims based on grants by the Turkish Government may be put forward in the various mandated territories.—(June 28.)

Gas Regulation Bill.

After some minor amendments had been inserted the Bill was read a third time and passed (*cf.* J., 1920, 187 R, 224 R).—(June 29.)

Ministry of Mines Bill.

The Ministry of Mines Bill provides for the appointment of a Minister of Mines as an additional Parliamentary Secretary of the Board of Trade, and transfers to him all the powers and duties of the Board with respect to the mining industry, including coal mines, metalliferous mines, and quarries. The special powers conferred on the Minister for one year in respect of the regulation of the export of coal, coke, etc., of the pithead price of coal, of miners' wages, and the distribution of profits are to be subject to the approval of the Board of Trade (section 3). It is proposed that the Coal Mines (Emergency) Act, 1920, shall continue in force until the date on which the first order made under section 3 takes effect, or until March 31, 1921, whichever may be the earlier; that advisory committees be set up, and that the committee on coal and the coal industry shall consist of a chairman and 24 members, including 4 owners of coal mines, 4 workers in or about coal mines, 3 employers and 3 workers in other industries, one mining engineer, two managers of coal mines, one coal exporter, one coal factor, one person with experience of commerce (other than coal), one person with experience of co-operative trading, and three experts in medical or other science.

Part II. of the Bill deals with the regulation of coal mines and provides for the constitution of pit committees, district committees, area boards and of a National Board. The functions of a pit committee, half the members of which must be representatives of the workers, include the making of recommendations in regard to the health and social welfare of the workers, the maintenance and increase of output, and disputes. The expenses of the above bodies are to be paid by the mine owners, who will also be called upon to pay 1d. per ton of coal raised into a fund to be applied to furthering the social well-being of the workers, and for mining education.

In moving the second reading on June 30, the President of the Board of Trade stated that although no provision had been made in the Bill for the nationalisation of minerals, the Government intended to fulfil its pledge in this connexion at a later date. The reading was opposed by the Labour Party, but carried by 217 votes to 91.

Replying to a question put by Capt. Tudor-Rees, Mr. Bridgeman gave the estimated cost of the new Department at about £250,000 per annum, nearly the whole of which sum represents the cost of existing organisations which will be transferred to the new Ministry.—(July 1.)

Cornish Tin Mines.

Mr. Seddon asked whether the owners of the tin mines in the Camborne-Redruth area are prepared to amalgamate their interests, and thus effect great economies, and, if so, if the Government would give any financial help, seeing that the threatened closing down of various mines, including the Dolcoath and Grenville United mines, would throw large numbers of men out of work.

Mr. Bridgeman replied that the position of the Cornish tin mining industry had been carefully considered and that the Government, however, did not see its way to ask the House to vote such financial assistance in view of the present position of national finance. The suggestion that control should be re-established and the importation of tin prohibited was ill-advised, as the whole output of this country was not likely to meet more than a fraction of the home demnd.—(July 1.)

War-time Scientific Inventions.

In reply to Sir H. Norman, Mr. Bonar Law said that the question as to the official attitude towards scientific inventions made by officers during the war had been considered by the Government Departments concerned, and the Lord President of the Council was about to appoint an inter-departmental committee with the following terms of reference:—(1) To consider the methods of dealing with inventions made by workers aided or maintained from public funds, whether such workers be engaged (*a*) as research workers or (*b*) in a technical capacity, so as to give a fair reward to the inventor and thus encourage further effort, to secure the industrial utilisation of suitable inventions, and to protect the national interest, and (2) To outline a course of procedure in respect of such inventions which shall further these aims and be suitable for adoption by all Government Departments concerned.—(July 5.)

Nauru Island (Agreement) Bill.

This Bill came before the Standing Committee on July 6, and in spite of Government opposition, a motion, by Lord Robert Cecil, that the Bill be subject to sanction by the League of Nations, was carried by 16 votes to 15.

Patents (Government Servants).

In reply to Mr. C. Edwards, Mr. Bonar Law said that technical officers and scientific workers employed by the Department of Scientific and Industrial Research can take out patents for inventions resulting from work done for the Department. The patents are taken out in the names of the inventor and of the Imperial Trust for the Encouragement of Scientific and Industrial Research. The Committee of the Council reserves the power to determine what share, if any, of the royalties or benefits arising from such inventions should be paid to the inventor.—(July 6.)

GOVERNMENT ORDERS AND NOTICES.

Spirit Duty.—The Commissioners of Customs and Excise have issued a notice to manufacturers of medical preparations setting out the conditions under which they may obtain repayment of the increased duties now imposed on spirits.

Export of Explosives.—The Board of Trade (Licensing Section) announces that, as from June 18 last, Rex powder may be exported without Privy Council licence.

REPORT.

Report on Industrial and Commercial Conditions in Germany at the Close of the Year 1919. *Pp. 38. H.M. Stationery Office.* 1920. (*Cmd. 752. 4d.*)

Finance and Taxation.—Factors contributing to the depression of German finance are destruction of credit by the loss of the war and by political unrest, absence of raw materials, inflation of currency, uncertainty as to obligations under the Peace Treaty, and the difficulty of controlling imports of goods and exports of marks across the western frontier. There was a marked increase of paper currency during the second half of 1919 due to rising prices and to the impending assessments in connexion with the levy on capital. The German Public Debt amounted to 16,715 million marks on March 31, 1915, and was estimated at 218,812 million marks on March 31, 1920; the budget made no provision for any except immediate obligations arising out of the Peace Treaty, it being left to the Allies to frame their demands. Many new taxes and a concentration of the control of taxes have been introduced to put the internal finances in order, but these do not affect the foreign credit and trade balance.

Coal and Railways.—There was a steady improvement in the output of coal during 1919, but strikes and transport difficulties prevented the accumulation of winter stocks. The production of lignite exceeded that of 1913 owing to the development of the nitrogen and aluminium industries. The transport of coal is still unsatisfactory, and large dumps exist in Upper Silesia and the Ruhr Area. Stocks for the railways were only maintained with great difficulty during the winter; many of the smaller gas works have been closed for some time, and in other cases a supply of gas is only maintained for a few hours daily. The distribution of domestic coal is very irregular particularly in the south and east. The food supply has been affected by the small quantities of coal available for shipping, flour mills, forge and other agricultural purposes. Blast furnaces, steel works, power stations and the cement, lime, brick and procelain industries, all of national importance, suffer from the shortage. Efforts have been made to avoid closing down manufactures in order to utilise such raw materials as were available. Coal taxes were introduced in 1917, followed by a system of central control of the industry, in which the miners participate, in 1920, but these do not affect production.

Iron and Steel.—The industry is particularly affected by the loss of the Saar and of Lorraine and by the rising cost of Swedish ore, large amounts of which were due at the end of the war. F. Krupp A.-G. closed the year 1918—1919 with a loss, being hard hit by the declining exchange as the Government prohibited payment for foreign ore in foreign currency obtained from exports during the war. After the armistice, new manufactures such as internal combustion motors, locomotives, goods-trucks, lorries, sewing machines and other small goods were started in addition to those run before the war.

The industry had anticipated an improvement in the coal and labour situation in May, 1920, but it is unlikely that this has occurred. The price of Swedish ore was 300 mk. per ton, as against 18 mk. in 1913, and of minette 0·70 mk., as against 8·5 mk. A Union of the German Metal Goods Industry, with 1400 members employing 300,000 hands, has been formed.

Leather.—Government control was removed in August, 1919, and the subsequent rise in prices up to 10—12 mk. per lb. for raw hides was such that manufacturers ceased buying. The state of the exchanges, coupled with import regulations, have raised foreign leather goods to a prohibitive price.

Shipping.—After delivering all ships over 1600 tons and half those between 1000 and 1600 tons, Germany now possesses a total of 501,910 tons, a tenth of her pre-war tonnage. Construction of new vessels over 1000 tons is prevented by uncertainty of the interpretation of the peace terms.

As Germany cannot buy she cannot produce, and is therefore not a serious industrial rival at present; her industrial organisation is, however, not seriously damaged, and would rapidly respond to any stimulus. German factories should not be purchased without consideration of the problems of fuel, labour, taxation and restrictive legislation. Most undertakings worth buying have taken precaution to prevent the intrusion of foreign influence.

LEGAL INTELLIGENCE.

Saccharin Transaction. *N. L. Scaliaris v. E. Ofverberg and Co.*

On June 22, in the King's Bench Division, an action was brought by Mr. N. L. Scaliaris against Messrs. E. Ofverberg and Co., of London, to recover money paid for saccharin and damages for breach of contract.

For the plaintiff it was stated that he purchased 1200 lb. of saccharin, Monsanto brand, from the defendant company in August, 1918. The goods were landed at Glasgow and then sent to London, where they were sold as being of the Monsanto brand. It was found that 400 lb. was not of this brand, and the sub-purchasers rejected this quantity. Mr. Justice Bailhache had previously confirmed the award of an arbitrator in favour of the sub-purchasers, to whom the plaintiff, therefore, paid some £4,500. Plaintiff now claimed this amount from Ofverberg and Co. and £225 for loss of profits. The defence was that as plaintiff took possession at Glasgow, he should have examined the goods there; as he failed to do this, there was no reason for complaint when the goods arrived in London.

Mr. Justice Rowlatt, in giving judgment, said that the buyer was entitled to reject the goods inasmuch as although they were manufactured by the Monsanto firm, they had been sold for shipment to another firm which had put the Monsanto label upon them. As to whether the buyer was not too late in his rejection of the goods, he held that the buyer could treat them as still in transit until they arrived in London, as Glasgow was not the port of destination. He found that the plaintiff did examine at the first reasonable opportunity, and that he was then entitled to reject.

Judgment was given for the plaintiff for a sum to be agreed upon between the parties.

Validity of a Pre-War Contract. *Pacific Phosphate Co., Ltd., v. The Empire Transport Co., Ltd.*

An action was brought on June 29, in the King's Bench Division, by the Pacific Phosphate Co., Ltd., of London, against the Empire Transport Co., Ltd., for a declaration that a contract of August 30, 1913, was a valid and subsisting contract.

On behalf of the plaintiff company it was stated that under the contract defendants were to be provided with twelve steamers a year from 1914 to 1918 for the transport of phosphate from Nauru and Ocean Islands, and that in the event of war shipments could be suspended until its termination.

The defendants denied liability, maintaining that the contract was frustrated and dissolved.

In giving judgment, Mr. Justice Rowlatt held that the contract had come to an end by reason of frustration by events not contemplated by the parties concerned; accordingly he gave judgment for the defendants, with costs.

Corrosion of Ship's Plates by Dissolved Copper Sulphate.

On June 29, the Court of Appeal upheld the judgment of Mr. Justice Hill that the owners of the steamship in question were not liable for damage due to water having entered a mixed cargo of copper sulphate in bags and cotton yarn, and dismissed the appeal by the owners of the cargo. (*Cf.* J., 1920, 19 R.)

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for June 24 and July 1.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number:—

Locality of firm or agent.	MATERIALS.	Reference number.
Australia	Earthenware	918
Canada	Dry colours, colours in oil, white lead, paint removers	931
"	Druggists' supplies	950
"	Coated papers and boxboard ..	*
Egypt	Cotton waste (tender for) ..	†
Belgium	Copper, brass, zinc, lead, nickel, white metal	934
"	Chemicals	935
Czecho-Slovakia ..	Nickel chrome steel, bright drawn steel bars	961
Germany	Olive oil, tanning materials ..	938
"	Oil (including all edible oils), oil-seed cake	965
Iceland	Glass, china, pottery	967
Italy	Pig iron, tinplate, copper, tin, zinc	940
"	Oil-seeds	941
"	Drugs, medicines, essences, perfumes, toilet soap	943
Sweden	Soda (ash and crystal), glue, gelatin, shellac, gum tragacanth, boric acid, sodium sulphide ..	973
Switzerland ..	Chemicals	974
Algeria	Glassware, metal sheets	975
" and Tunis ..	Copper sulphate, soap, candles ..	976
United States ..	Waste paper	946
Brazil	Chemicals, anilines, lubricating oil, cement	978
"	Industrial chemicals, iron bars and sheets, cement	979
Colombia and Venezuela	Paint, varnish	948
Cuba	Steel rails and bars, iron pipe, corrugated roofing, plate and sheet glass, floor and wall tiles..	981

* The High Commissioner for Canada, 19, Victoria Street, London, S.W. 1.

† Sir A. L. Webb, K.C.M.G., Queen Anne's Chambers, Broadway, Westminster, S.W. 1.

Market Sought.—A Canadian firm able to export lard oils for textile use wishes to hear from importers in the U.K.. Inquiries to the Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

TARIFF, CUSTOMS, EXCISE.

Austria.—A State monopoly of the sale and manufacture of natural and artificial mineral waters and mineral water products has been established as from June 1.

Belgium.—Among the articles affected by the law authorising, as from June 21, the increase of customs duty by means of "coefficients of increase" are fermented beverages, cocoa, candles, yeast, matches, certain metals, paper, skins, earthenware, gunpowder, liquid carbonic acid, acetic and sulphuric ethers, soap, glass, vinegar, acetic acid, and textiles.

The export without export licence of hackled flax and waste therefrom and of flax tow is authorised until September 15.

Denmark.—The prohibition of the export of potato starch has been cancelled.

Egypt.—The import tariff valuations of iron and steel manufactures are set out in the issue for July 1.

France and Algeria.—Among the articles subject, under certain conditions, to reduced rates of import duty when imported for the purpose of further working and re-export are tinplate, wire of copper, bronze or brass, certain kinds of paper, and porcelain.

The import of newsprint paper and cellulose pulp for the manufacture thereof is prohibited as from June 16.

Italy.—To obtain the reduced rate of import duty, crude mineral oils must have sp. gr. not less than 0·950 at 15° C., must be viscid and of a black bituminous appearance, and not contain more than 20 per cent. by weight of distilled products at 310° C. Residues when not suitable for lubricating purposes or illumination, and provided that they have sp. gr. not less than 0·860 at 15° C., may also be admitted at the reduced rate.

Kelantan.—As from February 1, the rate of export duty on copra is fixed at 3 per cent. *ad valorem.*

Luxemburg.—The rate of export duty on iron ore, slag, and scales from rolling mills has been reduced to 60 centimes per 1000 kg. as from May 1

Netherlands.—Export prohibitions have been temporarily withdrawn from bone black, nickel, and wire nails.

Poland.—The temporary suspension of customs duty on certain articles has been prolonged. Among the articles affected are margarine, nitric and sulphuric acids, natural colouring earths and clays, certain kinds of porcelain, rubber packing, and iron and steel wire.

"Articles of luxury," the import of which is prohibited include certain nuts and seeds, cocoa, chocolate, beer, precious stones, painted earthenware and porcelain, majolica, certain kinds of glassware, perfumery, toilet soap, boot polish, and liquid inks.

Portugal.—The decree modifying the export restrictions and surtaxes is given in the issue for June 24. Among the articles affected are hides and skins, molasses, olive oil, olive husk oil, whale oil, fish oil, oil cakes, industrial alcohol, cocoa, chocolate, wine, vinegar, alcohol, tartaric acid, tartar, tartrates, turpentine, rosin, resins, tanning materials, glue, copper ore, tin ore, tin, wolfram, copper precipitate, tinplate, certain metals, woodpulp, vegetable fibres, phosphorus matches, coal tar, medicinal plants, copper sulphate, chemical and pharmaceutical products, paper, and wax.

Portugal (Angola).—The export duties on hides, skins, palm kernels, and palm kernel oil have been amended.

San Salvador.—Exportation of brown sugar is prohibited as from May 12.

Southern Rhodesia.—The import duties on spirits. perfumes, essences, medicinal and toilet preparations, syrups, and tinctures containing more than 3 per cent. of proof spirit have been increased as from May 10.

Spain.—Sugar may be imported at the reduced rate of duty until September 8.

Sweden.—The customs duties on, *inter alia*, lard, dripping, margarine, and condensed milk have been suspended until August 31.

Switzerland.—The general export licence authorising the export of crude ferro-silicon, ferrochrome, and similar iron alloys has been abrogated as from May 25.

Tunis.—The export and re-export of industrial alcohol is prohibited as from April 30.

COMPANY NEWS.

THE BRITISH CYANIDES CO., LTD.

The annual ordinary general meeting was held in London on June 23. Mr. C. F. Rowsell, the chairman, said that in spite of the many alterations and extensions to plant and works, and the fact that trade had been exceptionally difficult during the past year, the balance of profit had increased from £20,572 to £25,042 (issued capital £256,438). The directors were engaged in negotiations which would doubtless result in a considerable change in the position of the British Potash Co. That company had done good service during the war and during the past year, and its value as an asset to the British Cyanides Co. would be eventually well worth the price at which it stands in the books, viz., £26,500; but it was impossible to say very much as to the future of the business.

Mr. Kenneth M. Chance, the managing director, referred to the great expansion the works had undergone during the past seven years, and said that greater progress had been made in the manufacture of chemicals since January 1, 1920, than in any previous complete year in the company's history. Manufacturing costs had been reduced and new methods had been worked out by the research department. The change-over to peace conditions had been attended by many difficulties, but now that the extensions had been completed neither German nor any other foreign competition was to be feared, provided only that fair treatment in regard to taxation and restrictions on trade were accorded by the Government. Despite long delays due to difficulties in obtaining materials, progress had been made in working out the company's " barium " process. He believed that ultimately the process would be better suited to the economic production of ammonia in this country than any other, although it would take many years to bring to fruition; meanwhile efforts were being concentrated on the primary objective—the production of a cheap and unlimited source of supply of cyanogen. Much progress had been achieved in regard to potash production, the output had been increased materially and both methods of manufacture and quality of the finished product greatly improved. Manufacture is handicapped by the prohibition of its exportation except under licence, and by the unrestricted importation of foreign material. Apparently, some of the crystal glass manufacturers were not satisfied with that form of protection, and wanted facilities for importing pure carbonate of potash from Germany at prices far below those at which the Germans can make it. During the present year the company had supplied this material without delay to British glass manufacturers at a lower price than had been charged for similar quality by any makers in any other country in the world.

BLEACHERS' ASSOCIATION, LTD.

The report for the year ended March 31, 1920, gives the gross trading profits at £1,202,240, or £472,628 more than in the year 1913–14, and the net profits at £813,579, which with the amount brought forward leaves a total available balance of £1,102,468. Out of this sum £150,000 is placed to the general reserve fund, bringing it up to £1,200,000, and the holders of ordinary shares are to receive 15 per cent. for the year, plus a bonus of 5 per cent. The carry forward is £321,461, as against £288,888 brought in. The directors, while not proposing to make any immediate issue, recommend that the capital be increased to £8,000,000 by the creation of 2 million new shares of £1 each. This proposal was adopted at an extraordinary meeting, following the annual meeting held in Manchester on June 22. Sir Alan Sykes, who presided, stated that the world's markets were at the present time doing extremely little in the way of buying.

BURMAH OIL CO., LTD.

In his address to the annual general meeting at Glasgow on June 24, Sir John T. Cargill stated that he had recently visited Cambridge University and had noted with great satisfaction the excellent use which was being made of the company's donation of £50,000 for chemical research. He wished others would follow the example of the oil companies and encourage scientific research and education at all our great universities.

The business of the company during 1919 was very prosperous, the profits having exceeded those of 1918 by £1,350,000. After writing off large sums, placing £1,291,000 to general reserve, and paying £318,120 for income tax, dividends amounting to 50 per cent. for the year are paid on the ordinary shares, and the carry forward is £1,536,994, subject to excess profits duty estimated at £1,300,000. Owing to increased taxation and a greatly increased share capital, the payment of 50 per cent. in dividends for the year 1920 is most improbable.

In conjunction with Messrs. Tata, Ltd., a company has been formed to initiate the manufacture of tinplate in India. The factory will be erected near the Tata iron and steel works at Jamshedpur, about 150 miles from Calcutta, which will supply the necessary materials. It is hoped that production will commence in the early part of 1922.

At a subsequent extraordinary meeting it was resolved to increase the capital to £7,000,000 by the creation of one million new ordinary shares of £1 each, to capitalise the sum of £2,286,000, representing undivided profits, and to appropriate that sum for distribution as a capital bonus to shareholders at the rate of four new ordinary shares for every five now held.

SCOTTISH OILS, LTD.

The first annual general meeting was held on June 24, in Glasgow, Sir Charles Greenway presiding.

Alluding to the critical position of the Scottish shale oil industry a year ago, the chairman said that a crisis was reached in September last (*cf.* J., 1920, 20 R) when the workers demanded a reduction of hours. Work was continued on the old basis for six months, after which the directors came to the conclusion that owing to the economies which would result from the amalgamation (*cf.* J., 1919, 277 R), and to the advance in the price of products, the industry would be able to stand a seven-hours' day, and this was brought into force on April 7 last. The projected extension of the activities of the industry by undertaking the refining of imported crude petroleum was now in operation, thereby enabling the refineries to work at full capacity and reduce working costs; very important developments were to be expected in this connexion. The sale and distribution of by-products by the Scottish Oil Agency, Ltd., were being successfully carried out, and an arrangement between this agency and the British Petroleum and Homelight companies, whereby the two latter would act for the former in England and Ireland, had been completed. The marketing of sulphate of ammonia was in the hands of the Sulphate of Ammonia Federation, Ltd. (*cf.* J., 1920, 209 R), in the formation of which the company had taken a leading part. The Scottish oil companies produce about one-sixth of the total production of sulphate of ammonia in the United Kingdom, and the Federation comprises 444 manufacturers out of a total of 499. Since the close of the financial year selling prices of all the company's products had advanced, but costs had also risen. However, with a continuance of present conditions, the current year should be prosperous.

THE BRITISH OIL AND CAKE MILLS, LTD.

The directors' report for the year 1919, submitted at the general meeting held in London on June 24, states that after allocating nearly £247,000 to reserves, etc., there remains a balance of £357,811, which, with the amount brought forward, allows of the payment of 25 per cent. on the ordinary shares. The sum of £255,000 has been spent on repairs and renewals during the year.

In his address as chairman, Mr. J. W. Pearson referred to the negotiations which had taken place between the company and the African and Eastern Corporation, Ltd., with a view to a possible fusion, but these were abandoned before any offer or proposal had been made by either side. The past year had been a very succesful one, the turnover having exceeded £25,000,000, of which the Revenue would take approximately one-half. Arrangements had been made to acquire the entire share capital of the business of J. and J. Stephenson, Ltd., of Hull. With regard to stocks of raw material, valued at £2,700,000, the company had rarely more than sufficient to run the mills for a month, and the whole of these had been sold at a profit within six weeks of the closing of the balance-sheet. The chief subsidiary companies were the British Extracting Co. and John Robinson, Ltd. The Hull Stearine and Warehousing Co. dealt with the whole of the by-products of the company's refineries. The margarine works had been completed and extended; the soap works at Hull were approaching completion and should reach the production stage early next year.

ELECTRO BLEACH AND BY-PRODUCTS, LTD.

The directors' report presented to the sixth annual meeting at Manchester, on July 1, states that the gross profit for the year 1919 was £68,368, and the net profit £34,637. After paying the preference dividend and allocating £5000 to reserve, it is proposed to pay a further dividend of 7¾ per cent. on the ordinary shares, making 14 per cent. for the year, and to carry forward £4277. The report and accounts were adopted at the meeting. The chairman, Sir H. Mackinder, stated that the exchange of shares with Brunner, Mond and Co. had been carried through; only the owners of 125 out of 400,000 issued shares had refused the offer.

New Issues.—*Low Temperature Carbonisation, Ltd.* (*cf.* J., 19 R), is offering £250,000 ordinary shares of £1 each at par.

A. Boake Roberts and Co., Ltd.—This company has a share capital of £300,000, divided into £200,000 ordinary and £100,000 preference shares, and annual profits have averaged £36,000 for the last four years. £50,000 six per cent. debentures are now offered for subscription at £92 per cent., making the balance of a total issue of £100,000. The debentures are repayable at par by annual drawings, the amount to be allocated to redemption being equal to 8 per cent.

Boot's Pure Drug Co., Ltd.—In a circular addressed to the shareholders, the chairman, Sir Jesse Boot, states that recent reports concerning the sale of this company to the United Drug Co. of America were inaccurate. As a result of negotiations between himself and the president of the American company, a working "alliance" between the two companies has been brought about by the formation of a new company with a capital of over £10,000,000, which has taken over all Sir J. Boot's holding of deferred ordinary shares in the Pure Drug Co., together with the large Canadian business and all other businesses outside of America controlled by the United Drug Co. The main object of the alliance is stated to be the avoidance of competition.

TRADE NOTES.

BRITISH.

Nigeria in 1918.—The total value of the imports, exclusive of specie, was £7,423,158, as against £5,808,592 in 1917. The imports included:—Kola nuts, 133,445 centals (£197,958); salt, 34,763 tons (£311,752); kerosene, etc., 1,615,960 galls. (£93,697); iron, steel and their manufactures, £139,535; and soap, 2867 tons (£129,337). The value of imports from the British Empire increased from £5,025,043 in 1917 to £6,459,147 in 1918, and foreign goods were valued at £964,011 (£783,549 in 1917). The exports, excluding specie, amounted in value to £9,511,971 in 1918, compared with £8,602,486 in 1917, and included:—Benniseed, 42 tons (£696); cotton lint, 661 tons (£697,339); cottonseed, 405 tons (£15,412); rubber, 157 tons (£19,667); hides and skins (£293,019); shea products, 126 tons (£4884); tin ore, 8294 tons (£1,770,003); palm oil, 86,425 tons (£2,610,448); palm kernels, 205,167 tons (£3,226,306); and groundnuts, 57,554 tons (£920,137). The share of the exports taken by the United Kingdom and British Possessions increased from 83·6 per cent. in 1917 to 92·4 per cent. in 1918.

In the Northern Provinces 82 tin-mining companies operated throughout the year and produced 8434 tons of tin ore (8314 in 1917). Gold mining operations were continued near Minna in the Niger Province and 1416·6 oz. of alluvial gold was won. In the Southern Provinces mining is confined to the Calabar Province and only one company, the Nigerian Proprietary Co., Ltd., is operating. The output of coal was 83,405 tons in 1917 and 148,214 tons in 1918.

The season was a fair one for most crops except cotton; groundnuts showed an increase of 10,000 tons, and a large quantity still remained in the country owing to the lack of railway facilities. Progress has been made with the cultivation of pedigree seedling sugar canes obtained from Barbadoes in 1914, and it is estimated that there are now approximately 150 acres under this crop. The Agricultural Department distributed large amounts of various types of cottonseed to the farmers and continues to encourage cotton growing. Coconuts in the Onitsha province have suffered from disease and control measures have only been partially successful. Several of the Para rubber plantations have reached a tappable size and the yield of rubber was on the whole satisfactory; a serious fungous disease of the bark which broke out on a number of tapped trees is being investigated. Successful efforts have been made to encourage the planting of the Gold Coast variety of the kola nut and it is hoped eventually to produce nuts equal in quantity to the imports.—(*Col. Rep.-Ann., No.* 1030, *Apr.*, 1920.)

GENERAL.

The Japanese Rubber Trade.—The manufacture of rubber goods in Japan has developed considerably of late years owing to the conditions imposed by the war. The Tokyo Rubber Association was formed early in 1919 and soon decided to raise prices by 20 per cent., but this was found to be insufficient. Japanese tyres are used almost exclusively in Shanghai in spite of the opposition of the Eastern branch of Dunlop's. Although the climate and conditions of the roads militate against a long life, the Japanese tyres are supplied under a guarantee of seven months.—(*India Rubber World, Apr.*, 1920.)

Chemical Trade of Japan.—The imports of chemicals into Japan, which include salicylic acid, caustic soda, sodium cyanide, soda ash, logwood extract and aniline dyes, have increased greatly of late years. In 1919, stocks of imported carbolic acid, soda ash, caustic soda, glue and resin were in excess of the demand. Most of these chemicals were imported from the United States, which is the sole sourceof Japanese imports of potassium dichromate, calcium acetate, milk sugar and aniline salts. Ammonium carbonate and chloride, tartaric acid, zinc white, sodium cyanide, sodium borate, citric acid and gelatin, however, are imported from Great Britain more freely than from the United States, whilst the former is the exclusive source of sodium peroxide and cyanide. Among the products that became export lines during the war are naphthalene, acetic acid, zinc dust, copper sulphate, potassium chlorate and chloride.—(*Bd. of Trade J., June* 3, 1920.)

Trade of Hongkong in 1919.—*Chemicals.*—The trade in chemicals was valued at £514,551 in 1919, compared with £413,116 in 1918. The chief imports were: Saltpetre, mainly from India (£91,931); camphor, from north and central China and Japan (£57,787); soda ash, almost entirely from Great Britain (£45,684); caustic soda, of which two-thirds came from the United States and the remainder chiefly from Great Britain (£38,939). The imports of acid, mainly from Japan, showed a marked decrease, as did also those of bleaching powder, calcium carbide, phosphorus and glycerin. There were increased imports of alum, borax, quinine, potassium chlorate, and sulphur. In general, supplies were difficult to obtain, and the trade showed little life.

Sugar.—For the first time in a good many years Hongkong imported refined sugar in quantity, the imports in 1919 amounting to about 12,000 short tons. The total imports during that year, viz., 403,7733 tons were, however, lower than the total imports during 1918, 485,530 t., of which Java furnished the largest portion. The total exports for the year 1919 were also below those of 1918, namely, 350,589 as compared with 417,664 tons. The quantity of refined sugar exported to Great Britain increased from 1899 tons in 1918 to 11,207 tons in 1919.

Leather, etc.—In 1918, a tannery erected in Hongkong by Chinese interests and equipped with modern machinery, started work, but did not prove a financial success. Since then the plant has been acquired by joint British and American interests, which purchased additional equipment, with the result that, early in 1920, the tannery had begun to produce chrome leather of practically all grades. It is believed that the leather now produced will take the place of cheaper grades imported from the United States, so that there will be little competition from the better grades supplied by Europe and America. Of the sole leather imported into Hongkong in 1919, valued at about £1,200,000, the Straits Settlements furnished 66 per cent., China 20, Siam 9, Australia 3, and the United States under 0·75 per cent. In the same year upper leather valued at £60,000 was imported, 90 per cent. of which came from the United States.

Exports of hides and skins improved during 1919, a total value of £1,154,152 being reached (£803,777 in 1918). Great Britain and France respectively took 48 and 39 per cent. of the buffalo hides, and the Straits Settlements and Japan took 30 and 23 per cent. of the cow hides, France, Great Britain, and China taking about 15 per cent. each. Most of the hides are usually shipped to Singapore, where they are turned into sole leather, the latter being reshipped to Hongkong.—(*U.S. Com. Rep., Mar.* 18, 25, *Apr.* 29, *May* 8, 17, 28, 1920.)

Foreign Company News.—*France.*—The Cie. Produits Chimiques de Saint-Gobain reports a net profit of 12,605,475 francs for 1919 (9,335,243 fr. in 1918); the dividend has been raised from 180 to 210 fr.

The Cie. Phosphates Tunisiens reports a net profit of 4,105,451 fr. (2,462,739 fr. in 1918), and it is proposed to pay a dividend of 15 fr. on each of the 160,000 shares, 15 fr. on the original shares, and 7·50 fr. on the shares issued in 1918.

With the support of the "Serica" company, a new company has been formed for the manufacture of artificial silk, chiefly by the Stearn process. The capital will be 1,800,000 fr. divided into 18,000 shares of 100 fr. each. The company will exploit the Belgian patent under licence at its works at Ecaussines.—(*Rev. Prod. Chim., June* 15, 1920.)

Norway.—It is reported that the Titan Co. A./S. of Frederikstad, which manufactures titanium white, is about to raise its capital from 6 to 9 million kroner (krone=1s. 1½d.). A portion of the plant was started up in June, 1919, with very satisfactory results; the full plant is now about to be put into operation. Ore in the form of slimes is obtained from Norwegian mines—(*Z. angew. Chem., June* 4, 1920.

Japan.—A syndicate of dyestuff manufacturers has been founded in Tokyo with the approval of the Ministry of Agriculture and Trade. The president and vice-president represent the Taisho Chemical Industrial Co. and Tokyo Aniline Dyes Co. respectively.—(*Z. angew. Chem., June* 15, 1920.)

United States.—The Farmers' Co-operative Phosphate and Fertiliser Co., recently organised in Mulberry, Florida, with a capital of $5,000,000, has purchased 3700 acres of phosphate land estimated to contain nearly 10 million tons of pebble phosphate rock with an average content of 65—75 per cent. tricalcic phosphate. A further area with some 4 to 5 million tons has been contracted for, and it is hoped to produce 50,000 tons of phosphate annually, to be increased eventually to 200,000 tons.

Reunion in 1918.—The imports and exports of this French colony in 1918 were valued at £1,205,029 and £1,133,421 respectively, as against £849,270 and £1,033,803 in 1917. Amongst the imports were 730 metric tons of petroleum and gasoline, valued at £36,624, and 336 tons of soap, worth £26,814, while the exports included vegetable and essential oils (geranium, 115,858 lb.; vetyver, 9975 lb.; ylang-ylang, 6333 lb.; other oil, 46 lb.) to the value of £147,770. The colony's trade is mostly shared between France and French possessions, England and British possessions, and the United States.—(*U.S. Com. Rep., Feb.* 18, 1920.)

Guatemala in 1919.—The imports into Guatemala during 1919 were valued at £2,246,163 (at normal exchange), of which the United States provided about 72 per cent. and the United Kingdom 18 per cent. The values of some of the chief imports were:—Iron manufactures, £191,894; copper manufactures, £7097; glass and pottery, £29,741; drugs and medicines, £89,914; paper, £59,083. The principal exports included:—Castor oil, 31,659 lb.; sugar, 11,335,919 lb.; vegetable fibre, 98,570 lb.; rubber, 15,340 lb.; mineral products, 3,711,966 lb. The United States took the majority of the exports. —(*U.S. Com. Rep., Apr.* 2, 1920.)

PUBLICATIONS RECEIVED.

OZONE. *By* E. K. RIDEAL. (*A Treatise on Electro-Chemistry, edited by* BERTRAM BLOUNT.) *Pp.* 198. (*London: Constable and Co., Ltd.* 1920.) *Price* 12*s.*

FOOD INSPECTION AND ANALYSIS. *By* A. E. LEACH. *Revised and enlarged by* A. L. WINTON. *Fourth edition. Pp.* 1090, *with* 41 *plates.* (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1920.) *Price* 45*s.*

NOTES ON CHEMICAL RESEARCH. *By* W. P. DREAPER. *Second edition. Pp.* 195. (*London: J. and A. Churchill.* 1920.) *Price* 7*s.* 6*d.*

THE EXTRA PHARMACOPŒIA. VOL. I. *By* W. H. MARTINDALE *and* W. W. WESTCOTT. *Seventeenth edition. Pp.* 1115. (*London: H. K. Lewis and Co., Ltd.* 1920.) *Price* 27*s.*

TECHNO-CHEMICAL RECEIPT BOOK. *By* W. T. BRANNT *and* W. H. WAHL. *Pp.* 516. (*London: Hodder and Stoughton.* 1919.) *Price* 15*s.*

KLEINES PRAKTIKUM DER KOLLOIDCHEMIE. *By* PROF. WOLFGANG OSTWALD *and* P. WOLSKI. *Pp.* 159. (*Dresden and Leipzig: Theodor Steinkopff.* 1920.) *Price* 15 *marks.*

TECHNOS. *Revue Analytique des Publications Techniques Françaises et Étrangères. Pt. I. Pp.* 190. (*Paris:* 40, *rue de Seine.*) *Price* 6 *francs.*

BULLETINS OF THE LANCASHIRE AND CHESHIRE COAL RESEARCH ASSOCIATION.

No. 3. THE INFLUENCE OF THE ADDITION OF INERT MATTER UPON THE VOLATILE MATTER EVOLVED WHEN COAL IS HEATED. *By* F. S. SINNATT *and* A. GROUNDS. *Pp.* 14. 1919. *Price* 6*d.*

No. 4. NOTES ON COAL ANALYSIS. *By* F. S. SINNATT. *Pp.* 38. 1920. *Price* 2*s.*

No. 5. COAL DUST AND FUSAIN. *By* F. S. SINNATT, H. STERN *and* F. BAYLEY. 1920. *Price* 1*s.*

REPORTS OF THE INDIAN TRADE ENQUIRY. *Imperial Institute.*

HIDES AND SKINS. *Pp.* 123. OIL-SEEDS. *Pp.* 149. (*London. John Murray.* 1920.) *Price* 6*s. per volume.*

JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY. *Part I.,* 1920. (*London: Royal Microscopical Society.* 1920.) *Price* 10*s.*

BRITISH CHEMICAL STANDARDS. *Report of the Working of the Movement from Sept.,* 1916, *to Sept.,* 1919, *as given April,* 1920. *Published by the Organisers. Middlesbrough,* 1920.

DIE FRAGE DER KÜNSTLICHEN DÜNGUNG (*mit besonderer Berücksichtigung der Phosphorsäure-Düngung in den Nationalstaaten des ehemaligen Oesterreich-Ungarn vor dem Kriege und Heute*). *By* DR. H. LIPSCHUTZ. *Pp.* 68 +ii. (*Vienna and Leipzig: Carl Fromme, G.m.b.H.* 1920.)

REVIEW.

CEMENT. BY BERTRAM BLOUNT, *assisted by* W. H. WOODCOCK *and* H. J. GILLETT. *Monographs on Industrial Chemistry, edited by* SIR EDWARD THORPE. *Pp. xii.*+284. (*London: Longmans, Green and Co.* 1920.) *Price* 18*s. net.*

This is a welcome addition to what may be described as the "popular" literature on cement. The author has to a large extent kept to the beaten track, which has led to similar books being stereotyped and uninteresting, but he has interspersed the inevitable historical quotations, descriptions of cement-making machinery, and extracts from standard specifications, with items of personal experience and predictions of the future trend of the industry that render the work under review of considerable interest and worth the while of even a cement manufacturer to read.

In the opinion of the author, the Portland cement industry will develop on the lines of blast-furnace practice for burning, either by electrical heating or with oxygen-enriched air as a means of attaining the high temperature required, together with some undefined method of destroying the quality of toughness in the resultant clinker, and so enabling it to be ground with a fraction of the power now absorbed.

There is indeed much in the book that should cause the cement manufacturer of to-day to think, and it will be interesting to observe whether, with this suggestive work before him, the British cement maker will take the lead or will again be satisfied for other countries to be the pioneers.

It must be admitted that the British standard specification for Portland cement in limiting the molecular ratio of lime to silica and alumina does not encourage progressiveness, and the first manufacturer to produce the fused clinker containing 70 per cent. of lime, stipulated by the author, would probably be unable to market his cement as complying with the specification. The possibility of producing a cement of monocalcic composition is hardly touched upon, but the fortunate producer of such a cement would be similarly handicapped by the existing specification.

Strangely enough, no reference is made in the book to the British standard specification requirements in regard to chemical composition, nor is there a single chemical analysis of cement. There are numerous analyses of raw materials, but in many of the calcareous examples there is no separation of "silica and insoluble," even when this item exceeds 10 per cent., thus rendering such analyses of little value for the purpose in view.

Methods of analysis of raw materials and cement are given in considerable detail, but when it is stated that "rational" analysis of clay is unnecessary it must have been overlooked that unless clays liable to contain silt are submitted to some form of mechanical separation the chemical analysis will not be very useful for cement manufacture. Description of a method of "rapid lime determination," which is a prominent feature of works control, might have been included with advantage.

The valuable summary of the literature of the chemistry of cement shows the almost chaotic condition of this subject, and indicates the harvest that is to be reaped by the research workers of the future.

One wishes that the author, with his unique experience in the industry, had, to use his own phrase, put himself in the witness-box for a longer period, for his evidence would have been more appreciated than the lengthy extracts from foreign cement specifications and other matter, such as the methods of oil testing and the history of the forms of briquettes.

S. G. S. PANISSET.

THE ANNUAL MEETING AT NEWCASTLE-UPON-TYNE.

The thirty-ninth annual meeting at Newcastle-upon-Tyne proved a successful achievement, on which all who contributed to its preparation and organisation are to be cordially congratulated. The lot of the 290 members of the Society who attended was an enviable one, thanks to the measures taken by the City Council, the Governing Body of the Armstrong College, the boards of industrial undertakings, and the Local Committee, for their delectation, instruction, and entertainment. Of the civic functions, at which the Right Hon. the Lord Mayor of Newcastle proved an untiring and genial figurehead, the most memorable perhaps was the dinner at the Mansion House on the last evening of the meeting, to which invitations were necessarily limited. No better accommodation could have been found anywhere than the Armstrong College afforded, not merely for the technical proceedings but for the social functions which followed them. The works, shipyards, mines, etc., which were thrown open to the inspection of members were of an exceptionally interesting and varied character, and the directorates and staffs vied one with the other in supplying information and dispensing hospitality. The efforts of the strong Local Committee were co-ordinated by the indefatigable honorary Local Secretaries, Mr. H. Dunford Smith and Dr. F. C. Garrett, whose efforts for the success of the meeting and the comfort of members were unflagging. The Chairman of the Local Committee, Professor P. Phillips Bedson, also deserves special recognition for his work, in which he was ably supported by Professor Henry Louis, who presided throughout the proceedings in the absence, through illness, of Mr. John Gray, the President, to whom the Society owes so much for his administrative work during the past year.

The proceedings furnished ample proof of the vitality of the Tyneside industries, in which chemistry plays a leading part, and the visits to works afforded convincing evidence of the energy, resourcefulness, and ability of the industrial chemists of the district. An excellent exhibition of chemical products and plant, which had been organised in connexion with the meeting, and was housed in an annexe to the Armstrong College, was much appreciated, and demonstrated the efforts which are being made by local business undertakings in particular to make more sure the foundations on which the extended chemical industry of the country stands.

Annual General Meeting.

The proceedings at the annual general meeting, and, indeed, throughout the week, were inevitably clouded by the absence of Mr. Gray, but the Society was fortunate both in having the services of Prof. Louis at its disposal and in not being deprived of a presidential address. In spite of his serious indisposition, Mr. Gray was able to draft an address which, by his express wish, will not be published until he has had the opportunity of completing and revising it. The draft was read by Prof. Louis and given a very hearty reception.

One of the most pleasing functions was the presentation of the Society's medal to M. Paul Kestner, who was present in person. In his reply, M. Kestner recalled his long connexion with this country, acknowledged the debt he owed to British science and British manufacturers, and thanked the Society for the honour it had paid, through him, to his country and the Société de Chimie Industrielle.

Finance and Publicity.

Less pleasant, but very necessary, was the consideration of the Society's financial position. In view of the present outcry against the Government for seeking to justify ever-increasing expenditure rather than cutting the coat according to the cloth, it might have been anticipated that the Council's proposal for raising more revenue would have met with some adverse comment; but "figures speak," and with the published balance-sheet before the meeting, Mr. Lloyd Howard, the retiring hon. treasurer (who received a hearty vote of thanks for his services) had no difficulty in justifying the Council's financial policy. In this he was ably seconded by Mr. E. V. Evans and Dr. E. F. Armstrong, both of whom emphasised the great importance of maintaining the standard of the *Journal*, the unavoidably increased cost of which has been almost entirely responsible for the deficits of the past two years. The accounts and resolutions relating to the increased subscription rates were carried unanimously.

Some remarks made by Mr. Evans concerning the policy of the Publications Committee appear to have led certain interested parties to the erroneous conclusion that it was intended to veto publicity of the Society's affairs in the press generally. Such is far from being the case; the Council invites the widest publicity of the activities of the Society, in the right way and at the right time, and it has recently instituted a news service to assist in attaining this object. In consideration, however, of the Society's dependence upon the sale and circulation of the *Journal*, and the valuable and indispensable revenue derived from advertisements, the view has been urged that the present practice of allowing other journals to record the Society's activities at undue length before they are chronicled in the *Journal* stands in need of some revision.

Canada.

Another matter of interest and importance was the very hearty acceptance given to the invitation of the Canadian Section to hold the next annual meeting in Montreal. The energy and enterprise shown by our fellow-members in the Dominion have been followed with close attention and deep appreciation on this side, and the enormous possibilities awaiting the chemical development of that country have been gradually dawning in the minds of those who think imperially as well as chemically. It is to be hoped that members in this country will make every effort to take part in the proceedings next summer; true, the difficulties in regard to expense, time, and so forth will not be few, but in the national interest, as well as from the more parochial standpoint of the Society's good, it is of the first importance that a truly representative body of English chemists and chemical manufacturers should accompany Sir William Pope, our new President, across the seas.

Conference on Filtration.

This was the fourth conference arranged by the Chemical Engineering Group and was, perhaps, the most successful that has been held, the quality of the papers, the character of the discussions, and the attendance all being very satisfactory. Circulated papers, discussion slips, rules of procedure, together with excellent chairmanship, aided in making the conference a really useful contribution to the technology of filtration.

Prof. H. Louis presided at the first session, and pointed out the general importance of filtration processes, but added that the subject matter of one or two of the papers could not be included strictly under the term "filtration." In his opinion scientific men should be careful in giving definite meanings to words they used, and the term filtration should be restricted to the operation of separating solid particles from their associated liquids by means of a porous septum. In the absence of the author, Mr. E. Hatschek, the paper (circulated in abstract) on "The Principles of Technical Filtration" was taken as read. In the discussion which followed, exception was taken to the statement that "the structure of the cake and its content of mother liquor are not affected by the pressure employed—a point on which the most common and serious misconceptions exist." Among expressions of appreciation of the suggestive character of the paper, some objection was made to the use of membranes for the separation of ultramicroscopic particles being described as filtration. In the next paper, Mr. R. A. Sturgeon described with great clearness his self-discharging centrifuge, and illustrated by examples the character of the work done by the machine, the feature of which was its continuous running and the intermittent discharge of the separated solids by means of a piston hydraulically operated. In reply to numerous questions and some criticisms, the inventor stated that one cylinderful of water was required for each discharge, so that the amount of operating water needed could be determined from the proportion of solids present in the material to be treated. The machine was of a new type, it was very free from vibration, and an experimental machine which had been in use since 1914 showed no sign of failure through wear and tear. It was capable of handling any material which did not clog the passages and was otherwise suitable for treatment.

Dr. Ormandy's paper on "The Filtration of Colloids" created great interest, and the lantern slides and experimental demonstrations elucidating the points raised were much appreciated. The author discussed the effect of electrolytes on colloid suspensions, and the movement of colloid particles under the influence of an electric field. A suspension of ball clay treated with about 0·03 per cent. of caustic soda was placed in a cylindrical vessel of copper, which formed the cathode, the anode being a carbon rod placed in the middle. In a very short time a thick deposit of clay particles was formed which was obviously comparatively dry. A continuous machine for laboratory use was shown which had a rotating drum from which the deposited clay was removed by an ebonite scraper. A useful discussion and many questions followed. Could the process be applied to the separation of oil emulsions, of oxidation products after caustic fusions, colloidal hydroxide of iron, the clarification and sterilisation of beer, the treatment of sewage, etc.? The author pointed out that the process had only been used commercially in this country for the treatment of clay, but that in Germany it is employed for the drying of peat, the purification and separation of glues and gelatins, the separation of paraglobulin from anti-diphtheritic blood serum, etc. The firm concerned with the development of the process in Germany had spent during the past twelve years £25,000 annually in development. Mr. S. H. Menzies described the construction and operation of the Sharples' "Super-centrifuge," and gave an experimental demonstration with a laboratory machine driven by compressed gas.

M. P. Kestner presided at the second session, and was introduced by the Hon. Secretary, who referred to his great interest in and the help he had given to the Chemical Engineering Group. Mr. W. J. Gee described his Centrifugal Separator, which differed from other types in point of size, discontinuous working, the method of removal of the solids, and the grading of the material which took place. The operation of the machine was made clear by means of a cinematograph film—a most effective method of demonstration. The machine shown on the film was a very large one, separating half a ton of solids at one operation, but a smaller size of machine is also made. The discussion on this paper was very interesting, and in reply to it Mr. Gee pointed out that the machine had been very successfully applied to the treatment of sugar, but that there was no provision in the ordinary machine for washing; he was engaged on that question at the moment. Acid-resisting material could be used for the construction if necessary. He could give few figures at present, but a 36-in. machine working on dyestuffs separated 2 cwts. in 12 minutes, as against 12 hours required in the filter press. Mr. E. A. Alliot gave an outline of his paper on "Recessed Plate and Plate and Frame Filter Presses: Their Construction and Use." This was adjudged by many the most useful contribution to the conference, and from a chemical-engineering point of view left nothing to be desired. The terms "chamber" and "frame" press, however, seem to be more convenient than the cumbrous description in the title of the paper. The subject was treated from every point of view, and efficiency was measured by the proper commercial standards. A mathematical discussion of the subject led to the determination of the most efficient size of press for a given job. The washing of the cakes was well considered, and the methods of charging and discharging fully discussed. Two excellent models of the Kelly Filter and the Rotary Vacuum Filter were exhibited by Mr. Campbell (U.S.A.), who gave a very good account of filters of the "leaf" type, *i.e.*, those in which the deposit is formed on the outside of a filter-bag which is immersed in the liquor to be filtered. Some important information as to the special value of this type of press was given. Mr. B. Bramwell discussed the design of mechanical filters for the purification of water supplies, but devoted most of his remarks to the "turn-over" filter. In this machine the cleansing of the filter is brought about by turning over the chamber containing the sand filter bed.

The Coke-Oven Conference.

In the Chemical Lecture Theatre of Armstrong College, on July 13, five papers were read, all bearing on various aspects of coke-oven practice.

Mr. W. A. Ward produced a treatise, rather than a paper, on "Modern By-product Coke-Oven Construction"; and it is to be feared that its great length and the mass of detail it contained made it difficult for his auditors to carry away much of the really valuable matter which he laid before the meeting. In the general portion of the paper he points out the need for choosing the site of ovens with due regard not only to its mechanical capabilities, but also to the general traffic of the works and to the possibilities of future extension. From his language, he seems to favour the national pooling of coking coals, and their treatment at "super-works," so as to achieve regularity of load and uniformity of treatment, and thus raise efficiency; but the cost of transport, the fact that though different installations work different coals yet any one installation has as a rule a very regular quality to deal with, and the further fact that different qualities of coke are really required, appear to have modified this opinion, for he points out later that no one type of oven can be treated as a standard, but that the type of coal to be carbonised must govern the construction of the oven; and he quotes as a merit of some of the quenching and loading devices which he describes, that they enable "selected coke," even from parts of the discharge of the same battery, to be segregated. He rightly combats the idea that either type of oven, "regenerative" or "waste heat," is inherently or essentially more efficient than the other: the truth being that each has its own avenues of waste, different from those of the other. He remarks, from the engineering point of view, on the structural design of ovens, and the relative advantages of bricks and blocks, arches and beams, and deals with the questions of expansion and contraction, the stiffening of the structure by tie-rods etc.; and he discusses the relative advantages of clay and silica as refractories. The need for proper admixture of gas and air at the burners, and the high efficiency of the oven at the beginning of the process, when the temperature difference between flue and oven is very great, are also noticed. At the end of the paper several mechanical devices for both quenching and loading the coke are described, all making both for rapidity and economy. There is still room, however, for an invention which shall render available the sensible heat of the incandescent coke—some 8 per cent. of the total amount used in coking the coal. Perhaps the most interesting part of Mr. Ward's paper, especially to those engaged in the industry, was his description of many designs of coke ovens and accessories: though this was just the part of it which was least suited for the transient oral method of communication, especially as his slides and diagrams, excellent in detail, were not on broad enough lines to be visible at a distance. There was really matter enough here for a treatise on the subject—too much for a paper in a journal—and such a treatise would probably be welcomed by many of those whose daily work deals with coke-making.

Mr. W. J. Rees' paper dealt with the corrosion of coke-oven walls by alkali salts, especially chlorides, which are contained in considerable quantities (over 0·5% of chloride and 0·2% of sulphate) in certain Midland coals. Even when the coal is washed about 50 lb. of sodium chloride and 20 lb. of sulphate go into the ovens with each ton of coal. These do not glaze the lining of the oven, because the temperature-gradient is upwards from within outward to the flues; and the vapours permeate the bricks, soften them by chemical action, and thus help their disintegration by the movements of the coke. The author points out that silica is less affected in this way than fireclay; so that, apart from their advantage over clay bricks in conductivity for heat, silica bricks would greatly reduce the wear and tear which now, with fireclay bricks, goes on from this cause. The large expansion of silica bricks has been a bar to their use in oven construction; but bricks are now obtainable in which the permanent part of this expansion has been effected during manufacture, and which should behave satisfactorily under coke-oven conditions.

The paper of Messrs. Hewson and Fowles deals with both coke-oven gas and blast-furnace gas. They advocate the building of coke ovens at the steel works, and state that the coal needed to produce coke for the blast furnaces would at the same time yield enough gas to work the steel furnaces and the heating furnaces, for which (especially for steel furnaces) it possesses many advantages over producer gas. The blast-furnace gas has usually, where it has been utilised at all, been burnt under boilers; and so treated, it has not been enough for the requirements (blowing engines, etc.) of the blast furnaces and auxiliaries. It has not been possible to use this gas in gas engines, because of the dust contained in it; but if the gas be cleaned by one of the modern processes it becomes suitable for gas-engine use, and the high efficiency of the gas-engine as compared with the boiler and steam-engine, allows of considerable economy in its use. The authors have used the Halberg-Beth process for cleaning the gas; and they find that instead of the gas needing to be supplemented by coal for the purposes of the blast-furnace plant, as is sometimes the case, one-half of it is enough for those purposes, and that the other half, used in gas-engines to generate power electrically, produces more than enough to drive all the steel works' machinery. A very large saving has thus been effected, and increased, incidentally, by the potash value of the recovered dust.

Mr. Harold Wright advocates the use of the by-product coke oven as a source of town gas supply; not only in cases where, as at Middlesbrough, the ovens are pre-existent, but also where they would need to be erected for the purpose, in establishing or extending a gas works. He bases his advocacy on the high efficiency of the regenerative oven, as compared with gas works' plant or with producers, and he deprecates the steaming of retorts and the production of water-gas as inefficient and hence uneconomical. But he recognises that the commercial success of such a plan is altogether dependent on the presence of a market for metallurgical coke, the sale of which at one and a-half times the price of coal, per heat unit available, makes the gas in his pattern costs sheet cost nothing at all, so that the sale of it at a figure represented by 105 covers all the costs of distribution, whilst ordinary coal gas must be sold, under similar conditions, at 162.

Dr. E. W. Smith, in reviewing the position of the coke-oven industry with special reference to the by-products rather than the coke, also advocates the use of the surplus gas as a town supply; but whilst Mr. Wright gives 55% of the total make as surplus, Dr. Smith puts it at 40%; and whilst Mr. Wright regards the use of producer-gas as wasteful and inefficient, Dr. Smith would heat his ovens by means of producer-gas, so as to have the whole of the coke-oven gas for use as town's gas. In dealing with ammonium sulphate, he points out that the present high price is due to the cost of acid, and that whilst gas works extract from their gas more sulphur than would make the acid they use in their sulphate houses, sulphur is not recovered from coke-oven gas at all. Benzol, on the other hand, is taken out at practically all coke works; but the methods of extraction are crude, and there is much room for improvement in them. He also dealt with cyanogen, naphthalene, ammonium chloride, and alcohol, and commented on the promising work that had been and was being done on the production of these substances from coke-oven gas. Besides the improvements that may be expected in methods themselves from scientific research, the most profitable industrial application of them, and the attainment of the best commercial return, would be promoted by co-operation among coke-oven installations; and Dr. Smith also thinks that study both by these engaged in the coke-oven industry and in the gas industry of each other's methods of work might be productive of considerable progress in both industries.

Catalysis.

On the Wednesday morning, Dr. E. F. Armstrong gave an account of some recent work which he had done in collaboration with Dr. T. P. Hilditch on "Catalytic Chemical Actions and the Law of Mass Action."

The earlier studies of the rate of chemical change effected by enzymes led to the conclusion that these actions were unimolecular, *i.e.*, in successive equal intervals of time the amount of change was the same fraction of the amount of material undergoing change present at that time; later the work of Duclaux and of Adrian and Horace Brown indicated that the amount of change was to some extent constant and independent of the amount of hydrolyte present. In other words, if the amount of chemical action was plotted against time, the resulting graph tended to be a straight line instead of a logarithmic curve. Next, the work of H. E. and E. F. Armstrong on enzyme action showed that in the absence of conflicting factors the action was "linear," the "logarithmic" changes being due to decrease in activity of the enzyme. This was illustrated by the decomposition of urea by urease, an enzyme whose activity is restricted by ammonia; the curves for the decomposition of urea alone and in presence of ammonium carbonate or ammonia were definitely logarithmic, whereas in presence of excess of carbonic acid the curve was linear.

In 1912—1914 preliminary work on the rate of hydrogenation of linseed, whale, cottonseed, and olive oils in presence of nickel indicated that well-marked linear phases were present; more recently an opportunity was taken to examine the hydrogenation of pure compounds, such as ethyl cinnamate and anethol, when it was found that the resulting curves were linear for 80 per cent. or more of the total action.

Just as the linear nature of the enzyme curves showed that the acting mass was constant in amount (the measured change being probably the decomposition of a compound formed between the enzyme and hydrolyte), so the hydrogenating action was explained by the hypothesis that a very small quantity of an unstable compound of nickel with the unsaturated organic compound was formed, that this complex further became associated with hydrogen, and that the action actually measured was the resolution of this complex into saturated compound and nickel.

Owing to the ease with which nickel of definite activity can be prepared and employed in known quantity, the effects induced by varying conditions can be studied much more readily than in the case of enzymes. Thus, when a phenolic compound, such as isoeugenol, was hydrogenated in place of anethol, the curves were found to be exactly logarithmic, the acidic phenol tending to spoil the activity of the nickel and the measured action being, not the rate of hydrogenation, but the rate of loss of activity of the catalyst. Similarly, if the process is carried on in a closed apparatus with hydrogen containing an inert impurity such as nitrogen, which accumulates as the hydrogen is absorbed, the curve is logarithmic, and good "unimolecular" constants are obtained if the theoretical total absorption is taken, not as the amount of hydrogen required to saturate the organic compound, but as the amount of hydrogen required to be absorbed before the closed space is completely filled with gaseous impurity.

It was also shown that the isomeric oleic acids actually found in the hydrogenation products of olein were exactly those which would be expected to result from decomposition of complexes of nickel with olein and stearin (elaidic and an iso-oleic acid with the ethylenic linkage displaced along the carbon chain).

Another type of action briefly referred to was the "water gas equation": $CO+H_2O=CO_2+H_2$, an action which proceeds in presence of iron oxide, slowly at 250° C. and with increasing velocity up to 450—500°, and is explained by the alternate reduction and oxidation of iron oxide by carbon monoxide and steam respectively. If copper is substituted for iron oxide as catalyst, however, the action is more rapid than in the latter case from 200—300°, but falls off somewhat above this temperature; this coincides with the temperature range over which copper was shown by Sabatier to decompose formic acid. The action is thus dependent on the chemical changes induced by the specific catalyst used.

It was pointed out in conclusion that a physical and a chemical factor are both necessary for catalysis; the physical factor is that of a surface at which gases and liquids are concentrated in what has been shown by the researches of Lord Rayleigh, W. B. Hardy, and Langmuir to be a single layer of molecules. In addition, for any given chemical action, the appropriate specific chemical catalyst must also be present; for example, nickel (copper, palladium, platinum) in cases of hydrogenation, alumina (thoria, etc.) for dehydration of alcohols, and a specific kind of enzyme for hydrolyses of various types (sugars, glucosides, urea).

Metallurgical Papers.

In a paper entitled "Some Properties of 60:40 Brass," Prof. C. H. Desch described experiments he had undertaken to determine the reason why brass rods approximating to this composition had been found to give widely differing results in turning and drilling operations on automatic lathes. He has found that the addition of metals other than zinc and copper changes the relative proportions of the alpha and beta constituents; that the Brinell hardness of brasses increases fairly regularly with the "apparent" zinc, *i.e.*, with the added metals calculated to the equivalent quantities of zinc; and that the machining hardness bears no relation to the Brinell hardness. A drilling test is described for determining machining hardness, and machining times have been correlated with composition. Brass of good machining quality should contain as nearly as possible 60 per cent. of copper and 1·5 per cent. of lead, with the smallest possible quantities of other metals. The structure should be fibrous, the alpha crystals forming parallel threads. Extrusion is preferably carried out at a moderately low temperature in powerful presses.

Mr. D. W. Jones discussed the composition of lead for use in the construction of chemical plant, and his experimental results should prove useful to manufacturers of sulphuric acid. Whereas ordinary lead, refined by the Parkes process, rarely withstands the action of concentrated sulphuric acid up to 280° C., lead intended for use in chemical plant should remain resistant up to 300° C. The addition of copper to Parkes lead, in certain definite quantities, has a marked effect in raising the temperature at which corrosion occurs, but no advantage accrues from adding it to a pure lead, *i.e.*, Parkes lead refined. The presence of sodium also acts beneficially, but that of antimony, zinc, tin, and bismuth is harmful. Antimony, even if present in quantities which a commercial metal may contain, will render the lead useless for chemical operations. Although copper will inhibit the injurious effects of antimony and bismuth, pure lead is to be preferred.

The last paper, "Recent Developments of the Electric Furnace in Great Britain," by Mr. D. F. Campbell, brought out very clearly the effect of the war on the development of electric-furnace work in connexion with the reduction of ores of chromium, tungsten, and molybdenum, and with the manufacture of steels, caustic soda, chlorine, phosphorus, and fused silica ware. Excluding the energy used for aluminium production, the electric-furnace capacity had increased from under 6000 to over 150,000 h.p. during the period of the war. The reasons for this great development and the technical advances achieved were reviewed, and grounds given for belief in the future expansion of the electro-metallurgical industry in this country.

The programme of the concluding day was of a purely non-technical character. In the day-time, thoughts were successfully diverted from chemistry, industry, and even chemical industry, by the glories of Hexham Abbey and the attractions of the Roman remains near Chollerford. In the evening, members and visitors passed some pleasant hours at a reception given by the Chemical Industry Club—a vigorous institution which can boast of a good collection of up-to-date literature presented by local chemists and chemical manufacturers.

The Newcastle Meeting of 1920 will long be remembered as one of the most enjoyable and best organised in the history of the Society.

THE INTERNATIONAL CHEMICAL CONFERENCE.

Owing to the kindness of M. Jean Gérard, general secretary of the International Chemical Union, we are enabled to give the following account of the proceedings of the conference held in Rome on June 21-25, under the presidency of Prof. C. Moureu.

At the meeting of the Council, attended by representatives of the five nations which founded the Union (Belgium, France, Italy, United Kingdom, United States), the following countries were by unanimous vote admitted to membership:—Canada, Denmark, Spain, Greece, the Netherlands, Czecho-Slovakia, and Poland.

The delegates present at the Conference (General Assembly) were as follows:—*Belgium:* Prof. F. Swarts, of the University of Ghent; Dr. R. Lucion, director of the laboratories of the Société Solvay. *Czecho-Slovakia:* Prof. E. Votocek, of the Polytechnic, Prague, and president of the Bohemian Chemical Society. *Denmark:* Prof. E. Biilmann, University of Copenhagen; M. Warming, chief engineer to the A/S Dansk Svovlsyre og Superphosfabrik. *France:* Prof. G. Bertrand, president of the Société Chimique de France; Prof. F. Bordas, director of the laboratories of the Ministry of Finance; M. J. Gérard, general secretary of the Fédération Nationale des Associations de Chimie de France; M. Paul Kestner, president of the Société de Chimie Industrielle; Prof. L. Lindet, president of the Association des Chimistes de Sucrerie et de Distillerie; M. C. Lormand, chemist in the Ministry of Agriculture; Prof. C. Matignon, vice-president of the Société de Chimie Industrielle; M. C. Marie, general secretary of the Société de Chimie Physique; Prof. C. Moureu, president of the Fédération Nationale des Associations de Chimie; M. Nicolardot, of the Ecole Polytechnique. *Greece:* Prof. Zenghelis, University of Athens. *Italy:* Prof. G. Bruni, of the Polytechnic, Milan; Prof. G. Ciamician, president of the Associazione Italiana di Chimica Generale ed Applicata; Prof. F. Garelli, of the Turin Polytechnic; Prof. R. Nasini, University of Pisa; Sig. Parodi-Delfino, vice-president of the Associazione Italiana di Chimica Generale ed Applicata; Prof. G. Oddo, University of Palermo; Prof. E. Paternò, University of Rome and vice-president of the Consiglio Nazionale di Chimica; Prof. Plancher, University of Parma; Sig. F. Quartieri, of the Società Italiana Prodotti Esplodenti; Prof. A. Peratoner, University of Rome. *Netherlands:* Prof. R. H. Kruyt, of the University of Utrecht, president of the Nederlandsche Chemische Vereeniging. *Poland:* Prof. Kowalski, of the Polytechnic at Varsovia, and Minister for Poland to the Vatican. *United Kingdom:* Sir William Pope, president of the Federal Council for Pure and Applied Chemistry; Mr. Hay, technical delegate on the Reparations Commission. *United States:* Dr. C. L. Parsons, general secretary of the American Chemical Society.

The sessions were held in the rooms of the Accademia dei Lincei, in the Corsini Palace, and each one was presided over by a different foreign delegate. The scheme of organisation of the International Union of Pure and Applied Chemistry decided upon by the Conference is as follows:—

To qualify for membership in the International Union, a country must first co-ordinate its various chemical societies by founding either a national council composed of the representatives of such societies or a federation. The initiative in this may be taken either by a chemical society, by a national academy, by a national research council or some other similar national institution, or by the Government.

In accordance with the rules (*cf.* J., 1919, 263 R), the Union is administered by a Council consisting of delegates of each of the countries adhering to the Union, and the executive power of the Council is vested in a Bureau. The General Assembly is the supreme authority. It considers reports of the Council, including those on the financial situation and general position of the Union, passes the accounts for the previous financial year, and votes the budget for the ensuing year.

Permanent relations between the chemical organisations of the associated countries are assured by the establishment of a special organisation which is under the control of the Council of the Union and the direction of an executive committee; it carries out the programme drawn up by the Council and defined by the Bureau. This permanent office is known as the International Organisation for Chemistry (*Office Internationale de la Chimie*); it is situated at the headquarters of the Union and is the connecting link between the various organisations combined within the Union.

The Council of the Union has power to investigate particular questions or to undertake specific work or administer international bodies in course of development.

Finally, there is a Consultative Committee, divided into sections corresponding to the different scientific and industrial branches, which secures the adequate representation of all departments of pure and applied chemistry and reports upon question of detail. The associated countries are represented in each section by delegates nominated for three years by the official national body attached to the Union. The delegates of any one nation are to constitute a National Committee, the function of which is to study for that nation the development of knowledge in science, industry, and commerce from the standpoint of chemistry.

A meeting of the Council of the permanent Commissions attached to the Consultative Committee and to the General Assembly is to be held annually under the name of the International Chemical Conference.

As the result of a motion by Prof. Lindet, it was decided that the International Chemical Conference should become every fourth year the International Congress of Pure and Applied Chemistry, at which the elections to the Council, the permanent commissions and the consultative committee will take place. The conference may be divided into sections, corresponding to those of the consultative committee, for the consideration and discussion of reports and communications.

English, French, and Italian are the accepted languages of the conference, but communications may be made in another language if a translation or summary in the accepted languages be provided. In order to avoid errors of interpretation, recommendations, resolutions and official decisions, if not already in French, must be translated into that language.

At the beginning of each Conference the Bureau of the Union will present minutes of the resolutions adopted by the preceding Conference with a statement of the results which have accrued.

The Council of the Union may, within the limits of the funds voted each year by the General Assembly, encourage research by awarding prizes and medals to the authors of important work.

In connexion with a report furnished by M. Nicolardot on the unification of chemical analyses, the Conference expressed the wish that the international agreement signed at Paris on October 16, 1912, should be ratified and brought into effect as soon as possible. This agreement relates to the adoption of a standard method for stating the results of chemical analyses of food stuffs, and for the establishment at Paris of a permanent International Bureau of Analytical Chemistry dealing with these matters.

Following a report by M. Crismer on the creation of an international bureau of chemical standards, the Conference directed the Council to organise a chemical standards bureau comprising three sections, viz., chemical standards, pure chemicals for research, and commercial products.

The Bureau of the Union will serve as a connecting link between scientific men, manufacturers and traders on the one hand, and the sections of the consultative committee on the other, in order to promote inter-communication and to induce the scientists, manufacturers, and traders to ensure that inquiries are addressed to the appropriate sections. The United States, with its special organisation, will constitute a branch attached to the Union in the same way as the sections. The different sections will have the duty of carrying out the conditions laid down by persons who give loans or donations. Three sections will be set up, the first for Belgium, the second for the United Kingdom, and the third for France.

On the proposal of Prof. Kowalsky and a report by Prof. Matignon, a special sub-committee asked for the appointment of a commission to investigate the subject of thermo-chemical data and standards. A provisional committee was set up for this purpose.

A report by M. Trincheri on the legal value of "sealed envelopes" in applications for patents led to the decision that the International Union of Pure and Applied Chemistry should set up a body of persons with technical and legal qualifications for the consideration of problems relating to patents. The first question to be considered is the legal value of "sealed envelopes" and the creation of international patents. Italy will prepare a scheme of organisation.

Consideration of a report by Prof. W. D. Bancroft (chairman of the Division of Chemistry and Chemical Technology, U.S.A.) on the International Commission for Atomic Weights, led to the constitution of a commission for this purpose, and the request that Messrs. Thorpe, Clarke, and Urbain, members of the former commission, should continue their work for another year.

On a motion by Prof. Oddo, it was decided to insert the following proposals on the agenda for the next International Conference:—(1) The table of atomic weights should be revised every ten years, so as to allow the commission and research workers sufficient time to check the available data. (2) That Dalton's proposition, accepted by Avogadro and Cannizzaro, to take the atomic weight of hydrogen as unity, should be reverted to.

On the proposal of M. Marie, the Conference decided that the International Committee for Tables of Constants should be attached to the Union.

With regard to physico-chemical symbols, on the request of the Chemical Society of London, the Conference will ask the various chemical associations and chemical journals of the countries attached to the Union to republish the list drawn up by the late International Association of Chemical Societies at Brussels on September 23, 1913, at its last meeting.

With the object of drawing the attention of the respective Governments to the importance of the work of the Union, the following recommendation was adopted at the request of the Danish delegates:—

"The Conference of the International Chemical Union desires that all the delegates of the associated nations shall endeavour to obtain recognition of the public utility of the work of the Union."

The Bureau will forward to the Italian Government the complete report of the Conference, with the request that this report shall be communicated officially to all the other Governments.

In its final session the Conference decided to hold the next meeting at Warsaw in 1921.

During their visit the delegates were entertained at receptions, including one by the Syndic of Rome, dinners and other social functions; visits were paid to the various museums, to Pompeii, to the works of the Bombrini Parodi-Delfino, at Segni, the Elettro-Chimica Pomilio at Naples, and the Società Italiana Prodotti Esplodenti at Cangio. The successful organisation of the Conference was due to the untiring efforts of Professors Marotta and Paterno, and the work accomplished may be regarded as of outstanding importance, inasmuch as it laid the foundations of a permanent organisation whose influence will extend to every country.

HELIUM.*

No element has had a more romantic history than helium, and few are of greater interest to men of science at the present time. Its extreme lightness, its absolute inertness, its close approximation to an ideal or perfect gas, and its intimate connexion with the phenomena of radioactivity are among its most interesting properties, whilst its use for inflating airships and its possible application to a variety of other utilitarian purposes appeal especially to the student of chemical technology.

The gases from some springs in France have been shown to contain as much as 5% of helium; natural gases in the Western States of America contain from 1 to 2%, but within the British Empire no natural gases have been found to contain as much as 0·5%. When during the late war it became apparent that the use of helium would have important advantages over that of hydrogen for filling airships, the Board of Invention and Research of the British Admiralty, acting on proposals advanced by Sir R. Threlfall, asked Prof. McLennan to undertake a survey of the sources of helium within the Empire, and to devise ways and means of isolating it in quantity and in a relatively pure state. Natural gases from Ontario and Alberta, Canada, were found to be richest in helium (0·34% and 0·33% respectively), and it was estimated that these sources could supply from 10 to 12 million cb. ft. of helium per annum. Gases from New Brunswick were found to contain 0·064%, and the richest natural gases in New Zealand not more than 0·077%. A natural gas from Pisa, Italy, contained no helium; the gas at Heathfield, Sussex, 0·21%; that from the King's Spring, Bath, 0·16%; and the natural gases at Pitt Meadows, Fraser River Valley, and Pender Island, on the Gulf of Georgia, British Columbia, were ascertained to possess a nitrogen content of over 99%.

In 1917 a small experimental station was set up at Hamilton, Ontario, where it was found that the helium present in the crude natural gas, to the extent of 0·33%, could be satisfactorily isolated on a commercial scale; and a second station was established to operate on the natural gas at Calgary, Alberta. Three methods of isolating the helium content were investigated, *viz.*, (a) by utilising the cold obtainable from the natural gas itself for liquefying all the contained gases except the helium; (*b*) by using external refrigeration only, by means of ammonia, liquid air, etc.; and (*c*) by combining methods (*a*) and (*b*). Although method (*c*) had been successfully used in the Texas field by the United States authorities, it was not adopted, as it did not appear to be economical.

* Abstracted from a lecture delivered before the Chemical Society by Prof. J. C. McLennan, on June 17, 1920.

Method (a) was selected, and by suitably modifying the Claude oxygen-producing column it was found that helium of 87—90% purity could be regularly and continuously produced. Ultimately an auxiliary apparatus was added whereby the purity of the gas was raised to 99% or higher. From the experience thus obtained, it was possible to draw up specifications for a commercial plant to deal with about 56,500 cb. ft. of gas per hour at normal temperature and pressure.† Six of these machines would deal with 9½ million cb. ft. of gas daily—the average supply of natural gas at Calgary. The cost of a commercial plant for treating the whole supply from the Alberta field would probably be less than £150,000, assuming an efficiency of 80% (*i.e.*, a recovery of 80% of the helium content of the natural gas), and allowing for salaries, running costs, amortisation, etc., helium could be produced in Alberta at less than £10 per 1000 cb. ft., excluding the cost of cylinders and transport. From data so far ascertained, it is probable that the potential yearly supply of helium from all sources within the Empire would not suffice to keep more than a very few of the larger airships in commission, even if diluted with 15% of hydrogen; it might be used to fill fireproof compartments adjacent to the engines if it were decided to instal these within the envelopes of larger airships.

In the course of this work a number of collateral problems was investigated. It was found, *e.g.*, that for aeronautical purposes hydrogen could be mixed with 15—20% of helium without the mixture becoming inflammable or explosive in air. The permeability of rubbered balloon fabrics for helium was shown to be about 0·71 of its value for hydrogen. For skin-lined fabrics, the permeability to hydrogen and helium was about the same. Thin soap films were found to be about one hundred times more permeable to hydrogen and helium than rubbered balloon fabrics, but untreated cotton fabrics when wetted with distilled water were but feebly permeable to these gases. It was found that rapid estimations of the amount of helium in a gas mixture could be made with a pivoted silica balance, a Shakspear katharometer, or a Jamin interferometer. The latent heats of methane and ethane were determined, and also the composition of the vapour and liquid phases of the system methane-nitrogen. It was ascertained that helium containing as much as 20% of air, oxygen, or nitrogen can be highly purified in large quantities by simply passing it at slightly above atmospheric pressure through a few tubes of coconut charcoal kept at the temperature of liquid air. In the spectroscopy of the ultraviolet, helium was found to be exceptionally useful.

Among the suggested possible applications of helium are its use in industry as a filling for thermionic amplifying valves of the ionisation type; for filling tungsten incandescent filament lamps, especially for signalling purposes where rapid dimming is an essential; and for producing gas arc lamps in which tungsten terminals are used, as in the "Pointolite" type. However, both of these varieties of lamps possess the defect of soon becoming dull owing to the ease with which incandescent tungsten volatilises in helium and deposits on the surface of the enclosing glass bulbs. As regards illumination, helium arc lamps possess an advantage over mercury arc lamps in that the radiation emitted has strong intensities in the red and yellow portion of the spectrum. Nutting has shown that Geissler tubes filled with helium are eminently suitable, under certain conditions, for light standards in spectrophotometry, but the amount of the gas which could be used in this way is very small. It has recently been proposed to use helium in place of oil for surrounding the switches and circuit-breakers of high-tension electric transmission lines.

† A full account of the apparatus employed, with diagrams, is given in the "Journal of the Chemical Society," July, 1920.

If the gas should prove suitable for this purpose large quantities could be utilised, but it has yet to be demonstrated that in this field helium possesses any advantage over the oils now used. It has been suggested by Elihu Thomson and others that if divers were supplied with a mixture of oxygen and helium, the rate of expulsion of carbon dioxide from the lungs might be increased, and the period of submergence as a consequence be considerably lengthened.

To chemists and physicists the discovery that helium can be produced in quantity at a moderate cost opens up a vista of surpassing interest in the realm of low temperature research. It is but a few years (1908) since Onnes, after prolonged effort, succeeded in liquefying helium, and in so doing reached a temperature within approximately 1° or 2° of absolute zero. The results obtained by him, although limited in number, are of great importance, for they show that if liquid helium were rendered available in quantity, fundamental information of the greatest value on such problems as those connected with electrical and thermal conduction, with specific and atomic heats, with magnetism and the magnetic properties of substances, with phosphorescence, with the origin of radiation, and with atomic structure, could be obtained.. In spectroscopy, supplies of liquid helium would enable us to extend our knowledge of the fine structure of spectral lines, and thereby enable us to obtain clearer ideas regarding the electronic orbits existing in the atoms of the simpler elements. In the field of radioactivity important information could be obtained by the use of temperatures between that of liquid hydrogen and that of liquid helium; and such problems as the viability of spores and bacteria at such low temperatures could be attacked with fair prospect of success. A point to be remembered is that the supplies of natural gas from which helium can be extracted are being rapidly used up, and hence careful consideration should be given to the problem of producing helium in large quantities while it is still available, and of storing it up for future use.

The number of problems which could be attacked by the use of liquid helium is so great that it appears well worth while to press for the establishment of a cryogenic laboratory within the Empire. Such a project merits national and, perhaps, imperial support. A well-equipped cryogenic laboratory should include:—(1) A large liquid-air plant, (2) a liquid-hydrogen plant of moderate capacity, (3) a small liquid-helium plant, and (4) machine tools, measuring instruments and other apparatus. The capital cost of such a laboratory would be £30,000, and the running costs would be covered by the interest on an endowment fund of £125,000. No better method could be imagined of perpetuating the work of the great pioneers of low-temperature research—Andrews, Davy, Faraday, and Dewar.

LORD MOULTON AND THE UNITY OF THE PROFESSION.

The dinner given last week to Lord Moulton in recognition of his work as Director-General of Explosives Supplies was a fitting tribute to one who has served his country well and who has, incidentally, made a host of friends among members of the chemical profession. Some eighty-odd representative chemists and chemical manufacturers took part in the proceedings, in the course of which a silver loving cup was presented on their behalf to his lordship by Mr. Emile Mond.

Sir William Pope, as chairman, described the signal services which Lord Moulton had rendered in developing the production of explosives with an energy and efficiency that were truly remarkable, and upon a scale which this country had never previously dreamed of. The secret of his success lay in his ability to co-ordinate the activities of a vast number of individuals and of corporations who were each doing their best in a thoroughly individualistic spirit, but who were getting in each other's way; and this triumph of organisation had been subsequently supplemented by the establishment of the coal-tar colour industry in this country and by important inquiries conducted by the Nitrogen Products Comittee. Sir William Pope then directed attention to the necessity of perpetuating among chemists the co-operative spirit which the war had engendered, and indicated the means of attaining this most desirable object:—

"Whilst strenuous attempts are being made, and with very considerable success, to expand and develop our chemical industries, to secure financial aid for the training of men in the methods of chemical research in our universities and colleges, and to direct a larger proportion of the young and vigorous intelligence of our country towards a career in chemical technology, one essential branch of chemical activity still awaits the necessary financial stimulus. The societies which represent the general and corporate interests of the various sections of pure and applied chemistry are ill-housed and ill-endowed, and the accommodation and the resources at their commend are entirely inadequate for their rapidly growing membership; the funds at their disposal are so insufficient as to make impossible any of the important schemes for publication which await their attention. They are unable to build up such a joint library as would be properly representative of the present position of chemical literature and, if they were in possession of such a library they would, under present conditions, have no place for its reception.

The urgent necessity for the provision of funds for the purposes to which I have just referred will be realised by everyone who acquaints himself with the work done by our chemical societies. The whole development of scientific and technical chemistry is centred in these great organisations; they furnish the intellectual stimulus so essential to the younger men who are preparing to carry on the work now in the hands of the older. It would be impossible to overrate the services rendered to pure and applied chemistry by the Chemical Society and the Society of Chemical Industry and by many of the smaller, more specialised societies.

This is a question which has for some time engaged the attention of the Federal Council for Pure and Applied Chemistry, and an appeal for funds is now about to be issued under the leadership of Lord Moulton. We cannot doubt but that the chemical industries of the country, which now represent such gigantic financial interests, will co-operate with our guest for this purpose with the same unanimity and public spirit as they showed during the war."

In acknowledgment, Lord Moulton modestly put the credit for having saved the country in the matter of explosives supply upon the chemists who had responded to his call and rallied together to face the common danger. He could scarcely think of an industry that did not grumble at him; he could think of none that did not support him. He had had to show to the nation how chemistry permeated every part of its life, and one of the lessons of the war was that of its omnipresence. It was the lack of unity among chemists that had previously played into the hands of Germany. Why did they not assert their essential importance, and why did they not announce to the world that they were at the roots of the nation's prosperity in industry? Unless they continued in peace the hearty co-operation which existed in war, he did not think they would attain to their rightful position.

THE ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS.

The fourth annual meeting of the Association was held in London on July 8, Mr. R. G. Perry (chairman) presiding.

The chairman's address dealt mainly with the recent activities of the Association, as described in our last issue (pp. 229-230 R). One of its most important functions was to watch over Parliamentary Bills from the standpoint of chemical industry. In the past year the Patents and Designs Committee had exercised considerable influence on the drafting of the new Patents Act, and since this was passed not a single adverse criticism had been received from any member of the Association. On the subject of taxation, the Council was opposed to the present Government policy, inasmuch as it discouraged enterprise; there was also evidence of too much haste to get the country's debts liquidated. Another point singled out for especial comment was the work of the Traffic Committee. Owing to the great importance of this subject, which affects all manufacturers in greater or less degree, he recommended that serious consideration should be given to the setting up of a Traffic Department within the Association having an experienced expert as head. Reviewing briefly the object and achievements of the Association during the past four years, Mr. Perry said that its chief object was to promote co-operation among manufacturers and thereby facilitate co-operation between them and Government officials. Perhaps too much stress had been laid in the past upon the advantages of individualism, and the time had now come to put team work in its place. An achievement of which they were proud was the report of the commission sent to Germany, the preparation of which was only rendered possible by co-operation with the Department of Overseas Trade.

Dr. E. F. Armstrong dwelt on the extreme value of individuality in trade and on the necessity of combating Government control and interference. The Association had proved its value in the latter respect, particularly in the case of the smaller firms. The immediate future could not be regarded as very hopeful in view of dear money, the certainty of a very big fight with labour, delay in obtaining delivery of plant, and taxation. On the other hand, adversity would doubtless bring out the best which was in the chemical manufacturer, and if manufacturers would work together through the Association the result would not be in doubt. Members should give more assistance to the Information Bureau by providing it with accurate statistics, as it was of prime importance that the Association should be able to approach the Government in the name of the whole industry. The advent of American competition would probably prove to our good, but it was imperative to overhaul our machinery in good time.

In the general discussion which followed, Mr. E. V. Evans spoke of the vital importance of chemical engineering to chemical industry, congratulated the Council on having initiated the formation of an Association of Chemical Plant Manufacturers, and expressed the hope that steps would be taken to direct and foster the education of chemical engineers.

Mr. E. B. Cook and Mr. F. H. Carr referred to the present position as regards unrestricted importation. The former appealed to the Council to impress the Government with the urgency of the situation, and the latter held that the Government was perhaps justified in delaying legislation in view of the need for re-establishing exchanges. With regard to the new Salicylic Acid Association, Mr. Carr said that its object was to bring prices down by securing that efficiency in the manufacture of salicylic acid which would enable home manufacturers to compete with Germans in foreign markets. English makers of fine chemicals were dependent for their continued existence upon selling in a bigger market than England affords.

Mr. Kenneth Chance, speaking as one who took no direct part in the management of the Association, congratulated the Council on the excellent work it had accomplished. He supported the proposal to employ an expert in traffic problems, and suggested tnat informal private meetings should be held at which such subjects as the working of chemical plant could be discussed.

After further speeches, by Mr. R. J. Pugh and Mr. J. Lukes, the resolution that the report be adopted was carried unanimously.

PERSONALIA.

Mr. C. O. Bannister has been appointed professor of metallurgy in the University of Liverpool.

Mr. D. R. Steuart has retired from the position of chief chemist to the Broxburn Oil Co., Ltd., after forty years' service.

The new chair of fuel technology in the University of Sheffield has been filled by the appointment of Dr. R. V. Wheeler.

Mr. G. B. Brook, lecturer in non-ferrous metallurgy at the University of Sheffield, has been appointed chief chemist to the British Aluminium Company.

Dr. L. A. Jordan, who was recently created Chevalier of the Order of the Crown of Italy for war services rendered, has been awarded the degree of D.Sc. in chemistry by the Senate of the University of London.

Sir Jesse Boot has given the sum of £50,000 to University College, Nottingham, for the purpose of developing the scheme of a new university for the East Midlands. Of the sum mentioned, £20,000 is to be devoted to the endowment of a chair of chemistry, and £30,000 to the building fund.

Two research fellowships, each of £300 and tenable for one year, have been founded at the Royal School of Mines by Mr. William Frecheville, who was professor of mining from 1912 to 1919, with the object of encouraging research in mining, mining geology, metallurgy, and oil technology.

Among the appointments made by the Council of University College, Swansea, are: Prof. C. A. Edwards, of Manchester University, to the chair of metallurgy; Dr. J. E. Coates, of Birmingham University, to the chair of chemistry; and Dr. E. A. Evans to the chair of physics. The foundation-stone of the new buildings of the College was laid by H.M. the King on July 19.

The following candidates were successful in the July examinations of the Institute of Chemistry:—*Fellowship:* A. C. Melville (metallurgy); G. E. Knowles (textiles). *Associateship:* E. A. Morris (minerals); C. Hollingsworth (metallurgy); L. V. Cocks, R. G. M. Dakers (organic); S. Greenberg, Vera Newcombe, H. C. M. Winch (food and drugs); A. Potter (coal-tar dyes). The following have passed the examination for the Fellowship and will be admitted thereto after three years' registration as Associates:—G. G. Auchinleck, H. C. S. de Whalley (agricultural chemistry).

NEWS AND NOTES.

FRANCE.

Industrial Notes.—*Metallurgy.*—Restoration in the metallurgical industry has been most marked in the Meurthe and Moselle districts, where pig-iron is produced in fairly large quantities and four big steel works are in operation. Although the rate of recovery in these districts and in the industrial parts of France generally has been very satisfactory, there is no room for unrestrained optimism; the work of reconstruction must continue to be slow and laborious. The Lorraine works will have to bear the brunt of production for some time, and this again will again be possible if coke is available in sufficient quantities. Works now in a position to produce are those which were equipped with up-to-date machinery and able to restart operations soon after the armistice, in many cases with machinery which had been removed to Germany but brought back without difficulty in the early days of peace. Factories which were entirely or partly destroyed, or which had no modern equipment when hostilities broke out, are now in a very different position; they have to make an entirely fresh start and to place big orders which cannot be executed promptly; moreover, they are not likely to receive assistance from Germany in the form of machinery removed during the occupation.

According to an official statement, the quantities of pig iron and semi-manufactured iron products exported to Germany during 1919 were 9593 tons and 30,580 tons, respectively, and for the first four months of 1920, 1698 and 16,289 tons, respectively.

Fuel.—No decision has yet been taken by the B.N.C. (National Office for Coal Distribution) regarding the controlled distribution of American coal. It is, however, reported that during the last quarter of this year consumers of American coal will see their British supply reduced in a certain proportion. From June 7 to 10, 545,725 tons of coal reached French ports, including 385,775 t. from Britain, 43,705 t. from Germany and 116,245 t. from the United States.

Measures are being taken to increase the production of peat in France. The Northern works utilise peat mixed with either oil or coal fuel, and this is found to give good results. Successful experiments were carried out during the war on the enrichment of peat with mineral oils, etc., at the "Conservatoire des Arts et Métiers." Unfortunately, peat is now expensive as it has to be imported from the Netherlands, the cost price of a ton delivered at Lille being 300 francs. The Government contemplates developing the peat-fields of the North of France, where the Departments of the Pas de Calais, the Somme and the Aisne are estimated to possess a total area of 5000 hectares. The peat of the Somme is rich in nitrogen. In the Pas de Calais much peat is found in the St. Omer and Montreuil s/Mer districts, and in the Aisne around St. Quentin and Laon.

The Chemical Industry.—The chief feature of the chemical industry is the dearth of stocks. The market is disorganised and prices are fictitious. Every consumer is prepared to pay almost any price for the stock he requires. The market just now is ransacked for tartaric, citric and oxalic acids, for formaldehyde, ferro- and ferricyanides, permanganates, chromates, dichromates, bicarbonates, sulphides and sulphates of soda and potash, gums, and ammoniacal salts. Prices vary considerably, but, whenever possible, consumers themselves undertake the manufacture of products they require and are glad to take advantage of the experience and advice of the industrial chemist.

Colonies.—The Government is apparently considering seriously the question of developing the colonies so as to obtain from them the raw materials which hitherto have been derived from foreign sources. An important statement to this effect was made on July 2, in the Chamber of Deputies, by the Colonial Secretary. The actual value of the trade of the French colonies is 3 milliards of francs. That great activity prevails is shown by the formation of 125 new companies with capitals ranging from 50,000 to several million francs, and distributed as follows:—Western Africa 40, Indo-China 35, Madagascar 18, and Equatorial Africa 8. The colonies have to be provided with all the necessary modern equipment in the way of machinery, ports, canals, railways and mercantile marine, and to finance this big development an appeal is being made to the great financiers and bankers of the country, who, if they have not employed their capital in reconstruction work in the liberated Departments, can well be expected to invest it in the development of the Colonial Empire. Such an appeal will very probably not be made in vain, as France is never deaf to a national appeal.

BRITISH INDIA.

Industries in the Indore State.—The recent report of the Commerce and Industry Department of the Indore State reveals its immense industrial potentialities and the rapid strides being made to develop them. Twelve joint stock companies have been started with an aggregate capital of one crore, twenty-two lakhs of rupees (over £800,000 at par), and industries represented by them include cotton mills, a tile and brick factory, etc., whilst among the new schemes nearing completion are a paper mill, a glass factory and a tannery. In order to help industrial development, railway facilities are to be improved and an active policy of State aid in the shape of loans to nascent industries is being pursued. The State has appointed Prof. Stanley Jevons as its Economic Adviser, and his report is now awaited.—(*Indian and Eastern Engineer, May*, 1920).

AUSTRALIA.

Oil Indications.—There are indications that oil exists in the Central State, a quantity of bitumen having been found in the Port MacDonnell district. "Coorongite," known in Canada as "elastic bitumen," occurs in the Coorong district, and 13 fractions of oil have been obtained from the asphaltic base of this material. Ozokerite and kerosene shale (which yielded 8—28 galls. of volatile oil per ton) have been discovered, and white paraffin wax is reported from the Mt. Gambier region and yellow paraffin wax from Fowler's Bay, on the West Coast. The Surveyor of the Queensland Department of Agriculture has applied to the Mines Department for a licence to prospect for oil over an area of 2000 acres, situated near Brisbane, indications of its presence having been detected.—(*Ind. Australian and Min. Stand., Apr.* 22, 1920; *Bd. of Trade J., July* 1, 1920.)

Sugar Industry.—Sugar cane is grown in only two States in Australia, viz., Queensland and New South Wales. The area occupied by the crop in 1918 was 186,484 acres, of which 175,762 was in Queensland, and the yield for the 1917-18 season was 174,881 tons of cane and 19,875 tons of sugar in New South Wales and 2,704,211 tons of cane and 307,714 tons of sugar in Queensland. In spite of the increased production of sugar in Australia, the exports exceeded the imports in 1907 and 1915 only. In 1917 there were three cane-crushing mills in New South Wales and 47 grinding mills in Queensland, whilst Victoria and Queensland had two sugar refineries each and New South Wales and South Australia one each. The output of refined sugar, from 271,131 tons of raw, was 263,145 tons.—(*U.S. Com. Rep., May* 6.)

Attention is drawn to the fact that the high price of sugar and the shortage in the Queensland crop are encouraging attempts to cultivate beet sugar in Western Australia. Orders have been sent to England for half a ton of the best Continental seed, and to the United States for a similar quantity. Arrangements have been made with farmers to sow this seed in experimental plots.—(*Austral. Sugar J., May* 7, 1920.)

UNITED STATES.

Technical Association of the Pulp and Paper Industry.—Although the leaders of the pulp and paper industry had long felt that insufficient attention had been given to the training of technical men, and that provision was needed for the encouragement of research on the part of paper mill chemists and engineers, it was not until September, 1914, that a definite plan was submitted to the members of the American Paper and Pulp Association relating to the formation of a new technical Division which should concern itself with the collection and dissemination of information concerning mechanical and chemical engineering and the chemistry of paper and paper-making fibres as applied to the manufacture of pulp and paper. In response to inquiries, replies were received indicating that a majority of members favoured the plan. A meeting was held in February, 1915, in connexion with the annual convention of the American Paper and Pulp Association, at which Mr. H. E. Fletcher and a committee of five were appointed to continue organisation work. The committee met in Chicago in April, 1915, adopted a tentative constitution, and elected a committee to prepare subjects and rules for a prize essay competition. The committee met again in Chicago in May, 1915, and adopted the name "Technical Section of the American Paper and Pulp Association." The text of the constitution was approved, an executive committee and a secretary-treasurer appointed, and the journal *Paper* was selected as the official organ of the section. Membership in the technical section was at first restricted to members of the American Paper and Pulp Association and their employees, but it was subsequently decided to throw it open to all who could meet the requirements for membership, irrespective of whether they were employees or members of the American Paper and Pulp Association.

At the first annual meeting of the technical section held at New York in February, 1916, the membership had grown to 207. On this occasion the constitution was revised, and the name of the organisation changed to "The Technical Association of the Pulp and Paper Industry." Two other meetings were held during 1916. The second annual meeting took place in New York on February 6—8, 1917, the membership having then increased to 274. Among the transactions of this meeting was the award of $400 in prizes for papers submitted in the prize essay competition. In March, 1917, the executive committee met at Erie, Pa., in conference with the council of the Technical Section of the Canadian Pulp and Paper Association, and steps were taken to assure fuller co-operation between the two Associations in all important committee work. The subjects discussed at the conference and on which co-ordination of work was invited included joint meetings, special bulletins, abstracts of pulp and paper literature, model library of books on paper making, and vocational education. It was also decided to hold a joint meeting of the two Associations at Holyoke, Mass., in September, 1917.

The Association has continued to grow steadily in numbers. Usually two meetings are held during the year; one in New York, at the same time as the annual convention of the American Paper and

Pulp Association, and one (sometimes two) in a paper mill district. The Association has standing committees on: Abstracts of literature; bibliography; groundwood; heat, light, and power; pulp and paper machinery; soda pulp; sulphite pulp; sulphate pulp; standard methods of testing materials; and vocational education. These committees have submitted many excellent reports and have been responsible for procuring a large number of interesting papers. The vocational education committee, in co-operation with the Canadian Association, is engaged in preparing a standard text-book on the pulp and paper industry, the first volume of which will be ready for publication about September. Each section is written by an expert, criticised by persons familiar with, or actively engaged in, the particular work covered by the section, and finally revised by a professional text-book writer. It is proposed to use the book as the basis of a correspondence course in paper-making. The membership includes honorary members, ordinary members, associate members, and junior members. Members must be at least 28 years old, have had a technical education or its equivalent, and have been actively engaged for at least five years in the manufacture of pulp and paper, or in related industries or institutions. Associate members include superintendents of plant, etc., and junior members include younger chemists and engineers The total membership, as reported at the annual meeting in April last, was 537. The connexion with *Paper* as the official organ of the Association has been terminated, and steps are now being taken to establish a new journal which will be published by the Association and have the character of a scientific journal devoted to the pulp and paper industry. The president of the Association is Mr. R. S. Hatch, and the secretary-treasurer Mr. T. J. Keenan, 131, East 23rd Street, New York, N.Y.

GENERAL.

German Dyes.—At the first annual meeting of the Colour Users' Association, held in Manchester on July 20, Mr. C. Rawson, chairman of the Technical Advisory Committee, stated that the stocks of dyes in Germany as at December last amounted to 22,000 tons, comprising 13,000 items. Under the reparation clauses of the Peace Treaty, Great Britain was entitled to 15 per cent. of this amount, or 3300 tons, but up to the present not more than 1500 tons had been received. As a result of its visit to Germany in January, the Advisory Committee had there purchased 140 tons of dyewares, worth about £192,000, and options were secured on a further 700 tons, valued at about £1,000,000. These options expired on July 1, and the committee decided not to agree with the request of the Bayer Co. to arrange an extension; so far, some 220 tons, worth £345,000, had been received on this account. The policy of collective purchasing of German dyes had been found to be unworkable, owing to the freedom with which these dyes were entering the country, and consequently it had been abandoned.—(*Cf.* J., 1920, 40 R, 94 R).

Increased Annual Subscription to the Chemical Society.—A second extraordinary general meeting was held at Burlington House, W., on July 20, to consider certain resolutions put forward by the Council, under the by-laws now in force, relating to the entrance fee, the annual subscription, and the life composition fee. The proposals submitted and confirmed by the Fellows at this meeting were: (*a*) that the entrance fee be reduced from £4 to £3 as from December 1, 1920; (*b*) that the annual subscription be increased from £2 to £3 beginning with the year 1921; and (*c*) that the life composition fee as from June 1, 1920, be £45, with reductions for those Fellows who have paid annual subscriptions for various periods.

Petroleum in Trinidad.—Considerable attention has lately been attracted to the oil resources of Trinidad, and the report of the Inspector of Mines for 1919 states that a number of companies of good financial standing has acquired lands with a view to commencing drilling operations, and it is expected that in the near future the oil-bearing lands of the colony will be developed on a very much greater scale than hitherto. At the present time, however, there is difficulty in obtaining prompt delivery of drilling equipment, etc. The export of crude oil and its products shows an increase over last year, the figures being 49,000,000 Imperial gallons during the year under review, as against 45,000,000 galls. for 1918. The shipments of crude oil, oil fuel and distillates to the Admiralty have continued during the whole of the year, and constitute the largest portion of the oil exported from the colony. The bunkering trade continues to make good progress. Many ships call to replenish their bunkers with oil fuel. The local and West Indian trade is also increasing (*cf.* J., 1920, 95 R).

Industrial Notes from Belgium.—*Coal Production.*—The Belgian output of coal in 1919 was 18,487,230 tons, compared with 13,887,600 tons in 1918. In spite of the increased number of miners, the comparative output has decreased, largely owing to the introduction of the eight-hour day. The need for increasing coal production in Belgium is urgent, as exports of non-industrial coal are of great importance in adjusting Belgium's adverse trade balance. The necessity for increasing the output of coking coal is perhaps even greater, because of the great difficulty in obtaining regular and adequate deliveries from Alsace-Lorraine and Germany. In January, 1919, the output of coal reached 97·8 per cent. of that for the same month in 1913.

Metallurgy.—Twenty-five coke ovens, half the installation at the St. Denis-Obourg-Havre coal mine, have been started up, in addition to another 35 at the Bray coal mine, and three more blast furnaces belonging to various companies have been blown in. The iron output for January, 1920, has surpassed that for January, 1913, by nearly three per cent.; the production of steel ingots and cast-iron, however, was only 27·7 and 19·7 per cent. respectively of the outputs in the last-mentioned period. The Société Anonyme Metallurgique de Corphalie has re-lighted several zinc furnaces, and the Vieille-Montagne Co. has started a seventh zinc-rolling mill at the Tilff works. The production of raw zinc in January, 1920, was 23·8 per cent. of that during January, 1913. Negotiations have been concluded with the British Government for the delivery to the Belgian zinc industry of 240,000 tons of zinc ore within two years.

Glass Industry.—The production of window-glass is from 1,800,000—2,000,000 sq. ft. a month, nine-tenths of which is exported, whilst numerous foreign orders cannot be filled. Eighteen furnaces are now operating, and the lighting of extra ones is under consideration, but is delayed by the fuel shortage. Trade in other varieties of glass is active and considerable amounts are being exported. On April 1 the working day was reduced from 9 to 8 hours.

Artificial Silk.—The reports of companies manufacturing artificial silk in Belgium indicate prosperity. The Tubize company, which announced a profit of 4,178,264 francs for the fiscal year 1919, has made a contract with a strong American syndicate for the erection of a large artificial silk factory in the United States. This company has hitherto used the Chardonnet process, but is now about to start manufacture by the Viscose process; the plant will be able to produce 1 metric ton daily. The four artificial silk factories at Tubize, Obourg, Maransart, and Alost now employ 5400 workers (6000 in 1913) and are producing thread at about 32 per cent. of their output in 1914—2,700,000 kg. The favourable position of the industry is being made use of by the workers in order to obtain higher wages.—(*U.S. Com. Rep., Apr.* 26, *May* 8, *June* 1, 1920.)

Sulphur Exports from Sicily.—The export of sulphur from Sicily in 1919 amounted to 147,286 tons, as against 231,390 tons in 1918. Of this amount, nearly 45 per cent. was exported to France, the remainder being taken by Greece, Turkey, Spain, England and South America. No sulphur was exported to the United States during 1919. On December 31, 1919, the stocks on hand were estimated at 136,991 tons. Production improved slightly during the year, but is still below pre-war figures, largely owing to industrial troubles and fires. The industry has many difficulties to contend with, and its prospects are not considered very bright (*cf.* J. 1920, 293 R).—(*U.S. Com Rep., May* 11, 1920.)

Orijarvi Copper and Zinc Mines in Finland.—It is stated that work is about to be resumed in the Orijarvi copper and zinc mines of Finland, which have produced some 4500 tons of copper in their 130 years of existence. In addition to copper and zinc, lead and silver are found in payable quantities. It is estimated that the waste heaps of the mine will last five years, and that the ore reserves will probably last at least another five years. The froth flotation process will be used, and the product thus obtained, which is said to contain about 30 per cent. of zinc, 10 per cent of lead, and a minimum of 200 gm. of silver per ton, will be smelted electrically in Finland, or, if this is not possible, in Sweden, Norway, or Belgium. It is expected that the mines will be in full operation by August, 1920.—(*U.S. Com. Rep., May* 19, 1920.)

Sulphuric Acid Factory in Uruguay.—In 1918 a law was passed in Uruguay authorising the Executive Power to borrow 100,000 pesos (peso=4s. 2d.) from a credit institution for the establishment of a sulphuric acid factory at Montevideo. A site and building have been acquired and the necessary plant has been installed. A further loan of 30,000 pesos was authorised in April last to cover the cost of apparatus ordered from Europe for the manufacture of hydrochloric and hydrocyanic acids and for the purchase of raw materials, etc., required before the factory can commence operations. (For other chemical manufactures in Uruguay, *cf.* J., 1918, 162 R).—*Bd. of Trade J., June* 3, 1920.)

Resources of Matto Grosso, Brazil.—The State of Matto Grosso occupies an area of 432,348 sq. miles in the western part of Brazil, of which it is the second largest State. It is a country of extensive forests, but stock-raising is the chief industry, and hides have mostly been exported to Britain. The forests produce rubber and large quantities of ipecacuanha, which furnishes a khaki dye as well as the drug. A large variety of excellent hardwoods is found in Matto Grosso, but little has been done to exploit them. The Paraguayan yerba maté zone extends north into the southern part of Matto Grosso; the chief company engaged in this industry gathers about 6 million kg. of this plant yearly. The most valuable mineral found in the State is manganese ore, deposits of which occur at Morro de Urucum and Morro Grande, near Corumba, and are said to contain at least 120 million tons of manganese. The ore assays at an average of 46 per cent. of manganese, with variations of from 37 to 60 per cent., and 9 to 10 per cent. iron. These deposits are owned by a large company, the Companhia Minas e Viacao de Matto Grosso, a joint mining and transport enterprise. Some 7,000 tons of ore have been taken out of the Urucum deposit, which is the only one now being worked, and the annual output is expected to exceed 120,000 tons. Alluvial gold is found, as well as diamonds, and copper ore assaying 40 per cent. occurs near Rio Jauru, a tributary of the Paraguay, but it has not been worked on a commercial scale.—(*U.S. Com. Rep., Apr.* 1, 1920.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

German Dyestuffs.

In answer to Lieut.-Col. Pickering, Mr. Bridgeman said he was aware that America had arranged to import German dyes, for which there is a demand in the United Kingdom, but the importation of dyestuffs in this country had been allowed since last December, and supplies were being secured from Germany under the Reparation Scheme. Even when their importation was prohibited, save under licence, arrangements were made to secure from Swiss manufacturers dyes that were not available from other sources. Although the Government was under an obligation to safeguard the dye industry in this country, and therefore to control importation, it was not part of its policy to compel British consumers to purchase dyestuffs from any one British firm.—(July 8.)

Sir R. Horne informed Mr. Hogge that the total quantity of synthetic dyestuffs, including a small quantity of intermediates, imported from Germany during the first six months of the current year was, roughly, 387 tons, 150 tons of which was received under the Reparation Clauses of the Peace Treaty.—(July 19.)

British Firms (Foreign Control).

Mr. Kellaway, answering Col. Newman, said that he had seen Press statements regarding the recent passing under foreign control of British firms, such as Boots and Co., Ltd., but no licence or authorisation from any Government Department was required in such a case; developments of this kind would be carefully watched.—(July 15.)

Oil-Burning Locomotives.

Replying to Major Palmer, Mr. Neal said that the Great Central Railway Co. had recently carried out tests on locomotives burning colloidal fuel, consisting of 60 per cent. coal dust and 40 per cent. oil. Figures of comparative efficiency had been received, but the fuel consumption and cost as compared with coal had not been given. Liquid fuel had been used extensively in locomotives since 1886, but its use was not economical at the present time, and it was doubtful whether oil would ever be supplied in sufficient quantity and at a low enough price to warrant its general use on the railways in this country.—(July 15.)

Excess Profits Duty and Contributions to Scientific Research.

In Committee on the Finance Bill, Lieut.-Col. W. Guinness moved a new clause to provide for exemption from income-tax and super-tax of sums devoted to charitable purposes up to a maximum of 5 per cent. of the total income of the claimant. In refusing to make this concession, Mr. A. Chamberlain offered to move a new clause to a similar effect but in relation to the excess profits duty, if the motion were withdrawn. This was done, and the Chancellor's clause, as given below, was subsequently added to the Bill.

"Where, out of the profits of a trade or business, any contribution has been made after the 16th day of July, 1920, to any trust, society, or body of persons in the United Kingdom established solely for the purpose of relief of the poor or the sick, or for the advancement of education, or for scientific research, there shall, for the purpose of Excess Profits Duty, be allowed in the computation of the profits of the trade or business arising in the accounting period within which such contribution was made, a deduction in respect of such contribution of an amount not exceeding 5 per cent. of those profits as calculated for the purposes of Excess Profits Duty (before adjustment for increased or decreased capital and before making any deduction under this section) and not exceeding 20 per cent. of the amount of such contribution. This Section shall not apply to any contribution which, apart from the provisions of this Section, would be admissible as a deduction from profits for the purposes of Excess Profits Duty."—(July 16.)

Salt Manufacturers' Association.

In reply to Major Entwistle, Sir R. Horne said that in the Report of the Sub-Committee (of the Standing Committee on Trusts) appointed to investigate salt, it was stated that the Salt Manufacturers' Association fixes the selling price of 95 per cent. of the salt sold in this country, but that prior to the formation of the Association the prices obtained for salt were barely remunerative. The present situation did not call for action by the Board of Trade, but the course of prices would be watched.—(July 19.)

Synthetic Dye Industry.

Answering Mr. Sugden, Sir R. Horne said that the Government was aware of the vital importance of the dye industry, and had given pledges to protect it for a time, so as to enable it to be placed on a secure foundation. All the various methods of fostering the industry had been considered, and the Government was of the opinion that the best method was to prohibit the importation of dyestuffs except under licence. An undertaking to this effect had been given, and suitable proposals would be embodied in a Bill relating to key industries to be introduced and proceeded with as soon as possible. The Government would facilitate the working of the trade so far as it could.—(July 20.)

German Capital (British Industries).

Mr. Bridgeman, replying to Brig.-Gen. Surtees, said that Section II. of the Aliens Restriction (Amendment) Act, 1919, prohibits a former enemy alien from holding any interest in a key industry for a period of three years from December 23, 1919, and the publication of a list of key industries was under consideration. The investment of capital by former alien enemies in the non-ferrous metal industry was also restricted by the Non-Ferrous Metal Industry Act, which would continue in force until five years after the termination of the war.—(July 21.)

Trade with Germany.

In a written reply to Mr. Short, Sir R. Horne gave statistics concerning the imports into this country from Germany during the period November 11, 1918, to May 31, 1920. The total value was £10,026,660, and included:—Paper and manufactures thereof, 159,751 cwts. (£458,884); potassium compounds, 350,894 cwt. (£445,550); glass and glassware, 112,239 cwt. (£301,650); coal-tar dyestuffs, 6208 cwt. (£294,693); unrefined beet sugar, 113,597 cwt. (£240,626); painters' colours, 182,908 cwt. (£181,934); and wood pulp, 1526 t. (£65,285). The value of the exports from the United Kingdom to Germany was £23,166,090, and included 25,279 tons of linseed oil (£2,030,418) and 222,021 cwts. of soap (£870,995). Exports to Germany of foreign and colonial produce and manufactures were valued at £20,287,915, including 3,923 tons of raw rubber, worth £906,435.—(July 21.)

Cane-Sugar Production.

Mr. McCurdy informed Lieut.-Col. Croft that the increased production of cane sugar from 1913–14 to 1919–20 was estimated at 736,000 tons in the British Empire and 1,873,000 t. in other countries. The decrease in the world production of beet sugar in the same period was about 5,4407,000 t., so that the world supply of sugar is still about 3,500,000 t. below pre-war production.—(July 22.)

LEGAL INTELLIGENCE.

Trade Marks in Foreign Countries.—*Espinar v. Burgoyne, Burbidges and Co., Ltd.*

On July 13–16, in the King's Bench Division, the Lord Chief Justice and a special jury heard an action which emphasises the need for traders to exercise care in the registration of trade marks in foreign countries.

In 1900 the defendants arranged with the plaintiff that he should sell in Spain their disinfectant, sold under the trade mark "Zotal." The plaintiff thereupon registered the mark in Spain in his own name. After trading for some years he left for Mexico and sold the mark to Tehera, who thus became the only person entitled to sell Zotal in Spain, but could not get it to sell. In these circumstances Tehera applied to the defendants and obtained a promise that he should be their sole agent. When Tehera died the plaintiff approached the defendants and offered to abandon the sale of "Germol," which he had recently been pushing, if the defendants would contract with him to sell Zotal. An agreement was signed that the plaintiff should have the agency if he could obtain possession of the trade mark Zotal from Tehera's heirs. On the ground that this condition was not fulfilled, the defendants repudiated the contract, and the plaintiff sued for £12,000 damages for loss of business in Germol and for an alleged libel.

From the summing up of the Lord Chief Justice it appears that under Spanish law the defendants' assistance in the action to recover the trade mark was needed, and this they had not given, thus creating a breach of contract with the plaintiff. The jury found for the plaintiff for £5000 damages for breach of contract and £1000 damages for libel.

REPORTS.

Report of the Merchandise Marks Committee of the Board of Trade. *H. M. Stationery Office, June,* 1920. (*Cmd.* 760. 2*d.*)

This Committee was appointed to consider:— (*a*) Whether the Merchandise Marks Act should be extended to require "indications of origin" to be affixed to goods, (*b*) the advisability of "National Trade Marks" or similar collective marks, (*c*) whether further international action is required to prevent the false marking of goods.

(*a*) Whereas manufacturing interests favoured the compulsory marking of imported goods as an indication of origin, the merchants insisted that any such requirements would be detrimental, especially to the entrepôt trade. The Committee therefore recommends that the Board of Trade should have power to make an order requiring indications of origin in the case of any particular kind of goods, *after an official inquiry*, in the course of which special attention should be given to any unfair competition in the manufacture or sale of such goods. In appropriate cases, therefore, it might be ordered that particular goods should be marked "imported," etc.

As the central authorities have no adequate staff for the detection of offences under the Act, it is recommended that local authorities should be given power to prosecute, since they already possess suitable staffs. But prosecutions should be in the High Court to secure uniformity.

(*b*) In the absence of agreement among the bulk of the traders concerned there are grave objections to the institution of a British National or Empire mark (like the French "France-Unis" or the Swiss "Spes" marks); but marks administered by a group or association of a particular trade or trades, for use in connexion therewith, have met with considerable support, and provision for their registration in proper cases has already been made in this country.

(c) With regard to international action, the interesting proposal is made that if a country refuses to carry out its obligations under a convention, the matter might be referred to the League of Nations. It is suggested that further investigation should be made as to the possibility of international or Imperial registration of trade marks. A useful warning is given as to the danger of British trade marks owners losing their rights in many foreign countries in which the first applicant for a mark, even if he be a pirate and not the real owner, can obtain registration even against the originator of the mark. Recommendations are made as to legislation against this abuse. Meanwhile the only remedy is for the British owner to obtain early registration abroad.

REPORT TO THE BOARD OF TRADE OF THE EMPIRE FLAX GROWING COMMITTEE ON SUBSTITUTES FOR FLAX AS AT APRIL 27, 1920. *Pp.* 6. *London: H.M. Stationery Office.* (*Cmd.* 762, 1*d.*)

Two fibres come mainly into account as possible substitutes for flax, namely, ramie and Italian hemp. Ramie grows in almost unlimited quantities throughout equatorial Africa, in India and China, the finest qualities coming from China, where also a certain amount is cultivated. The quantity of the raw plant actually available appears to be far in excess of any possible requirements, but the preparation of the fibre for the market is a long and complicated process. No large development of the industry can be expected until mechanical methods of decortication have been established. The process of degumming has been employed successfully as a secret process, first in Germany at Emmendingen and later in Yorkshire. The output is almost entirely devoted to the manufacture of gas mantles. There is little doubt that ramie could be used as a substitute for flax to a much larger extent than at present; the appearance of the manufactured articles is excellent, but it is alleged that, owing to deficient elasticity, cracking occurs in the finer textiles when they are folded.

The Committee has come to the conclusion that there are considerable possibilities for the use of Italian hemp in the linen trade. It has been spun successfully in Belfast on a commercial scale as fine as 35 lea, and with due care and experiment might be used even for finer yarns. It would appear that the finest qualities of Italian hemp have never so far reached this country, most of the specially fine quality having been sent to Germany before the war. The principal difficulty in the use of Italian hemp lies in the fact that it must be properly softened, and only when the softening process has been thoroughly carried out is the fibre capable of consideration as a substitute for flax. A successful German machine for this purpose consists of a concrete bed on which two stone rollers mounted on a swivel are rotated very rapidly, so that the hemp on the bed becomes quite hot under the action of the rollers. The yarn from Italian hemp, like that from ramie, is deficient in elasticity and tends to break when used as a warp. The total Italian crop of hemp this year is estimated to reach 100,000 tons, about half of which is available for export; the quantity of high-grade fibre is estimated at between 5000 and 10,000 tons from Bologna and Ferrara and 3000—5000 tons from Naples. In buying hemp for use in the coarse and medium numbers in the linen trade, it would be necessary for spinners to obtain hand-dressed or half-dressed hemps and to put them through all the processes as though they were raw flax. Hemps of other origin than Italian have been considered by the Committee; some of these might be utilised, as for instance Hungarian hemp, but some are inferior in quality and others difficult to procure. Nettle fibre does not appear to offer any attractions. The Committee concludes that, although substitute fibres exist and come into use when flax is scarce and the price is high, none of them can satisfactorily replace flax in the manufacture of the finer textiles, and that the solution of the difficulties now confronting the linen trade is to be sought by extending the cultivation of flax.

SECOND INTERIM REPORT OF THE WATER POWER RESOURCES COMMITTEE. *Board of Trade. Pp.* 27. *H.M. Stationery Office.* 1920. (*Cmd.* 776, 4*d.*)

The terms of reference to the Committee were enlarged in October, 1919, and now include the consideration of what steps should be taken to ensure that the water resources of the country are properly conserved and fully and systematically used for all purposes. (For previous interim report see this J., 1919, 151 R.)

The difficulty in allocating water is becoming annually greater in England and Wales, and it is recommended that the Minister of Health should set up a Water Commission having jurisdiction over England and Wales in regard to all uses of water, and that the responsibility of the Commissioners to the Minister should be direct. Amongst other duties the Commission would be charged with the allocation of water resources in the interests of the community, with the adjustment of conflicting interests in the use of water, with the consideration of the development of rivers from the point of view of all water interests, and with the appointment of Advisory Committees for the purpose of advising upon matters within the purview of the Commission. Duplication of work and delay in procedure would be avoided by the establishment of a Statutory Interdepartmental Committee, upon which various scientific services would be represented. All future proposals regarding the utilisation of water, whether surface or underground, for purposes other than private domestic use would be subject to the sanction of the Commission, which would also be empowered to modify burdensome conditions, or conditions inconsistent with proper conservation of water resources, by Order, which should take effect, in the absence of opposition, without confirmation by Parliament. With regard to the development of water resources, it is recommended that facilities be given for private enterprise of various kinds as well as for public electricity supply. The duty of studying, supervising, and promoting the development of water power should be specifically delegated to the Board of Trade or the Electricity Commissioners, and a fund be made available for the purpose. In the event of the duty being delegated to the Board of Trade, the development of water powers allocated to the purpose of public electricity supply should be among the duties of the Electricity Commissioners. It is remarked that the possible water-power resources in an area embracing North and Mid-Wales, Dartmoor and Exmoor, the West Riding, the Avon, and the Dee average about 10 continuous h.p. per square mile of catchment area. Preliminary surveys indicate that the view expressed by some witnesses that comparatively little water power remains to be developed is not justified. One appendix is devoted to a digest of recommendations concerning water supply drawn up by various Commissions, etc. during the period 1866—1910.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for July 8, 15, and 22.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number:—

Locality or Firm or Agent.	Materials.	Reference Number.
Australia	China, earthenware, glassware, paper	32
British India	Paper, pitch	1
Canada	Metals	5
,,	Soap, druggists' supplies	8
,,	Imitation leather	39
,,	Iron, steel	40
,,	Soap	82
,,	Chemicals, fish oils, grease, rosin, turpentine	*
Egypt	Chemicals, paint, oil, iron, steel, leather	48
New Zealand	China, earthenware, glass	42
South Africa	China, glassware	9
Austria	Cocoa, rubber	50
Belgium	Soap, candles, vegetable oil	11
,,	Copper sulphate, potassium dichromate, ammonium chloride and carbonate	12
,,	Pig iron	93
Bulgaria	Chemicals, leather	51
France & Colonies	Chemicals, pharmaceutical products	53
Germany	Tanning materials	96
Greece	Paper, rubber	56
Italy	Black sheets, tinplate	16
,,	Paint, varnish, enamel	17
,,	Paper (newsprint and journal), glassware	18
,,	Heavy pharmaceutical and analytical chemicals, paints, varnishes, anti-fouling compositions	98
,,	Chemical products for industrial purposes	100
,,	Chemical and pharmaceutical products	59
,,	Industrial chemicals, oils	60
Norway	Crucibles	103
,,	Caustic soda and potash, calcined glauber salts, sulphuric acid, quebracho extract (63-65%), soda ash, salt cake, chloride of lime, rosin	105
Serb-Croat-Slovene State	Technical oils, window glass, iron and steel bars, druggists' sundries	64
Spain	Paint, varnish, paper, glass bottles	22
Sweden	Chemicals	65
Turkey	Drugs, dyes, soap, china, glass, paper, inks	24
,,	Perfumery, leather	68
Algeria	Earthenware, tiles	70
United States	Chemicals, essential oils, mica, rubber	73
,, ,,	Chemicals	112
,, ,,	Chemical products	114
Ecuador	Metals, chemicals, paint, varnish, linseed oil, dyes, drugs, medicines, starch, perfumery	77
Mexico	Metals, chemicals, drugs, dyes, cement, china, perfumery (catalogues of)	78

* The High Commissioner for Canada, 19, Victoria Street London, S.W. 1.

MARKET SOUGHT.—A Danish firm in Mexico dealing in essence of linaloe, henequen, mercury, vanilla, cocoa, sugar, alcohol, hides, and *coquito de aceite* is anxious to get into touch with importers in the U.K. [79]

TARIFF, CUSTOMS, EXCISE.

Argentina.—The new Customs Tariff Amendments Law increases the former duties by 20 per cent., but the duty on various articles, including red and white lead, lead pipes, slabs and sheets, rubber goods and galvanised iron sheets, is increased to a greater extent.

Belgium.—A supplement to the issue of July 8 sets out in full the customs tariff showing the "coefficients of increase" applicable in the case of each separate heading and sub-heading and also the articles either free of duty or subject to *ad valorem* duties which are not affected by the decree of June 12. The decree is effective from June 21, and will cease to be in force on June 15, 1921.

Among the duty-free articles are drugs, manures, certain oils, scientific instruments and apparatus, chemical products not specifically mentioned (including acids, salts, and unenumerated chemicals), resins, bitumens, dyes, and colours.

Export licences are again required for bottles of all kinds.

Bolivia.—The new customs tariff came into force on July 1.

Chile.—A decree dated April 17 imposed certain restrictions on the importation and sale of saccharin and similar products.

A copy of the new Sanitary Code may be seen at the Department. The articles affected include pharmaceutical preparations and foodstuffs.

Cuba.—The restrictions on exports and re-exports have been withdrawn except in the case of money, and gold and silver in any form.

The import duty on gold, silver, and platinum has been increased.

Danzig.—The conditions regulating trade between Danzig and Germany, Danzig and Poland, and Danzig and other countries are set out in the issue for July 22.

France.—A summary of the new turn-over tax, which varies from one-tenth to 25 per cent. *ad valorem* is given in the issue for July 15. Spirits are subject to the highest tax, and among the "articles of luxury" which pay tax at the rate of 10 per cent. are ceramic wares, cocoa, chocolate, glass and crystal wares, and perfumery.

The export of oil cake in amount to be fixed each month by the Ministry of Agriculture will be allowed during the summer, but export duty will be levied thereon at the rate of 25 francs per 100 kg.

A list showing the quantity of dyes and other chemicals that may be imported from Germany in excess of the levy imposed by the Peace Treaty may be seen at the Department.

The export or re-exportation of cast iron and scrap iron capable of utilisation for re-smelting is prohibited as from July 10, save under certain conditions.

French Colonies.—Colouring materials, chemical and pharmaceutical products, in excess of the levy imposed by the German Peace Treaty, still require special licences when imported from Germany and other European countries subject to the French General Tariff.

Dominican Republic.—A copy of the new sanitary laws may be seen at the Department. The laws affect the sale of drugs and patent medicines and the sanitary control of foodstuffs.

Italy.—The temporary suspension of the customs duty on newsprint paper is continued until August 31.

Among the articles for which export licences are still required are cocoa, cocoa-butter, edible gelatin, sugar, molasses, glucose, edible vegetable oils, lard, steel ingots, pig iron, base metals, metal alloys (except ferrosilicon and tinplate), acetone, certain acids, alizarine, aniline and its salts, starch, lime, cement, sodium carbonate, waxes, rosin, copra, bones, chromates and dichromates, *dégras*, dextrin, tanning extracts, gypsum, gums, rubber, animal and vegetable fats, indigo, vegetable fibres, ores (with some exceptions), mineral oils, cellulose, woodpulp, hides and skins (with some exceptions), certain potash salts, pyrites, chrome salts, tin salts, copper sulphate, cinchona bark, alcohol, toluene, turpentine, vaseline, precious metals, certain drugs, and fertilisers.

Kelantan.—The import duties on alcoholic liquors have been increased.

Latvia.—The right to sell spirits and brandy is a State monopoly, and importation by private persons is not allowed.

Morocco (French Zone).—The revised "gate taxes" on, *inter alia*, glassware, lime, cement, iron and steel bars, bricks, building pottery, fireproof wares, coal, are set out in the issue for July 22.

Netherlands.—Export prohibitions have been temporarily raised from ammonia, iron, steel, metals (except gold and silver), and vegetable fibres.

Newfoundland.—The proposed tariff changes affect leather, tanning materials, manures, sulphuric acid, printing paper, fire clay, china clay, sand, cattle cakes and foods.

Peru.—An additional 10 per cent. import duty is applied to all dutiable materials imported through the customs houses of the Republic.

Poland.—The import and export regulations now in force are set out in the issue for July 22.

St. Christopher and Nevis.—The export duties on sugar, syrup, molasses, rum, and coconuts have been amended.

South Africa.—It is proposed to prohibit the import of wines and spirits from "prohibition" countries.

Sweden.—Olive oil, arachis oil, sesame oil, and cottonseed oil when imported in glass or earthenware vessels pay duty at the rate of 5 öre per kg. (including the weight of the vessels), but when imported in other vessels are free of duty.

Switzerland.—A permit is required for the export of, *inter alia*, various semi-manufactures of glass, glass hollow-ware combined with precious metals, raw animal and vegetable material for pharmaceutical use, crude tartar, phosphoric acid, and certain phosphorus compounds, white and red phosphorus, "chromosal" mordant, laundering powders, and soap.

New or increased duties are payable on, *inter alia*, coal, lignite, coke, briquettes, alcohol, petroleum and its products, naphtha-solvent, mineral and tar oils.

Tunis.—All goods imported from or originating in Germany pay duty at the rates prescribed in the French "General" Tariff, increased by the "coefficients of increase" applicable in France.

Products of other countries imported from Germany are also subject to the "surtaxe d'entrepôt" or the "surtaxe d'origine" applicable in France.

The export or re-export of wood for the manufacture of cellulose pulp, celluloid, etc., is prohibited as from June 16.

GOVERNMENT ORDERS AND NOTICES.

Prohibited Exports.—The Board of Trade has notified the removal of the following materials from the List of Prohibited Exports as from July 22, 1920:—Guanos; phosphate rock, namely, apatites, phosphate of lime and alumina.

German Nationals and British Patents.—The President of the Board of Trade has issued an Order, dated July 19, 1920, directing the Custodian of Enemy Property to divest himself of patents previously owned by German nationals, in accordance with Article 306 of the Treaty of Peace with Germany. The full text of the Order is given in the *Board of Trade Journal* of July 22, and in the *London Gazette* of July 23.

British Industries Fairs.—The President of the Board of Trade has appointed a committee, with Sir Frank Warner as chairman, to consider the best policy to be adopted as regards British Industries Fairs, particularly in respect of the centres at which they should be held, the trades which should be included, and the classes of exhibitors which should be allowed to participate. The secretary of the committee is Mr. A. G. Chuter, of the Department of Overseas Trade.

Dominions Touring Exhibition.—The Department of Overseas Trade is issuing a pamphlet containing particulars of the touring exhibition it is now organising. The Tour will leave England early in 1921 and will travel for about two years; it will visit South Africa, New Zealand, Australia, and Canada, the various Governments of which are providing Exhibition Halls, and arranging for reduced fares, freights, etc. Among the goods especially wanted in the Dominions are glassware, china and earthenware, and scientific instruments.

COMPANY NEWS.

EXPLOSIVES TRADES, LTD.

At the ordinary general meeting, held in London, on July 6, Sir Harry McGowan, chairman and managing director, described the object of the amalgamation (this J., 1918, 462 R, 1919, 151 R), the difficulties experienced in bringing it about, the lines upon which it was developing, and the financial results of the past two years.

Although the long-drawn-out negotiations between the firms concerned were not completed until November, 1918, the effective policy of the merger had been operative some time before that date. It had been carried out on the soundest lines; the capital value of pre-war plant was drastically written down, war-time extensions were taken at one-fifth of their cost, and met by the issue of deferred shares, whilst goodwill was valued entirely upon pre-war results. The difficult problems attending the re-establishment of pre-war industries and the re-distribution and consolidation of production had been successfully solved, and attention had been directed to the opening-up of new fields of employment for capital rendered unproductive by the war. The present activities of the company could be roughly segregated into chemicals (industrial explosives, chemicals, acids, gas mantles, collodions, varnishes, etc.), and hardware and metals (metal goods and hardware, motor accessories, metal powders, welding, etc.). Seeing that some 60 per cent. of the capital was now invested in undertakings which had no connexion with the explosives industry, it was proposed to give the company a new name. In selecting new fields of manufacture, the transport industry appeared to be of great promise. Substantial holdings were acquired in the Dunlop Rubber Co. and its subsidiaries, in the Rotax Motor Accessories Co., and the business of John Marston, Ltd. (makers of the Sunbeam cycles) was purchased *en bloc*. Following the example of the leading explosives firm in the United States—the Du Pont Co.—the sum of about $25,000,000 was invested in the General Motors Corporation, Ltd., of America, the largest motor-manufacturing firm in the world. Substantial interests were also held in the British Dyestuffs Corporation and the British Cellulose Co., and more recently the whole of the shares of the British Pluviusin Co., of Manchester, had been acquired;

this firm manufactured artificial leather, the prospects of which appeared to be endless. The result of the amalgamation had been to lower the prices of the company's products, *e.g.*, explosives are now selling at about 80 per cent. above the pre-war level, in spite of increases of 150—200 per cent. in the cost of materials and increased wages. On the subject of taxation Sir H. McGowan held that the period of liquidation of our national indebtedness should be prolonged, so that our industries would be enabled to acquire such a share of the world's trade as would facilitate the much earlier payment of that debt.

The net balance at profit and loss for the years 1918–19 was £1,655,241. The ordinary shares received 9 per cent. for 1918, and are receiving 10 per cent. for 1919, the deferred shares obtaining 5 per cent. The sum of £231,472 is carried forward.

TRADE NOTES.

BRITISH.

Barbados in 1918.—In the year 1918 the imports amounted to £2,986,006, as against £2,285,278 in 1917. The sources of the imports were distributed as follows:—United Kingdom 27, Canada 15·25, British Possessions (including India) 15·5, United States 37 per cent. The imports from the United Kingdom and the United States showed a decrease of 7 and 2 per cent., respectively. Exports were valued at £2,480,646, an increase of £290,532, the share of the United Kingdom being £479,346 and of British colonies £1,428,332. The chief product of the colony is sugar, 33,207 t. of which, valued at £687,453, was exported in 1918, as against 51,960 t., worth £1,056,430, in the previous year. The export of molasses was 10,683,609 galls., worth £875,396, compared with 9,400,166 galls., worth £513,845, in 1917. The decrease in the 1918 sugar crop was mainly due to the lack of rainfall. The new seedling sugar canes continue to give good results and other new varieties are promising well. A commission was appointed to inquire into certain serious pests of the sugar cane, but a report has not yet been issued. Following sugar in importance is cotton, the crop amounting to 192,541 lb., worth £28,949, against 76,296 lb., worth £8213, in 1917; the area under cotton increased from 980 to 1337 acres. The local agricultural department has been improving the exotic and indigenous cottons by selection and hybridisation, and 20 acres were planted with the improved exotic cotton, which it is thought will furnish enough seed of a good strain to plant the area estimated for 1919–20.—(*Col. Rep.-Ann., No.* 1035, *May*, 1920.)

FOREIGN.

Sumac Trade of Sicily.—During 1919 the production of sumac in Sicily was only about 16,000 tons; of this amount 6055 tons of ground and 1920 tons of leaf, to a total value of £237,901, were exported to the United States. The trade was greatly restricted by lack of transport facilities, and prices, which have advanced to 18·6—19 lire (lira = 9½d.) for sumac with 28—30 per cent. of tannin, still show an upward tendency. It is reported that from 10,000 to 15,000 tons of sumac is on hand in Sicily, most of it being already sold to, or earmarked for, American purchasers.—(*U.S. Com. Rep., May* 18, 1920.)

Trade of the Soerabaya District, Dutch East Indies.—The trade of this district during 1918 was much hampered by shipping difficulties. Amongst the imports in that year were:—Chemicals, 3410 tons; coal, 31,999 tons; ammonium sulphate, 9747 tons; iron and steel and manufactures thereof, 7292 tons; kerosene oil, 223,881 cases; lubricating oil, 870,598 litres; white and red lead paint, 410 tons; asbestos sheets, £7865; soap, 20,379 cases; tar, 826 tons; zinc, 76 tons; zinc white, 184 tons. The exports included: Groundnuts, hulled 188 tons, and unhulled 855 tons; copra, 1821 tons; sisal fibre, 27,924 tons; hides, buffalo 437,887, and cow 2,633,008; kapok, 2898 tons; peanut oil, 1,284,683 litres; Peruvian bark, 246 tons; rubber, 7373 tons; and sugar, 654,378 tons. About half of the sugar exported in 1918 went to British India and a little less than half the total exports went to Singapore in that year. The exports of sugar, rubber, and sisal fibre showed large increments, but those of coffee, kapok, and copra showed decreases.—(*U.S. Com. Rep., Suppl., Apr.* 24, 1920.)

Chemical Exports from Norway.—The following table shows the exports of Norwegian chemical products, in metric tons, for the years 1918 and 1919:—

Chemicals.	1918. Metric tons.	1919. Metric tons.
Nitric acid	836·7	1,432·8
Oxalic acid	206·0	293·4
Ammonium sulphate	—	232·5
Ammonium nitrate	49,587·9	5,163·1
Sodium nitrate	2 636·6	13,036·4
Sodium nitrite	2,097·8	1,893·9
Norway saltpetre	53,625·3	63,880·2
Cyanamide	10·5	9,929·9
Calcium carbide	41,771·9	25,599·3
Ferrosilicon	16,861·3	2,458·0
Iodine	5·4	3·0
Matches	5,014·9	4,653·8
Gunpowder and other explosives	5·0	8·6

—(*U.S. Com. Rep., May* 18, 1920.)

REVIEWS.

Kleines Praktikum der Kolloidchemie. By Wolfgang Ostwald, *assisted by* P. Wolski. *Pp.* 159, *with* 14 *illustrations.* (*Leipzig and Dresden: Theodor Steinkopff.* 1920.) *Price* 15 *mk.*

This book gives clear and ample directions for no less than 168 exercises in Colloid Chemistry, all of which, the author assures us, " really come off "—a statement which the reviewer can emphatically confirm from personal experience of a large number of them. The examples chosen are well calculated to impress the student with the vast scope of the subject and with the number and variety of the methods, mostly physical, called for in the study of the colloidal state. From the pedagogic point of view it may perhaps be questioned whether such a plethora of material is necessary or even desirable. The view seems tenable that a comparatively small number of carefully chosen typical instances will serve the needs of the student, who must afterwards be induced to exercise his ingenuity and to acquire the useful habit of consulting the original literature. On the other side it must be admitted that the task of selection is extraordinarily difficult, that at present laboratory manuals are written quite as much for teachers as for students, and that the former, if at all qualified to teach the subject, will have no difficulty in choosing what is most useful to their particular pupils.

The book is extremely well balanced, and the author has not allowed personal preferences for certain parts of the subject to affect his choice of matter unduly. A certain affection for viscosity measurements is perhaps noticeable. The examples given are useful, provided the student is made to realise that time-viscosity or concentration-viscosity curves show only " in a glass darkly " what changes take place in a given system, and that attempts at precise interpretation go much beyond the limits of our knowledge. This, however, is a small point. Generally speaking, the catholicity of the book is remarkable, and probably the outcome of a very lively "joy in the phenomenon" of whatever kind, and of that enthusiasm for the whole discipline which has made the author for some time its leading propagandist, or (to use a term free from disagreeable associations) its knight-errant.

It is to be hoped that this enthusiasm will prove sufficiently infectious to induce a large number of students to carry out the experiments described. There are few branches of experimental science in which mere procedure plays a part as important as in colloid chemistry, and none in which the properties of a system depend, not only on its composition but on its history, as they do with most colloidal preparations. While the theoretical results, and the terminology, of colloid chemistry are becoming fairly widely known, a comprehensive working knowledge of this vast field is still the property of a very small number, as is evident to anyone who critically reads some recent literature, more especially on its "applications." Nothing could contribute more towards remedying this state of things than the present work.

EMIL HATSCHEK.

PRINCIPLES OF METALLOGRAPHY. BY R. S. WILLIAMS. *Pp.* 158. (*New York: McGraw-Hill Book Company. London: Hill Publishing Co., Ltd.* 1920.) *Price* 12*s. net.*

This little book has been expressly written to meet the needs of engineering students who do not wish to specialise in metallography but who require some knowledge of the subject in connexion with their professional work. In the accomplishment of this the author has been eminently successful, as he has given a review of the subject not only sufficiently wide for general engineering students, but for the majority of metallurgy students also. There is no doubt that there is a tendency in all the large schools of metallurgy in this country to devote far too much time to the physico-chemical principles of metallography at the expense of time which should be devoted to the general principles of metallurgy, ore treatment, and kindred subjects.

In the book also greater emphasis has been laid on the applications of metallography to the study of industrial materials and to the elucidation of the causes of failures met with in practice than to the more purely physical aspect of the subject. Here again our schools of metallography will do well to take the lead given and train graduates who can not only read complicated equilibrium diagrams of alloys of little importance, but who can actually tackle a problem connected with the failure of material in service and give a correct opinion on the cause of the trouble and advice as to how the same trouble may be avoided or overcome. The book may be considered of special value as indicating what is necessary for the students for whom it has been written, in spite of a few errors in tho text, such as the statement given on the solidification of solid solution that "It is necessarily true that the crystal which solidifies last must have exactly the same composition as the original liquid melt," and on intermetallic compounds that "By far the most important of these compounds is the iron carbon compound Fe_3C., the chief surface constituent of case-hardened steel."

The illustrations, which include a large number of photomicrographs, have been well chosen and neatly executed. In the appendix are given an outline of a course of experimental metallography which embraces most of the practical work necessary for students to undertake, and a descriptive list of the more important books and journals dealing with the subject, which will be of value to those wishing to pursue the subject further.

C. O. BANNISTER.

PUBLICATIONS RECEIVED.

THE CHEMISTS' YEAR BOOK, 1920. *By* F. W. ATACK AND L. WHINYATES. *Fifth edition. Vol. I., Pp.* 422; *Vol. II., Pp.* 1136. (*Manchester: Sherratt and Hughes.* 1920.) *Price* 21*s.*

THE PHYSICAL CHEMISTRY OF THE METALS. *By* RUDOLPH SCHENCK. *Translated and annotated by* R. S. DEAN. *First edition. Pp.* 239. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1919.) *Price* 17*s.* 6*d.*

LE SOUFFLAGE DU VERRE DANS LES LABORATOIRES SCIENTIFIQUES ET INDUSTRIELS. *By* H. VIGREUX. *Second edition. Pp.* 268. (*Paris: Dunod.* 1920.) *Price* 15 *francs.*

LES COLLOIDES METALLIQUES: PROPRIETES ET PREPARATIONS. *By* P. BARY. *Pp.* 95. (*Paris: Dunod.* 1920.) *Price* 5 *francs* 50 *ct.*

A TEXT-BOOK OF ORGANIC CHEMISTRY. *By* E. DE B. BARNETT. *Pp.* 380. (*London: J. and A. Churchill.* 1920.) *Price* 15*s.*

AN INTRODUCTION TO CHEMICAL ENGINEERING. *By* A. F. ALLEN. *Pp.* 272. (*London: Sir Isaac Pitman and Sons, Ltd.* 1920.) *Price* 10*s.* 6*d.*

COCOA AND CHOCOLATE. *By* A. W. KNAPP. *Pp.* 210. (*London: Chapman and Hall, Ltd.,* 1920.) *Price* 12*s.* 6*d.*

DICTIONARY OF EXPLOSIVES. *By* A. MARSHALL. *Pp.* 159. (*London: J. and A. Churchill.* 1920.) *Price* 15*s.*

THE MINERAL INDUSTRY OF THE BRITISH EMPIRE AND FOREIGN COUNTRIES. ARSENIC (1913-1919). *Imperial Mineral Resources Bureau.* (*London: H.M. Stationery Office.* 1920.) *Price* 6*d.*

THE EFFECT OF MANURING WITH SUPERPHOSPHATE AND SANNAI ON THE YIELD OF CROPS ON INDIGO PLANTERS' ESTATES IN BIHAR—ESPECIALLY OF RASI CROPS IN THE SEASON 1918–19. *Agricultural Research Institute, Pusa. Indigo Publication No.* 6. *By* W. A. DAVIS. *Pp.* 30. (*Calcutta: Superintendent Government Printing, India.* 1920.) *Price* As.6.

BRITISH GUIANA COMMERCIAL HANDSOOK. *By* CAPT. J. M. REID. *Pp.* 87. (*Georgetown, Demerara: The Argosy Co., Ltd.* 1920.) *Price* 36 *cents.*

PUBLICATIONS OF THE UNITED STATES BUREAU OF MINES, WASHINGTON, GOVERNMENT PRINTING OFFICE, 1920:—

COAL-MINE FATALITIES IN THE UNITED STATES IN 1919. *By* A. H. FAY.

SAFE STORAGE OF COAL. *By* H. H. STOCK.

DEVELOPMENT OF LIQUID OXYGEN EXPLOSIVES DURING THE WAR. *By* G. S. RICE.

QUARRY ACCIDENTS IN THE UNITED STATES DURING 1918. *By* A. H. FAY.

PERFORATED CASING AND SCREEN PIPE IN OIL WELLS. *By* E. W. WAGY.

PUBLICATIONS OF THE UNITED STATES GEOLOGICAL SURVEY, WASHINGTON, GOVERNMENT PRINTING OFFICE, 1920:—

BAUXITE AND ALUMINIUM IN 1918. *By* J. M. HILL.

IRON ORE, PIG IRON AND STEEL IN 1918. *By* E. F. BURCHARD.

MANGANESE AND MANGANIFEROUS ORES IN 1918. *By* D. F. HEWETT.

GOLD, SILVER, COPPER, LEAD AND ZINC IN COLORADO IN 1917. *By* C. W. HENDERSON.

GOLD, SILVER, COPPER, LEAD AND ZINC IN CALIFORNIA AND OREGON IN 1918. By C. G. YALE.

THE EXCESS PROFITS DUTY AND SCIENTIFIC RESEARCH.

In our "Parliamentary News" of July 31 we gave *in extenso* the terms of the new clause added to the Finance Bill on the proposal of the Chancellor of the Exchequer, by which contributions made for charitable, educational and scientific (research) objects are to be allowed as deductions in computing excess profits duty. In granting this concession, and incidentally establishing a precedent, Mr. Chamberlain stated that his aim was to encourage great trading firms to recognise their corporate liability to the communities in which they live, and among which their revenue is earned, and to enable directors adequately to recognise their growing responsibility.

The generous response on the part of many public companies to the numerous recent appeals made by our universities, no less than the spontaneous gifts which have been made to scientific institutions, are welcome signs that some, at least, are "recognising their growing responsibility." Yet it must be confessed that, in spite of all the so-called lessons of the war, the British public still far from realises the very vital connexion between science on the one hand, and industry, commerce and national welfare on the other. The recent opposition by a body of shareholders of one of our greatest chemical undertakings to giving for the furtherance of scientific education and research a sum equivalent to less than one-eleventh of the company's net profit, shows that Matthew Arnold's reproach that we are a nation of philistines is not wholly undeserved. That there is hope of better ideals prevailing may, however, be inferred from the fact that after the proposal had been more fully explained to all the shareholders, they expressed approval of the allocation by an overwhelming majority. Moreover, the fact that the House of Commons has seen fit to include the promotion of scientific research among the liabilities and responsibilities of those who direct our industries, may be regarded as a sign of no small promise.

The purport of the Chancellor's "concession" is that any contribution made after July 16, solely in aid of scientific research, will be paid as to three-fifths by the State and only two-fifths by the contributor. Surely opportunity was never more golden for those public and private companies whose existence and prosperity depend upon the applications of science to industry to make some return for "services rendered"! The old saw, "Bis dat qui cito dat," applies with peculiar force at the present time, for—if ministerial promises can be taken seriously—the excess profits duty is not to be retained indefinitely; in the Chancellor's words, it is "an abnormal and temporary tax arising out of temporary and abnormal circumstances." Probably no tax of recent times has met with such a torrent of adverse criticism as the one in question, and it remains to be seen whether those who see in it a "thing evil" will recognise their gratitude and responsibility to science by demonstrating that, after all, it contains a "soul of good."

There is a further consideration of especial importance to chemists and chemical industry at the present time. The appeal which is shortly to be launched for funds to enable the various chemical societies to find, *inter alia*, a solution of their "housing problem," will derive great support from the far-seeing action of the Chancellor of the Exchequer, provided that the new clause be applicable to this case. The relevant words in the clause are:—". . . . any contribution . . . . to any trust, society or body of persons in the United Kingdom, established solely . . . . for the advancement of education or for scientific research . . . ." Although the proposals of the Federal Council for Pure and Applied Chemistry have not yet been announced in any detail, it is safe to surmise that they will be found to meet the urgent and essential needs of all those associating societies to which research is of the very first importance, and hence it is to be hoped that the Chancellor's clause will lend itself to an interpretation favourable to their furtherance.

BRITISH PHARMACEUTICAL CONFERENCE.

The fifty-seventh annual general meeting of the British Pharmaceutical Conference was held at the Royal Institution, Liverpool, from July 19—23. After the Lord Mayor of Liverpool had welcomed the members, Mr. C. A. Hill delivered his presidential address on "Progress in Science and Pharmacy."

In dealing with synthetic drugs, Mr. Hill spoke of the attempts made by chemico-physiologists to correlate chemical constitution and physiological action. Much chemical and physiological work has been done in this field of research, and certain generalisations have been deduced from very numerous data; yet it has to be admitted that really very little is known of this borderland subject. The physical condition of the substance, its solubility, especially its relative solubility in different solvents ("partition coefficient"), its absorptive power, osmotic properties, and other physical properties, have as much to do with its physiological action as has its constitutional formula. It may indeed be that the purely chemical action of a drug is destined to play a subordinate *rôle* in therapy, and that, in the past, the physical action has not been sufficiently considered. Chemotherapy shows clearly that the physiological action of a substance is not due to one constituent only of that compound, but that it also depends largely upon the molecular orientation of the compound, and the ratio of adsorption which exists between it and the protein colloidal particles through which this or that constituent is going to act. Consider arsenic, for example. In the treatment of disease, plain *liquor arsenicalis* is not so effective as colloidal arsenic sulphide, nor is the latter so effective as arsenophenylglycine, nor the last so effective as diaminoarsenobenzene. They all contain arsenic, but the last, in virtue of its amino-groups, is able to be absorbed in very large quantities by the protein colloidal particles; consequently, the greatest amount possible of the element gets taken up. So far as can be seen at present, the amino-groups are of great importance in a chemotherapeutic compound, especially if they can be placed in the ortho-position to the element one wishes to incorporate.

Of greater importance than the group is the molecular orientation; one needs only to mention the effect of introducing an acetyl group to illustrate this point. Compare diorthoaminothiobenzene with its acetyl derivative; the former is practically a specific for metallic poisoning, whilst the latter is as inert as plain colloidal or sublimed sulphur. Even diparaaminothiobenzene cannot compare with the ortho-compound. The addition of an acetyl group to salicylic acid results in a new analgesic property, while at the same time the undesirable after-effects of salicylates are in some measure eliminated. A similar addition to phenetidin gives us phenacetin with its valuable antipyretic properties. On the other hand, the addition of an acetyl group to parahydroxylphenylethylamine (an active principle of ergot) results in a loss of activity. The introduction of the acetyl group into the choline molecule converts this comparatively inert substance into a powerful heart poison. Highly interesting is the case of aconitine. This intensely poisonous alkaloid is the acetyl derivative of benzaconine, the latter substance being relatively non-toxic. Yet the introduction of further acetyl groups into the aconitine molecule does not increase, but diminishes, its toxicity.

Considering synthetic drugs from the point of view of their manufacture, we find that in very many of them alcohol is necessary, either as a solvent or as a reacting constituent—*e.g.*, adalin, anæsthesin, phenazone, chloral, veronal, sulphonal, urethane, phenacetine, and many others. Individually each one may not be sufficiently important to warrant legislation nor change of departmental attitude of administration, but collectively these, and other pure chemicals not used in medicine, mean the organic fine chemical industry. The use of duty-free alcohol without unduly harassing restrictions is essential for the establishment of this branch of manufacture, with which goes progress in the discovery and introduction of new substances into medicine; but it is a wider question still, for this class of manufacture is one branch of the fine chemical industry which must be considered as a whole. The importance to the country of establishing upon a firm basis the fine chemical industry, in which previous to August, 1914, Germany stood supreme, has been argued so frequently and so convincingly during the past six years that further reference to it ought to be unnecessary, yet unhappily this is not the case. Now, before the industry is sufficiently strong to resist the onslaught, it is exposed to attack from abroad by the unrestricted importation of foreign fine chemicals. As if to make assurance doubly sure, this infant industry is in process of being strangled at birth by the excess profits duty. Starved of alcohol and stifled by the E.P.D., what remains is being done to death by the Sankey judgment.

Among the papers read at the Conference was one by Mr. T. Tusting Cocking, who showed that when oil of eucalyptus and ortho-cresol are mixed, heat is evolved, and on cooling, white transparent crystals, consisting of an equimolecular combination of cineole and ortho-cresol, separate. This is a new compound, which has been named "cresineol." It may be recrystallised from various solvents, and forms beautiful prismatic crystals melting at 55·2° C., and boiling at 185° C. Cresineol is volatile, and possesses a pleasant camphoraceous odour. It is not caustic in its action on the skin, and yet contains 41 per cent. of cresol. Having high germicidal properties, it is likely to prove of great value as an antiseptic, both for internal and external application. The fact that a solid compound is formed when oil of eucalyptus and ortho-cresol are mixed can be made use of as a means of determining the amount of cineole in oil of eucalyptus. The method is based on the determination of the freezing point of a mixture of the oil with ortho-cresol; having observed this point, one may read off directly from a curve, given by the author, the percentage of cineole contained in the oil.

Mr. A. J. Jones dealt with the variability in the composition of commercial samples of mercuric oxycyanide, which are more frequently than not mixtures of true oxycyanide with normal mercuric cyanide in differing preparations. The difficulties regarding the decomposition of the salt during manufacture were referred to, and a method for preparing the pure substance was given. One of the chief points to which attention was drawn is the explosive nature of the salt. There have been one or two accidents through explosion, but no satisfactory explanation has yet been advanced as to whether the salt in itself is dangerous, or whether the explosions may be the result of secondary reactions.

Mr. J. L. Lizius showed that the tests given in the United States Pharmacopœia for the detection of inorganic phosphate in sodium and calcium glycerophosphate are valueless. A satisfactory means of applying the molybdate test was given, and also a special modification capable of detecting 0·001 per cent. of inorganic phosphate in glycerophosphates.

Mr. Norman Evers dealt with the disadvantages of determining lead in alkaline solution by the method given in the British Pharmacopœia. A method of determination in acid solution is suggested for such cases, using the indicator bromphenol blue, which has a colourless neutral point, to ensure that the hydrogen-ion concentration is always the same.

Mr. A. Nutter Smith gave details of a test devised for determining the uncombined acetic acid present in acetylsalicylic acid.

Mr. R. Leitch Morris dealt with the determination of hydrocyanic acid. It was shown that the British Pharmacopœia prescribed the use of too small an amount of potassium iodide, and that accurate results could be obtained by using a larger quantity.

THE ARTIFICIAL SILK INDUSTRY.

L. P. WILSON.

During the last six years the artificial silk industry has assumed an importance even greater than in pre-war days, partly owing to the continued expansion of the industry, and partly owing to the shortage of natural fibres due to the enormous consumption of cotton for explosives and of wool for army clothing, together with the reduced production of raw material.

As is generally known, the oldest commercial methods for the manufacture of artificial silk were the nitro and the cuprammonium processes, of which the former was developed in France and the latter in Germany, but for several years before the war these two were gradually being displaced in all countries by the viscose process, which is English both in origin and development.

During the war period the progress of the viscose silk industry has steadily continued, while manufacture by other processes has become relatively unimportant until, at the present day, by far the greater part of the artificial fibres on the market are of viscose origin. In Great Britain the change-over has been complete, and there is now no artificial silk on the market—made in this country—other than viscose. The Flint works of the British Glanzstoff Co., a subsidiary company of the Vereinigte Glanzstoff A.-G., of Elberfeld, and formerly manufacturing by the cuprammonium process, being enemy property, were acquired from the Public Trustee by Messrs. Courtaulds, Ltd., and are now manufacturing wholly by the viscose process. Both here and at the Coventry works considerable extensions have been carried out since the armistice, and, in addition, new works are being erected by this firm in other places.

The viscose process differs from its competitors in that the raw material used as the source of cellulose is wood pulp and not cotton, and, during the war, the advantage of this circumstance was especially emphasised owing to the shortage of the latter fibre. Numerous sources of cellulose have been tested for the production of viscose silk, and many will yield a satisfactory thread, but spruce pulp—of which Norway supplies the greater part—is the most usual starting material. The almost unlimited resources of wood in Canada and other northern countries ensure a sufficient supply for the requirements of the industry for an indefinite period, but for the processes which require cotton as a basis, viz., the nitro, cuprammonium, and acetate processes, the position for a large production is much less secure. In common with all other materials, the price of pulp has increased very greatly, so that pulp which in 1914 cost £12 per ton is now marketed at £100, and the prices of all other chemicals have altered in the same direction, but it is satisfactory to be able to record that by means of improved processes and machinery English viscose silk is now put on the market at a considerably lower price than that produced in any other country, and in the case of some sizes is even cheaper than the corresponding count of Egyptian cotton.

For the production of a satisfactory spinning solution and product, it is essential that the pulp should be free from lignin and colouring matter, and for this reason a bleached sulphite pulp is the most desirable. The wood pulp is converted into alkali-cellulose by steeping in strong caustic soda, the excess being pressed out and the wet sheets finely ground and then oxidised. At this stage very careful control is necessary, particularly with regard to the amount of oxidising catalyst present in the alkali-cellulose. Treatment with carbon bisulphide vapour converts the alkali-cellulose into xanthate, which is then dissolved in dilute soda, forming "viscose." This solution is projected through fine apertures in platinum jets into the spinning bath.

Spinning baths of very varied composition have been employed to produce the thread, and, in the case of viscose silk, very different results can be obtained by the choice of the proper coagulating medium; the composition of this—together with the degree of xanthation—enables the manufacturer to produce fibres with varying shapes of cross section, and thus, of different lustre, covering power, dyeing affinity, etc., according to the requirements of the fabrics which are to be made from them. In this respect viscose silk is unique, for its fibres may be either smooth and round, or irregular and serrated in cross sectional outline, or with any intermediate variation; nitro, cuprammonium, and acetate fibres do not possessess this property, but have a generally smooth outline with, consequently, less lustre and covering power.

In the latter part of the war, owing to the fact that the most suitable raw materials were often unobtainable, viscose silk did not maintain its earlier standards, but these have now been regained and in some respects surpassed; at the same time the production, which was necessarily reduced, has in this country again reached and passed its earlier figures. On the Continent numerous artificial silk factories were in the war zone, with the result that some were destroyed; others, as in Belgium and Northern France, had their machinery removed by the Germans for the benefit of their own factories, the nitro-cellulose factory at Tubize being used by the Germans for the production of explosives, while still others were forced to work with a reduced output, and those in Germany itself had the increased responsibility for the production of textile fibres owing to the blockade by the Allies. The shortage of supplies due to the blockade led the Central Powers to direct great attention to the manufacture of substitutes for the hitherto commonly used textile materials, these substitutes necessarily being obtained from internal sources, of which wood and such plants as nettle formed the chief. This gave a great stimulus to the production of fibres from wood, which before the war had already been considerably developed in the two directions of artificial silk and paper yarn. The latter was produced by twisting together narrow strips of paper obtained either by formation direct from the pulp or by cutting from paper of greater width. In either case the wood fibres remained in their original form and were not subjected to any chemical dissolution. This paper yarn or "Textilose" was employed by the Central Powers for many uses: including string, ropes, sacking, and even clothing.

A certain confusion existed in the minds of outsiders with regard to this paper yarn and the new "Staple Fibre" which was, as a result of the war, produced and employed to a large extent by the Central Powers, and is likely to have a considerable application in the future. Staple fibre, however, is a form of artificial silk coresponding to the "Fibro" of British manufacture and also of recent date. "Fibro" does not differ chemically or in the early stages of its manufacture from ordinary fine filament viscose artificial silk, but it is characterised by the short lengths of the fibres. In Germany this material was largely used during the war to eke out the wool stocks, which were exceedingly small, and it was stated that wool fibres which were otherwise too short for spinning could be used satisfactorily if mixed with 10 to 20 per cent. of staple fibre. The Vereinigte Glanzstoff A.-G. stated that staple fibre, like artificial silk, is manufactured by means of a very complicated process requiring chemicals in large quantity and great variety. A description in the *Färber Zeitung* says that very fine fibres are first produced, twisted into thick threads, and then cut into 4 or 5 cm. lengths; by this means the fine fibres separate again and the product thus obtained spins exceptionally well, either alone or in admixture with other fibres. The production of staple fibre during the war was, however, limited in Germany both by the restricted supplies of chemicals available for its manufacture and by the fact that the production of artificial silk was confined to a few factories, but there is no doubt that developments in this direction may be expected in most countries. In England, "Fibro" is being produced in increasing amounts, but instead of being a substitute for wool it is rather a new material used for the purpose of giving increased lustre in fabrics and for producing improved effects.

Another form of filament which has been produced in considerable quantities during the past few years is known as "Ribbon Straw," which, as its name indicates, is in the form of a ribbon; it is generally from one to five millimeters in width and about 0·02 millimeters in thickness. To produce this flattened form the cellulose solution is projected through a slit-shaped aperture into the coagulating bath, the subsequent processes being similar to those employed for silk, omitting, of course, the twisting. This product is extremely lustrous, dyes readily, and is employed in a similar manner to fine straw for plaiting or braiding and the manufacture of hats.

The applications of artificial fibres, and particularly of those produced by the viscose process, are constantly increasing, and it will be evident, from the fact that the length, thickness, and form are variable at will over the widest range, that the purposes to which artificial silk can now be put are limited by little more than the ingenuity of the textile designer. At the present time it is used for all the varieties of knitted materials which can be made from natural silk, cotton or wool, and for innumerable woven fabrics from the finest gauzes to heavy tapestries, including also practically all varieties of ladies' dress materials, and many fancy materials and trimmings.

The production of artificial silk on the continent is said to be 5 tons daily in Germany, 4 tons in France, with smaller amounts in Belgium, Italy, Switzerland, Austria and Holland; the industry was making progress in Russia until 1917, and the latest countries to take up the manufacture are Japan and Sweden. In Great Britain the output has increased to about 10 tons per day, whilst in the United States the amount greatly exceeds this figure.

During the last two years the exploitation of cellulose acetate as a material for the production of artificial fibres has been attempted in this country. It has been tried on various occasions during the past ten years in several foreign countries, where it has not met with any commericial success; its introduction into England will be watched with considerable interest. The British Cellulose and Chemical Co., which set out to produce cellulose acetate for aeroplane dope during the war, and which was, for this reason, largely subsidised by the Government, has now turned its attention to the production of artificial silk from this material.

Cellulose acetate is not soluble in aqueous liquids, and for this reason the production of filaments from it largely follows the now nearly obsolete Chardonnet process; also for the same reason the thread produced from it is soluble in or softened by numerous organic solvents. The thread is stated to be impervious to water, this however does not cause its strength when wet to be greater than that of viscose silk, and in the dry state its tenacity is considerably lower. The production of acetate silk is apparently still in the experimental stage, for it cannot yet be obtained for commercial purposes, although small quantities have been exhibited, and the samples which are obtainable possess properties of which most users, whether textile workers or dyers, will probably need considerable experience before they will be persuaded to accept them as desirable in a standard yarn. It is, for instance, unique in its dyeing properties, in that with ordinary methods it can be dyed only by means of basic dyes which are among the most fugitive of colouring matters; direct cotton colours it refuses to take up, and the dyeing of fabric composed of cotton and artificial silk with direct colours, a very usual procedure, is not possible in the case of acetate silk. If this is attempted with acetate silk, the cotton takes up the colour normally, but the acetate combines only with the basic impurities in the dye, with the result that the former may be the desired navy-blue whilst the latter is perhaps a dirty yellow shade, or while the former is black the latter is brick-red. When dyeing is attempted with vat colours of the indanthrene type, which are coming into great demand on account of their remarkable fastness and consequent suitability for washable materials, cellulose acetate silk sometimes is partly decomposed, and loses its lustre and silk-like properties. Acetate silk has, however, a very low electric conductivity, and consequently may prove to be a very useful material for the covering of electric wires and for other insulating purposes; in such cases where colouring is often desirable, but numerous or exact shades are not necessary, the methods and dye-stuffs available may give sufficiently good results.

The chemist is constantly searching for new materials and solvents with which to produce improved filaments of increased tenacity and elasticity, greater fineness, lower specific gravity, or reduced cost, and numerous suggestions have been made to one or more of these ends, but he must always bear in mind that before his product can deserve, to say nothing of achieve, success, it will have to pass before the inquisition of the textile industry which has torn to pieces many a fine theory and shown up more than one faulty material in its true colours.

Artificial silk is no longer a curiosity suitable only for exhibition or at most for fancy articles, but a commercial fibre which by the beauty of its fabrics, and its proved resistance to wear and tear, has now established its position among the premier natural fibres which have stood the test of centuries.

POSITION AND PROSPECTS OF THE RUBBER INDUSTRY.

W. A. WILLIAMS.

The position and prospects of the rubber industry are decidedly encouraging as gauged by the demand for practically all its products. As almost every manufacturing industry requires rubber goods for running its plant, a period of industrial activity is immediately reflected in the volume of orders lying in the hands of rubber manufacturers, by far the greatest demand being from the motor industry. The mass production of cars, together with the incentive to road traffic brought about by the increasing cost of railway transport, is producing in its turn a constant and increasing demand for rubber tyres, both pneumatic and solid, so that any forecast of the prospects of the tyre industry is necessarily governed by the progress of the motor trade.

During the war all rubber factories were working at their utmost capacity, and although with the cessation of hostilities there was a falling off in special war requirements, this demand has been replaced by that for general rubber goods, and order books in most factories are filled for a considerable time ahead. It is unlikely that any substantial increase in the production of general rubber goods will be shown, owing to the enormous difficulty in most cases of procuring early delivery of new plant. It can be assumed. therefore, that any increase in this class of goods will not exceed the normal, but owing to the need for replenishing the world's depleted stocks, it will probably continue for some time to come. Conditions in regard to motor tyre production are, however, abnormal. It was foreseen by manufacturers that a large and immediate increased demand would eventuate and appropriate preparations were made to meet it.

The prospects of the rubber trade in this country cannot be dissociated from the activity of the trade in the United States. American factories consume about 60 per cent. of the world's total production of raw rubber, and consequently the position of the industry in America has a world-wide influence. The production of motor-cars in the United States will in the near future be about three million per annum; this year the registration of cars on the road, including commercial vehicles, will be in the neighbourhood of nine millions, and these will consume, on a conservative estimate, some 200,000 tons of rubber for tyre-replacement purposes.

In Great Britain our requirements are modest as compared with those of America, the registration of cars in this country being just under the half-million figure. The requirements of crude rubber for tyre-replacement can be taken at, approximately, 10,000 tons per annum. This represents about 25 per cent. of the country's total rubber requirements used in the tyre industry, a proportion that will in all probability increase in the near future owing to developments in the use of motor transport.

From the above and the following figures it will be seen that the greatest part of the rubber consumption is due to motor traffic.

For all requirements the world's consumption of rubber in 1919 can be taken at 320,000 tons, and the production of crude rubber at 380,000. Taking into consideration the demand for the motor trade and for general rubber goods, it is estimated that, in 1920, there will be a total world consumption of 384,000 tons, with a possible crude rubber production of 403,000 tons, thus again showing a surplus of production over consumption.

If the development of the motor trade continues at the same rate as in recent years, it is just possible that the available rubber in sight will be taxed to meet the demand, as the area under plantation rubber coming into bearing only represents an increase of 7·2% in 1921, 6·2% in 1922, 5·6% in 1923, and 5·4% in 1924. In addition, the increased yield per acre from the estates in bearing will also be contributing to the total production figures. It is worth noting that the average yield per acre has risen from 157 lb. in 1910 to 293 lb. in 1919. There is also a possibility that should a shortage in the supplies of crude rubber be indicated, wild rubbers will again come into the market to help to make up the balance. These have dropped off within recent years to the extent of 20,000 tons annually. For the immediate requirements of the trade, however, there are undoubtedly sufficient supplies of crude rubber to meet the manufacturing demand.

The supply of cotton is as essential to the rubber manufacturer as is that of crude rubber, and in the pneumatic tyre industry, provision has to be made for the supply of special grade material. For this purpose, so far, satisfactory results have only been obtained by the use of long staple cotton, viz., Sea Island or Egyptian grades. The former is at the present time not available, the American Sea Island crop having been destroyed by the boll weevil, and the amount that will be raised need not be taken into consideration. The supplies of cotton from Egypt are not expected to show any appreciable increase over those of recent years owing to Government restriction, the available ground being needed for the raising of food crops. The only relief that can be given to meet the heavy demands which are expected will come from America, where the cultivation of Egyptian cotton has been given special attention, and large areas of land have been placed under cultivation, principally in Texas, Louisiana and Arizona. In Arizona, especially, the question of cotton supplies has been taken in hand by the large rubber-tyre manufacturing companies themselves, and these have planted solely for their own requirements. These plantations are under United States Government control in respect of the grade of cotton, and also of the steps to be taken for the elimination of pests, with the result that good supplies of cotton suitable for the trade's requirements are being produced. It is hoped that the Arizona crop will have the effect of steadying the price and preventing the serious situation which might result if Egyptian cotton alone were on the market. Prices are already on a very high plane, having risen to about 200d. per sq. yard from about 20d. per sq. yard in 1914.

The result of the high prices for long staple cotton may be that manufacturers will be forced to use a proportion of short staple cotton in their products, which up to the present has probably never been seriously attempted, but undoubtedly something in this direction will need to be done if the supplies of the long staple varieties do not keep pace with the increased demand for tyres. Should this result in giving a lower average mileage than the present production, it may be compensated for by a corresponding decrease in the selling price of tyres.

The consumption of long staple cotton in the form of tyre fabric for 1920, based on the number of cars registered in the United States and Great Britain will be in the neighbourhood of 210,000,000 lb. As against this, the total world crop, according to the latest figures, is approximately 600,000,000 lb., a quantity which has to meet the requirements not only for tyre fabrics but for fine count cotton fabrics generally, for which this grade is extensively used. Hence it must be recognised that unless other grades can be used or the world production increased, the position of the rubber industry in regard to supplies of cotton fabric will be a serious one.

The supply of chemicals and compounding materials is barely sufficient for present demands, although no actual shortage has been experienced. The difficulties of supply are due to depletion of stocks augmented by delay in rail transport to the consumers' works. These handicaps materially increase the difficulties of continuous manufacture and may possibly lead to curtailment of output. The rubber manufacturer can only protect himself from such a contingency by carrying largely increased stocks of what is to him raw material, a policy which, at the present time, is absolutely essential, not only in regard to chemicals but also to cotton cloths, delivery of these from the cotton mills being long-dated on new contracts. Unfortunately, this necessity adds to the cost of manufacture by reason of extra charges for storage, and the interest on money locked up in increased stocks. At the moment this cannot be avoided if plants are to be kept running, the increased expenditure being more than offset by the risk of loss through the shutting down of manufacturing operations due to inadequacy of supplies.

The labour supply is sufficient to meet the increasing demand, but, as in all other industries, only at a greatly increased cost; and although labour-saving machines and devices are introduced wherever possible, the high cost of labour employed in ratio to value of goods produced will still remain a characteristic of the rubber industry, and proportionately high selling prices must in consequence be expected.

The relation between cost of manufacture and selling prices is likely to continue satisfactory, except in the tyre section, where there appears to be a grave possibility of severe foreign competition, especially from America, unless the Government comes to the aid of the British manufacturer.

Tyre-manufacturing plants are being increased in the United States to such an extent that their output will be more than can possibly be absorbed in their own market. At the present time three firms alone have a combined output of 100,000 tyres per day, and plant in course of erection which will further increase it. Their output capacity is such that they could supply the whole of Great Britain's requirements in motor tyres in a few weeks, and undoubtedly when the time of over-production comes in the States the surplus will be shipped to this market, if still open; by this means their plants will be kept operating at full capacity, their factory organisation intact, and their on-cost charges at the minimum figure.

There are already indications of the efforts that will be made in this direction. The import of motor tyres into this country during the first three months of this year was at the rate of £5,000,000 per annum, and this rate is steadily increasing. The Continental countries, particularly France and Italy, are shipping the bulk of their production to this country, finding it more profitable to sell here and reap the benefit of the exchange position than to manufacture for their home requirements. These trade conditions are outside the control of the British manufacturer, and only Government action can be looked to for assistance against this class of competition.

The rubber industry is in a favourable position to meet competition on an equal footing, for during the last few years a considerable amount of investigation and research has been undertaken, and engineering problems relating to the construction of more efficient plant have been investigated, with the result that the leading mills are well-equipped with modern and up-to-date machinery. Factory operations are controlled by chemists and physicists, working, in the case of the larger firms, in close co-operation with the routine and research laboratories, with the result that the manufacture has been brought up to a high state of perfection both in respect to cost of output and in quality of the goods manufactured. The question of research has also been taken in hand, independently, by the Research Association of British Rubber and Tyre Manufacturers, of which most firms are members.

Looking ahead, it appears reasonably certain that the rubber industry will be called upon to increase output, and provided that the difficulties attendant upon rising production are met, as outlined above, there is every reason to anticipate substantial progress and prosperity.

CORRESPONDENCE.

"THE USE OF COLLOIDAL PREPARATIONS IN MEDICINE."

SIR,—There is an excellent custom that reviews are not ordinarily subject to the right of the author to reply to the criticisms made, and, in view of this and of the attitude of your reviewer in regard to both Sir Malcolm Morris and me personally, as well as against the numerous medical men cited in my book, I do not propose to send any detailed reply to his various statements. Even an apparent contradiction (on pp. 73 and 97) which he mentions is not actually contradictory—except when the statements are separated from the context—and when he claims (p. 212 R) that no one "acquainted with the facts of pathology" could attach a meaning to a certain statement, he is not tilting at me, but at no less eminent a pathologist as Sir William Collins! It is surely a significant measure of the value of your reviewer's criticisms that my lectures —of which my book on Colloids is a summary—have been delivered on many occasions in London and various other important cities and towns before audiences of medical men and chemists, and in no case was there any adverse criticism of a serious nature.—I am, Sir, etc.,

A. B. SEARLE.

[The above is an abridgment of a letter received on July 6, in reply to criticisms which appeared in our issue of June 30 (pp. 211—213 R).—ED.]

SIR,—The bright beam of Dr. H. H. Dale's just indignation (*cf.* J., June 15, 1920, p. 211 R) reveals the inherent cloudiness of Mr. Searle's book on the medicinal use of colloids, and shows that colloid chemistry is more apt to be stunned by indiscriminate invocation than damned by faint praise. But Dr. Dale's criticism is also constructive, and it seems that in many cases colloids may, as he suggests, serve as depôts whence issue over a period streams of active ions, which may be locally concentrated by local adsorption of the colloid. In any event, Dr. Dale appreciates that it is not necessary to understand modus operandi before recognising practical results; and many remedies of acknowledged efficiency are colloidal (even the mercurial ointments to which he refers), to say nothing of such treatment as the intra-venous injection of gum arabic solutions to help combat surgical shock.

There is nothing occult or mysterious about colloid chemistry, which exists because it is a fact that when *any* substance is reduced to a degree of subdivision below about 0·1μ, but somewhat above the dimensions of simple molecules, it exhibits activities quite different from its ordinary physical properties, but by no means identical with its ordinary chemical properties, though specific forces exert an influence. Just as with the radioactive disintegration of the elements, the electron, and the complex structure of the atom, it is still a shock to many to learn that there is no sharp line of demarcation between the chemical and the physical, although as early as 1892 (in the *Chemical News*) Sir Wm. Ramsay quoted, in support of this view, the proverb, "*Natura nihil fit per saltum.*"

The colloidal condition is ubiquitous—it is found in the comet's tail, in the microscopic confines of the cell, and it exists, if but for a transient moment, in the course of most chemical changes. Reason demands a just consideration of all factors, and though the colloidal condition is often important or controlling, it is only *one* factor.

But from Dr. Dale's remarks one might gather the impression that very dilute true solution, *i.e.*, "chemical action" in the old orthodox sense, is the basis of all colloidal activity. This alone would hardly account for "protection," swelling and shrinking, non-stoichiometric adsorption compounds, mutual coagulation of sols, etc. Such a book as Bechhold's "Colloids in Biology and Medicine" makes it evident that the rational basis for the use of colloids in medicine is already much broader than Dr. Dale indicates, and that we have much more to expect in the future.—I am, Sir, etc.,

JEROME ALEXANDER.

Ridgefield, Conn.
July 19, 1920.

PERSONALIA.

Professor C. A. F. Benedicks has been appointed director of the new Metallographic Institute in Sweden.

Sir John Brunner has been elected chairman of the council of the Association of British Chemical Manufacturers for the ensuing year.

It is announced that Prof. Marston T. Bogert has declined President Wilson's invitation to serve on the United States Tariff Commission.

Dr. H. Wieland, extraordinary professor in the Munich Technische Hochschule, has refused the offer of a chair of chemistry in the University of Berlin, and has received a call to the University of Freiburg i/B as successor to Prof. L. Gattermann.

The following appointments have been made to the British Cotton Industry Research Association:—Organic chemistry: Mr. R. G. Fargher; general and inorganic chemistry: Dr. D. Clibbens; colloid chemistry and physics: Mr. F. D. Farrow and Dr. A. M. Williams.

We regret to record the death, on August 4, of Prof. John Perry, emeritus professor of mechanics in the Royal College of Science, at the age of 70.

H. T. von Böttinger, until recently chairman of the board of the Farbenfabriken vorm. Fr. Bayer und Co., died on June 9 last, aged 72.

The death is announced of F. von Gans, cofounder of Leopold Cassella and Co., in his 87th year.

NEWS AND NOTES.

UNITED STATES.

Plant Protection Institute.—A meeting of manufacturers of chemicals used for insecticides and fungicides with entomologists and phytopathologists was held on June 23, by invitation of the National Research Council, with the result that a new organisation—the Plant Protection Institute—was formed. The object of the Institute is to support and direct research relating to the control of injurious insects and plant diseases, and it is hoped that it will be the means of effecting the long-desired co-operation between the various interests concerned.

Titanium in Enamels.—Recent investigation has led to the conclusion that the advantages of using titanium oxide in enamels more than outweigh the disadvantages. The resistance to corrosion of enamels in the preparation of which rutile has been used is much greater than is the case with ordinary enamels, and under all tests such enamel has shown unusual durability. The resulting surface has a high gloss and a resistance to abrasion which gives a longer life, since a damaged surface may lead to the speedy failure of the enamel. The enamels bearing titanium have a high heat resistance, but the greatest difficulty in its use is the maintenance of a satisfactory state of suspension of the titanium oxide in the frit.

Self-lubricating Abrasive Wheels.—The abrasive wheel previously heated to a temperature corresponding to the melting point of the filler is immersed in a molten bath, whereupon the filler penetrates the pores of the wheel. One satisfactory mixture for this purpose consists of paraffin and rosin. Upon removing the wheel from the bath it is rotated, so that any excess of the lubricating filler is removed by centrifugal action.

Artificial Silk Industry.—The artificial silk industry in the United States was inaugurated by the General Artificial Silk Co., which carried out much experimental work, but was not successful in producing a yarn that would sell on the American market. This company was taken over by the Genasco Silk Works, which continued the work and produced a marketable yarn, but only in small quantities. Although over $1,500,000 was spent on experimental work, no plant was erected in the United States solely for the manufacture of artificial silk until 1910—1911, when the British firm of Courtaulds, Ltd., opened its American branch under the name of the Viscose Co., and took over the works of the General Artificial Silk Co. The successful development of the artificial silk industry, as we know it to-day, is inseparably connected with the Viscose Co., which has plants at Marcus Hook, Pa. (3500 hands), and Roanoke, Va. (1500 hands). The pre-eminence of this company in the United States is illustrated by the following table:—

	Imports. lb.	Production of Viscose Co. lb.	Consumption. lb.
1912	1,631,807	1,117,285	2,749,092
1913	2,395,599	1,565,583	3,961,182
1914	2,590,490	2,443,954	5,034,444
1915	3,044,316	4,107,385	7,151,701
1916	973,082	5,741,338	6,714,420
1917	543,446	6,696,861	7,240,307
1918	129,540	5,827,627	5,958,167
1919	1,072,040	8,173,824	9,245,864

Recent developments include the entry of the Du Pont Co. into the field of artificial silk manufacture by its alliance with the Comptoir des Textiles Artificiels, and the acquisition of manufacturing facilities by the Belgian Tubize Co. at the former munitions town of Hopewell, Va., where an artificial silk plant will be established under the name of the Tubize Artificial Silk Co. of America. Although the cost of artificial silk is only about half that of real silk, the former has not come into competition with the latter; rather has it worked out a field for itself and, owing to its greater lustre, it is seldom used as an adulterant of real silk.—(*Chemical Age* (*U.S.A.*), *May* 20, 1918.)

Utilisation of Wool Grease.—It is reported that good progress is being made in the investigation conducted by the United States Bureau of Chemistry into the utilisation of the grease, potash, nitrogenous substances, etc., present in wool-scouring wastes. The grease content of wool, though very variable, is surprisingly high in certain grades; thus, Ohio delaine wool (unscoured) contains from 17·8 to 41·9 per cent. of grease. For this reason methods for the economical recovery and utilisation of the grease and other valuable constituents of wool-scouring wastes are being developed.—(*Oil, Paint, and Drug Rep., June* 28, 1920.)

Dye Situation.—The announcement that the State Department is prepared to grant licences for the importation of German dyes in amounts sufficient to meet the consumer's requirements for a period of six months, and provided the dyes are not obtainable from home sources, is causing some anxiety among American dye producers, particularly as the names and formulæ of such dyes could be adjusted to deceive the War Trade Board, while remaining quite comprehensible to the importer. Another disquieting fact is that American prices for certain home-produced standard colours are out of all proportion to the German prices for similar products, the former being in many cases as much as three or four times greater than the latter. This disproportion has led to the charge of profiteering, and, should this not be true, it is claimed that such safeguards should be given to the American dye industry as would enable it to develop on a broader basis and thus reduce costs.—(*Oil, Paint, and Drug Rep., June* 28, 1920.)

SOUTH AFRICA.

New Starch and Glucose Factory.—The firm of Lewis and Marks is building a starch and glucose factory at Vereeniging, Transvaal, which will be worked in conjunction with its local milling plant. The estimated cost of the factory is about £100,000, and the daily output 50,000 lb. of glucose and 55,000 lb. of miscellaneous starch products. South African maize will be used as raw material, and maize oil will also be prepared for sale as an edible oil. It is intended to cater for the export as well as for the home trade. (*Cf.* J., 1919, 25 R.)—(*U.S. Com. Rep., June* 15, 1920.)

Cotton in the Transvaal.—The Rustenburg agent of the Transvaal Land Owners' Association reports that the yield of the 1919 cotton crop is estimated at one million lb. of seed cotton, as against 53,000 lb. in 1918. It was anticipated that the acreage planted in 1920 would be five times that in 1919, but the poor rainfall has modified this estimate.—(*Official.*)

Nickel Deposits in the Barberton District.—A deposit of nickel has been found on the property of the Scotia talc mine in the Barberton district. A hand-picked specimen examined by the Government Mining Chemist contained 25·8 per cent. of metallic nickel; and as sulphur and arsenic were apparently absent, the ore was considered to be a mixture of magnetite and a nickel silicate. As the market is at present over-stocked with nickel, development of the new deposit will only be proceeded with if the ore is found to be of sufficient value.—(*S. African J. Ind.*, *June*, 1920.)

South-West African Protectorate.—The report of the Administrator of the Protectorate of South-West Africa for 1919 indicates that the progress made was satisfactory and that the country is settling down to work. The year was one of great prosperity for the stock farmers, and this prosperity has spread to the commercial community. Residents who had, to a large extent, been marking time during the occupation years have re-opened old business relations and started further enterprises. The mines have been busy and the traders have benefited by the great prosperity. The output of precious stones and minerals was as follows:—Diamonds, 463,180 carats, valued at £1,500,000; copper ore, 26,675 tons, valued at £120,000; and tin, 111 tons, valued at £20,000. The country has been thrown open to prospecting, and alluvial tin is attracting attention in some of the central districts.—(*Official.*)

CANADA.

Clays in British Columbia.—A number of clays which were collected from different parts of British Columbia by the field staff of the Geological Survey has now been tested and reported upon. Some of the clays from the vicinity of Ducks, and others from the Chimney Creek bridge on the west side of the Fraser River, withstood high temperatures without softening, and would, therefore, be suitable for the manufacture of fire-brick. The silty clays of the Nicola Valley and the Fraser and Thompson Rivers burn to a red colour, whilst those in the Columbia Valley and along the Windemere Lakes contain much lime and burn to buff. Although the latter as a rule are useless for fire-clays, they are suitable for making building bricks. Other good clays were found in the neighbourhood of Smithers and along the Bulkley River. The discoveries are important, particularly the fire-clays, which are needed in the construction of metallurgical furnaces.—(*Agricultural and Industrial Progress, May*, 1920.)

AUSTRALIA.

Professional Chemists Bill.—The Victorian branch of the Australian Chemical Institute has for some time past been giving consideration to the drafting of a Bill designed to close the profession of chemistry in that State. It was suggested in the Bill that a Board be established having the power to determine what persons shall be regarded as qualified to practice chemistry, and that such persons should be known as professional chemists, and have rights similar to those already enjoyed by the dental and medical professions. Recently, a referendum was taken of the whole of the members in the State, and although there was a majority of those in favour of the proposal, the number of voters was not sufficient to give a clear majority of the subscribing members of the Institute. The proposal was submitted to the members together with a statement by Professor Masson in which the arguments for and against were clearly set out. As a result of the ballot the matter will be shelved for the present. There is, however, a very strong feeling that efforts should be made to protect the interests of properly trained men and ensure an adequate reward for professional services.

Slag Cement.—The manufacture of slag cement in Newcastle, N.S.W., is now proceeding satisfactorily. Blast-furnace slag is granulated at the Newcastle Steelworks and then conveyed to a neighbouring site where it is dried and ground with cement clinker. The clinker is carried approximately 250 miles to the Kandos Cement Works, situated on the Mudgee line. Tests have been made which showed that, prepared in this manner, slag cement will fulfil all the requirements demanded by the specifications for Portland cement. It is not, however, proposed that this material should be used for more important work, but there is a considerable demand for cement for use in road construction, foundry work, etc., in which a lower-grade product might be employed. The new product is being marketed at approximately £1 1s. 0d. to £1 10s. 0d. per ton lower than the ruling price of cement in Newcastle. The present output is approximately 200 tons per week. Reports from assayers are somewhat variable, but the only objection so far raised is the tendency for this material to leave a somewhat friable surface when worked up in the same way as Portland cement. It is also somewhat slower in setting time, but with experience there is little doubt that it may be used satisfactorily for the less important classes of construction work.

Caustic Soda in Tasmania.—The announcement has been made that the Electrolytic Zinc Co., of Risdon, Hobart, Tasmania, contemplates the establishment of an electrolytic plant for the manufacture of chlorine and caustic alkali. It is well known that under the hydro-electric scheme in Tasmania electricity can be obtained at a cost of 0·1d. per unit. The proposal now being considered has for its object the production of some 6000 tons per year of caustic alkali with corresponding quantities of chlorine and chlorine products. Should this enterprise be successfully inaugurated, the supply of chlorine will materially affect the development of other industries. Thus, although several attempts have been made to recover tinplate scrap by electrolytic methods, there seems little doubt that success will not be achieved until chlorine is available to facilitate the removal of the tin as stannic chloride. The development of this industry will undoubtedly be watched with great interest by chemists in Australia.

FRANCE.

Industrial Notes.—*Chemical Industry:* According to the census taken on June 1 last, 98 out of 127 chemical plants, *i.e.*, 77 per cent., were then in operation. Since October, 1919, the resumption of work in chemical factories has steadily increased, and in the Nord Department, which suffered most during the war, the recovery has been greatest.

The prices fixed for the 2500 tons of ammonium sulphate due to be delivered by Germany to France during August and September next are 165 fr. per 100 kg. in a loose state on rail French frontier, and 170 fr. per 100 kg., in bags not returnable.

There has been a slight fall in the prices of natural fats, of turpentine, and of a few metallic salts, but the demand for parasiticides, particularly for sulphate of copper, has been keen. Alcohol remains very scarce. Methyl alcohol, which could be obtained at 400—450 fr. per 100 litres two months ago, is now 780—800 fr. There is a great demand for this product for the production of formaldehyde, which, in 40 per cent. solution, has reached the extraordinary price of 1800 fr. per 100 kg. Generally it may be said that all wood-distillation products have reached very high prices as a direct result of the scarcity of the wood, and of the lack of coal and labour.

Metallurgy: In the region of Longwy reconstruction work is proceeding steadily in all the great metallurgical factories. A year ago only three blast furnaces were working in that district, four months ago the number was increased to eight, and now it is fourteen; a few more furnaces are expected to restart very shortly. These figures bear witness to a more regular arrival of coke.

Many rolling mills, *e.g.*, those of the Longwy steelworks, will soon be ready to start work, and others have already begun. At present four large steelworks have re-started rolling.

Coal: The quantity of coal imported during June was about 1,435,000 t., to which total Great Britain contributed 985,000 t. (1,145,000 t. in May), Germany 150,000 t. (190,000 t. in May), and the United States 300,000 t. (180,000 t. in May). According to the decisions recently arrived at by the Peace Conference at Spa, France will now derive her monthly supplies as follows:—1,500,000 t. from Germany, 1,600,000 t. from French mines, 750,000 t. from Britain, 250,000 t. from America, 100,000 t. from Belgium; making a total of 4,200,000 t., which represents 80 per cent. of the demand. A further 150,000 t. should be available from the French mines in Poland. The arrival of all these supplies is considered doubtful in many quarters.

Transport: The Orleans Railway Co. has been authorised to harness the waters of the "Haute-Dordogne" and of the "Chanavon" and the "Rhue" in order to electrify 3350 kilometres out of its railway line of 7787 kilometres. The energy needed is estimated at 280 million kw. hrs., to be gradually increased to 500 millions. This will result in the saving of 1½ million tons of coal yearly. The example should be followed, as a general electrification of the railways in France would do much to solve the coal problem. At the beginning of July normal pre-war traffic was resumed by the railway companies of the North and East.

JAPAN.

The Phosphorus Industry.—Although the Japanese production of phosphorus is valued at over 30 million yen (yen=2s. 0½d.), two-thirds of which is exported, the raw materials were almost all imported in pre-war days. During the war, however, owing to the absence of Swedish competition, Japanese matches acquired a wide market, and in consequence the manufacture of the raw materials, including phosphorus, was developed at home.

No phosphorus was made in Japan until 1912, when the Electric Furnace Industry Co. was founded, aided by the Government Industrial Examination Bureau, with a capital of 35,000 yen. Soon after, the Fuji Electro-Chemical Co. was established for the same purpose. But the industry did not prosper until 1915, when the latter company increased its capital to 1 million yen, amalgamated with the Nippon Chemical Industry Co., and raised its output to 180 cases of yellow phosphorus a month (case=100 lb.). This company has since opened branch works at Onakigawa, Tokyo and Omiya, Shizuokaken, and a number of other companies has been established, viz., the Tokyo Electro-Chemical Co. at Niigataken, the Yamanashi Chemical Industry Co. at Yamanashiken, the Teikoku Electro-Chemical Co. at Kyoto, the Kyoto Electric Light Co. (chemical branch) at Kyoto, the Umebachi works at Osakafu, and the Tottori phosphorus works at Tottori.

The demand for phosphorus depends on the market for matches, and as a rule 4000 gross of safety matches requires about 400,000 kin (kin=1·32 lb.) of red phosphorus, whilst 1000 gross of paraffin matches require about 230,000 kin of yellow phosphorus. The relation of the output of matches to the phosphorus consumption is shown in the following table:—

Year.	Output of Matches. Gross.	Consumption of Phosphorus. kin.
1906	54,802,293	539,442
1907	57,125,761	502,436
1908	39,397,680	360,309
1909	49,972,039	612,255
1910	49,947,215	522,280
1911	43,948,327	547,093
1912	52,845,232	638,859
1913	51,731,010	657,266
1914	49,050,229	———
1915	49,237,519	493,120
1916	50,612,996	738,696
1917	53,000,000	640,000

The cost of manufacturing a case of phosphorus in Japan is estimated, in yen, as follows:—

Electric power (0·008 yen per kw.)	12·00
Phosphatic ores (at 20 yen a ton), coke, silica	8·49
Labour, etc.	13·70
Packing	6·00
Other expenses	9·79
Total	49·98

Phosphatic ore is chiefly obtained from Rasa Island, Lu-Choo, where the ore, containing 14·63 per cent. of phosphorus, is of the best quality. The production of ore in recent years has been:—1908, 740 tons; 1909, 3932 t.; 1910, 1057 t.; 1911, 2268 t.; 1912, 7851 t.; 1913, 19,043 t.; 1914, 38,259 t.; 1915, 57,716 t.; and 1916, 114,810 t.

GENERAL.

Arsenic.—The Imperial Mineral Resources Bureau, as already announced, is engaged upon the preparation of a digest of information on the mineral resources of the British Empire for the period 1913—1919. It is proposed to issue each part as it is completed, and the first to appear is a 19-page pamphlet on Arsenic, issued in a convenient form (9⅝ in.×6⅛ in.) and sold by H.M. Stationery Office at the price of 6d. Arsenic of commerce is essentially a by-product in the metallurgical treatment of ores of tin, copper, silver, etc.; hence it follows that in countries such as England, where smelting operations are not increasing and where the authorities have already long insisted upon the non-pollution of the atmosphere by smelter fumes, there is little progress in production to report. The one notable exception is that of the United States where, mainly owing to the more exacting regulations now in force, but no doubt assisted by the great rise in value, an increased recovery of the hitherto waste arsenic fume has resulted in an increase in production from 2280 tons refined white arsenic in 1913 to 10,275 tons in 1918. Whilst mineral statistics are notoriously difficult to obtain at any time with any degree of accuracy, the period under review was one of particular difficulty, and the Bureau has probably made the best possible use of the available information. The world's production of arsenic, in terms of white arsenic, appears to be between 20,000 and 25,000 tons per annum. In the British Empire, the United Kingdom and Canada contribute approximately equal amounts, *i.e.*, about 2500 tons per annum. South Africa and Australia have of late taken up the production of arsenic seriously, but as yet their output is small. The United States is said to have produced 3487 lb. of metallic arsenic during 1918. Canada is also a producer of the metal, and a little more information might have been given in this connexion. A welcome bibliography gives references to production and uses.

Industrial Conditions in Germany.—The main business of the majority of factories since the war has been export trade, but it has been checked by a falling off in demands from abroad as well as on the home market. The absence of raw materials and fuel are the main factors which are depressing the industries of the country, and, although some improvement is shown in certain branches, leading to more employment and higher wages, the outlook generally is still uncertain. In the drug industry wages have risen, but fuel shortage is causing considerable trouble. The conditions in the colour trade are not satisfactory. Though still in a leading position, the aniline dye industry is suffering from lack of fuel, and one important firm was unable to carry out more than 40 per cent. of its orders. Many firms which were manufacturing powder and explosives are now lying idle or converting their plant for the purpose of peace work. With regard to the tar-distillation industry, one important firm reports having failed to obtain more than 60 per cent. of the raw materials required; many other works are closing down for longer or shorter periods. The wood-distillation industry is also experiencing great difficulties owing to the short supply of raw materials which were formerly imported from foreign countries such as Poland, Austria, Hungary, etc. More favourable reports are forthcoming from manufacturers of photographic goods, oils, and artificial fertilisers. Speaking generally, the industries of the country have suffered severely from the shortage of coal and raw materials, and if matters do not improve, more workmen will be dismissed. Wages can neither be lowered nor can they be raised further, and, as factories are still working up their costly raw material, the prices of goods cannot at present be reduced.—(*Z. angew. Chem., June* 22, *July* 2, 1920.)

German Potash Industry in 1919.—The reorganisation of the German potash industry on the basis of self-administration is now complete, and although no tangible improvement due to the activity of the various potash offices is as yet apparent, the liberation of the industry from the guardianship of the States bureaus will soon be felt, and prices can now be fixed in accordance with the increase in wages and cost of material.

During 1919, potash prices had to be raised three times in order to cover costs, and the industry became dependent upon foreign trade for its profits. A large number of works had to be closed down owing to lack of coal, and those that kept running either required little coal, viz., those producing kainite, manure salts and chlorate of potash, or owned their own supply (Kaliwerke Aschersleben). Output has been kept back by a number of factors, such as the bad condition of the plants, shortage of materials, industrial unrest, etc.

The net profit for 1919 of the Kaliwerke Aschersleben was 17,661,511 mk. (2,317,667 mk. in 1918), the increase being due to the exports of chlorate and sulphate that began in the latter half of the year. The pre-war dividend of 10 per cent. (7 per cent. in 1918) was reverted to and a bonus given of 200 mk. per share. It was decided to issue 2,500,000 mk. of 6 per cent. preference shares, thus raising the capital to 25 million mk.

The Adler Kaliwerke Oberroehlingen am See made a profit of 3,429,268 mk. (379,172 mk. in 1918) and paid a dividend of 20 per cent. A new share issue amounting to 4 million mk. has been made.—(*U.S. Com. Rep., May* 28, 1920.)

Development of Lignite Mining in Germany.—The following table, compiled by the "Verein für Interessen der Rheinischen Braunkohlen-Industrie" of Cologne, shows the output of lignite in Germany and its two chief producing areas during the last seven years, in thousands of metric tons:—

	Lignite output.		
	Germany.	Rhineland.	Halle a. S. district.
1913	87,116	20,256	46,502
1914	83,947	19,480	41,151
1915	88,370	20,788	47,718
1916	94,332	23,931	50,694
1917	95,535	24,218	51,659
1918	100,663	26,460	53,220
1919	93,800	24,380	—

The introduction of the eight-hour shift and the division of the day into three instead of two shifts on March 1, 1919, did not result in any appreciable falling-off in production. The output of lignite is greatest in Saxon-Thuringia which, together with the Rhineland district, produces over four-fifths of the total. The output in the latter district has increased from 1,016,000 metric tons in 1893 to 26,460,000 t. in 1918, whilst the number of persons employed in the industry has increased in the same period from 2067 to 20,485. During the second quarter of the last few years the average wages paid per shift were as follows:—1914, 4·38 marks; 1917, 5·95 mk.; 1918, 9·43 mk.; 1919, 15·30 mk. The output per man per shift increased from 15·69 metric tons in 1914 to 25·62 t. in the third quarter of 1918 owing to the introduction of mechanical appliances, the more efficient working of substitute labour, and the employment of prisoners of war in the mines. During the following two quarters these figures declined to 17·29 and 11·67 t., whilst in the second quarter of 1919 the output was 12·48 tons per man per shift.—(*Z. angew. Chem., April* 16, 1920.)

The German Textile Industry (Occupied Area).—Although the area under cultivation has been increased, the market supply of flax has not improved owing to the poor crop resulting from shortage of fertilisers and labour difficulties. Imports of silk, raw cotton, wool, and jute have been kept low by the rate of exchange, and the scarcity of these raw materials has greatly hindered trade; the home demand for artificial silk and staple fibre is very great, and exports are subject to licence. The Zellstofffabrik, Waldhof, has had to shut down owing to lack of coal, and it is stated that the Vereinigte Glanzstofffabrik, Elberfeld, has been obliged to negotiate for Norwegian cellulose. The latter company enlarged its works at Oberbruch during the war, provided new plant at Klesterbach, erected a large works at Stettin, and formed a branch company in Bavaria. Germany produces a total of 250,000 kg. of staple fibre, of which the Elbefeld firm consumes two-thirds, the remainder going to the Bemberg A.-G. and the Glanzfäden A.-G., Petersdorf. Further developments are probable after May, 1920, when the Muller patent expires; this originally covered artificial silk, but it also protects the preliminary stages of the staple fibre process. The following were the increases in the prices of raw materials up to January last, since when further rises have taken place: Cellulose 700 per cent., sulphuric acid 300, sodium hydrate 600, and carbon bisulphide 240 per cent.—(*Bd. of Trade J., May* 27, 1920.)

Synthetic Rubber.—According to the annual report of the Elberfelder Farbenfabriken, synthetic rubber has no prospect of success in competition with the natural product. Larger quantities are now stored in London than before the war; moreover, there has been a marked increase in the cost of raw materials, especially of acetone and aluminium. The factory, having used up all its raw material, has been lying idle since the revolution in 1918, and although no actual loss has been incurred, there is no immediate prospect of restarting it under present conditions. — (*Handelsmuseum, July* 1, 1920.)

Dutch Rubber Goods Industry.—The Ministry of Agriculture, Industry and Trade has recently issued a statement on the rubber industry in Holland. The production of tyres has recently been decreasing, but other branches of the industry have been making progress. Some tyre factories have had to shut down owing to difficulties over raw materials. Inmport of tyres were valued at 262,129 during the first three months of this year, but the exports only at £12,293. Raw rubber to the extent of 2126 tons was imported, whilst 1655 tons was re-exported. Imports of balata amounted to 20 tons, all of which came from Curaçao.—(*Rubber Age, July*, 1920.)

Proposed Rubber Industry in Para.—Substantial grants are being offered to the first firm to be established at Pernambuco and Para for the manufacture of tyres and other articles requiring or using Para rubber. The State is prepared to advance a loan of 75 per cent. of the cost of erecting the factories to the contractors who undertake the work.—(*Financial Times, July* 17, 1920.)

Oil Shale in Bulgaria.—The increasing demand for oil has directed attention to oil shales, and three concessions have been already granted. Deposits occur at Breznik, Radomir, Popootzi, Kazanlik, and Sirbinovo. The oil contents average about 13 per cent., whilst that of the Scottish shales is 12. According to German war experience, a minimum of 5 per cent. is workable at a profit. The Scottish shales show a higher content of gasoline, kerosene, and sulphate of ammonia, whilst the Breznik shales are richer in lubricating oils and wax.—(*U.S. Com. Rep., Apr.* 27, 1920.)

Mineral Resources of Rumania.—In addition to the oilfields, Rumania is rich in minerals, especially salt and coal. The salt mines cover an area of over 250 sq. miles from the Bukovina to the west of Oltenic, and the known salt deposits are estimated to contain over 10 million tons. Though of good quality, the output of salt is very small owing to lack of organisation, the total pre-war production amounting to only 144,000 tons per annum. Coal, like salt, is found chiefly in the Lower Carpathians, but it is little worked, and more than 300,000 tons of coal and coke were imported annually before the war from England, Germany and Turkey. Anthracite of good quality is also found, but has been little worked on account of the irregularity of the deposits; during the German occupation the production was increased from 2500 to 7300 tons a year. Lignite deposits, estimated at 200 million tons, occur over a large area, and the annual output amounts to some 235,000 tons. The deposits of copper ore are not worked owing to the low copper content (2—4 per cent.), but pyrites, with 40 per cent. of sulphur, was extracted for use in the manufacture of sulphuric acid. Copper ore containing 5—7 per cent. copper, and estimated at 250,000 tons, has been found in the Dobrudja. Other minerals found in Rumania, but not yet fully exploited, include gold, asphalt (the Germans exported 3000 tons), mica (the Germans exported 400 tons), graphite, and there are quarries of quartz, china clay, gypsum, etc., throughout the mountain areas.—(*Bd. of Trade J., May* 13, 1920.)

Sulphur Production in Italy.—According to *Economista*, the production of sulphur in Italy during 1919 was 364,000 quintals (35,750 long tons) less than in 1918; the values for the two years were 49,705,000 and 51,257,822 lire respectively.—*Schweiz. Chem.-Zeit., Apr.* 17, 1920.)

Synthetic Ammonia Plant in Italy.—An American subject has obtained a concession from the Italian Government for the utilisation of 800 h.p. from the waterfalls at Terni, 70 miles from Rome, and has taken over a munitions plant as a works for the manufacture of synthetic ammonia. In the process used electrolytic hydrogen and pressures up to 250 atmospheres are employed. One unit out of twelve contemplated is stated to be in operation.—(*U.S. Com. Rep., May* 21, 1920.)

The Italian Soda Industry.—The first attempt to establish the soda industry in Italy dates back to 1907, but, owing to scarcity of raw materials, the construction of a factory at Rosignano was not begun till 1914, and on account of the difficulty of obtaining building materials and plant, the manufacture of sodium carbonate was only started in September, 1919. Although the Rosignano factory was unable to meet the great demand, it nevertheless produced more soda than the railways could transport. Manufacture has ceased and the factory is importing foreign soda; since January 1 it has imported 4000 tons, and a further 3000 tons has been taken by other firms. Owing to the extremely high price of soda in Italy, the firm in question has been bitterly, but erroneously, attacked by the press for alleged profiteering.—(*Chem. Ind., Apr.* 28, 1920.)

Sugar Production in Czecho-Slovakia.—During the year 1919, Czecho-Slovakia was the only country in Europe that exported sugar, to the value of about £2,000,000, for the twelve months. Owing to unusually heavy snowstorms in October, 1919, which damaged a large percentage of the sugar beets still in the ground, only 500,000 metric tons of sugar was realised from the 1919—1920 campaign, but those provinces of Austria-Hungary constituting the Republic of Czecho-Slovakia produced almost 18 per cent. of the total beet sugar of the world, or about 1,500,000 tons. During 1919 about 283,000 tons was exported, of which Austria purchased 160,000 tons, France 55,000 tons, Germany 26,000 tons, and England 1250 tons. During the same period the total home consumption was 258,000 tons.—(*U.S. Com. Rep., June* 2, 1920.)

The Swedish Sugar Industry.—The manufacture of beet sugar in Sweden for the present season began on October 1 last, with a supply of 910,000 metric tons of roots, as against 819,000 tons in the previous year. The average yield of roots per acre was 10 tons and their sugar content higher than that of any previous year, viz., 17·5 per cent. Roots, washed and cleaned, were being paid for at the rate of about 4s. a cwt. As the estimated production, together with reserve stocks, will not cover the home consumption, the difference of about 40,000 tons will have to be imported.—(*U.S. Com. Rep., June* 3, 1020.)

Swedish Wood-Pulp in 1919.—It was not until October, 1919, that the Swedish sulphite cellulose industry recovered sufficiently from the effects of the war to allow the mills to be again fully employed. The output in 1919 was, however, still only 64 per cent. of the normal pre-war output. The sulphite industry will have 22 mills equipped with machinery for the manufacture of sulphite spirit, with an estimated output of 17 million kg. of 95 per cent. sulphite spirit. Owing to small sales and the almost complete cessation of the sale of by-products, the Swedish sulphate cellulose production had by November, 1919, fallen to 42 per cent. of the normal, and nearly all the large mills were idle. They resumed operations in November, and by the end of the year their output was again normal, *i.e.*, about 217,000 metric tons.—(*U.S. Com. Rep., June* 3, 1920.)

Norwegian Iron and Steel Industry.—The policy of the Norwegian Ministry of Industry is to develop and support the iron and steel industry, so as to make the country independent of foreign supplies as far as possible. One of the schemes relates to the iron and steel works at Narvik (*cf.* J., 1920, 220 R), and now a grant has been made to a Trondjhem firm which is about to erect an experimental plant for reducing oxidised iron ore with gas at 900—1000° C. It is claimed that this process produces iron free from sulphur and phosphorus, and that, as the product is free from carbon, it is well suited for the production of steel. The gas used is to be produced by introducing a fluid fuel or gas distilled from coal into an electric high-tension flame of the kind used in the artificial nitrate industry. The process is stated to be a Swedish invention and particularly suited for low-grade Norwegian ore. The Norwegian Government has been authorised to invest a maximum of 500,000 kroner (krone=1s. 1½d.) in a company which is to produce pig iron electrically, and to guarantee a loan of 150,000 kr. to another company for the production of the necessary electrodes.—(*Bd. of Trade J., June* 3, 1920.)

New Fertiliser.—A new fertiliser, known as "Ephos" basic phosphate, has been made from phosphate mined in Egypt. It contains from 60—65 per cent. of tricalcium phosphate, of which 85—95 per cent. is soluble in 0·2 per cent. citric acid solution. The new fertiliser, of which over 30,000 t. has been exported to New Zealand and small quantities to England, is said to be suitable for wheat and root crops as a substitute for basic slag or superphosphate.—(*Rev. Prod. Chim., June* 30, 1920.)

REPORTS.

Fifty-Sixth Annual Report on Alkali etc. Works. *By the* Chief Inspector. 1919. *Pp.* 77. *London: H.M. Stationery Office.* 1920. *Price* 2s. 6d.

The total number of registered works in the United Kingdom in 1919 was 1568, of which 165 were in Scotland; the total shows a decrease of 12 on the previous year. The number of separate manufacturing plants under inspection was 2288, distributed as follows:—Alkali: salt cake 57, copper (wet process) 17; cement, 49; smelting, 78; sulphuric acid, 140, do. class II. 116; fertilisers, 143; gas liquor, 107; nitric acid, 83; sulphate and chloride of ammonia, 632; chlorine, 25; muriatic acid (other than alkali) 66, tinplate flux, 70, salt 42; sulphide, 98; arsenic, 50; carbon bisulphide, 5; bisulphite, 30; tar, 376; zinc extraction, 13; etc. There was a decrease of 64 plants compared with 1918, mainly accounted for by reduction in sulphuric acid, nitric acid, and picric acid works. The number of alkali (salt-cake) works increased from 54 to 57.

The return of three inspectors from war service led to a considerable amount of re-arrangement in the administration that was not conducive to the highest efficiency in inspection; but the derangement was only temporary, and must be reckoned as the closing stage of war conditions. The resident inspectorship of the Widnes, Runcorn, and Liverpool district has been abolished and the area included in the Cheshire and South Lancashire district.

No proceedings were instituted against the owners of works for the emission of noxious gases or vapours.

At the beginning of the year demand in the chemical trades was not strong and much plant was idle; during this period arrears of repairs and renewals were overtaken with subsequent good results, although the adverse conditions in regard to labour, materials, and transport continued. During the year production gradually increased, and the heavy chemical industry may be said to have entered 1920 under favourable conditions.

Alkali works.—As in previous years, the electrolytic and ammonia-soda processes continued to oust the Le Blanc process for the manufacture of alkali; the last-named process is now very largely confined to the production of salt cake and hydrochloric acid, and several new plants have been erected merely to manufacture these products. The output of nitre cake diminished rapidly after the armistice, and little of this material was available for salt-cake manufacture. No fresh development in the use of mechanical furnaces is to be reported.

Cement works.—Great activity prevailed in this industry throughout the year, but output was hindered by shorter hours of labour and difficulties in effecting repairs. The poor quality of the coal available was also an important factor in decreasing output, as it affected the working of the rotary kilns. The British Potash Co. is putting down a plant at Harefield (Middlesex) for the recovery of potash from the fumes of a large rotary kiln, and this marks the first serious attempt in this country to recover potash at a cement works. The Reading clay deposit found at Harefield contains 2·5—3% K_2O.

Smelting works.—The general average acidity of the chimney gases discharged from smelting works fell from 3·15 grains of sulphur trioxide in 1918 to 2·46 grains in 1919, the improvement being effected largely by the use of efficient limestone scrubbing towers and milk of lime wash towers. Zinc smelting works, however, formed a marked exception. The proposed utilisation of these sulphurous gases from the roasting of zinc blende for the manufacture of sulphuric acid has not materialised owing to difficulties in the operation of the mechanical roasting furnaces, and although chamber plant was erected, it has remained idle. Electrical methods of separating dust from the furnace gases have proved satisfactory, and their use has been extended.

Sulphuric acid works.—On the cessation of large-scale explosives manufacture, many sulphuric acid plants were laid off for repairs, but by the end of the year a considerable number was in full operation again, and demand had so increased that the industry as a whole was in a fair state of activity. The use of chamber plants working with limited chamber space continued to extend; these plants are extremely sensitive and need very efficient control, not only to meet the requirements of the Act, but also to attain the best practical results. An example is given of the graphs plotted at one works, which show a continuous record of the control tests throughout the plant, such as the composition of burner gases, strengths of acids, temperature of chambers, etc. The wide adoption of this system is recommended. The catalytic oxidation of ammonia as a source of supply of the oxides of nitrogen for the chamber reaction continues to give satisfaction, but the financial success in any one instance depends entirely on the local conditions as regards the competitive price of nitre. The preliminary iron contact towers referred to in the last report continued under trial, but no definite quantitative results are yet available, and the system has not been adopted elsewhere. The towers have been found to give a great improvement in the quality of the acid made, due largely to their effect in removing dust from the burner gases prior to entry into the Glover tower. The question of the most efficient working of ordinary chambers, by varying their size and shape, position of the trunks, etc., has been under discussion for a long time, but it is thought that many plants could still be improved by the comparatively simple means of increasing the circulation of the gases. Oleum production has fallen off considerably, and some plants were shut down. The trouble in purification of the burner gases continues, and it is thought that the electrical methods for the deposition of dust, which have proved so successful in smelting works practice, could be adopted with great advantage in oleum manufacture. Part of the oleum produced has been used to bring chamber process acid up to the highest required strength, and this method of obtaining strong acid has several advantages over the ordinary method, as it avoids the last stages of concentration which have proved to cause the greatest wear on the plant, the greatest loss by volatilisation, and the highest fuel consumption. Many concentration plants were shut down owing to cessation of recovery processes in connexion with explosives manufacture. It is noteworthy that this reduction of plant has been carried out mainly by closing down cascade units. In some cases cascades have been replaced by modified Kessler plants.

Chemical manure works.—There was an increased and continuous demand for phosphatic fertilisers, which was not always met owing to irregularities in the supply of phosphate rock. The use of mechanical dens is increasing, and more new designs have been put forward, the most noteworthy being a plant on quite original lines which has been put into operation by Messrs. Kynoch at Keith. The tonnage of mineral phosphate imported into the United Kingdom in 1917, 1918, and 1919 was 276,617, 464,747, and 351,187, respectively; and the figures for nitrate of soda were 1680, 300, and 24,485 in the same years.

Sulphate and muriate of ammonia and gas liquor works.—The reversion from the production of concentrated ammonia liquor to the manufacture of sulphate continues. The total amount of ammonia products manufactured in the United Kingdom amounted to 397,513 tons (expressed in terms of sulphate containing 24·5% NH_3), and nearly 9 per cent. of this amount was produced as concentrated ammonia. In one works where the sulphuretted hydrogen of the waste gases was burnt directly for the manufacture of sulphuric acid, the chamber capacity was so reduced by reason of the large amount of inert gas admitted by the waste gas burners, that the introduction of the ordinary oxide purifiers and burning of the resulting spent oxide are now being considered. High-grade sulphate is receiving more attention, and considerable quantities of excellent dry neutral salt are being made. Inquiry into a complaint against one works showed that no sulphuretted hydrogen was discharged, but that the strong liquor contained sufficient pyridine to be offensive. This was the first time that pyridine was identified as the chief source of trouble in sulphate of ammonia manufacture, and in following the matter up a large amount of laboratory work was done on the determination of pyridine in the presence of ammonia; an account of this is given in a lengthy appendix to the report.

The "direct" and "semi-direct" processes of ammonium sulphate manufacture have proved quite satisfactory in coke-oven practice, but in gas works the conditions are different, and the direct methods have not proved so successful as was anticipated. A full review of the work done in this connexion is given, together with tables of the comparative costs of direct and ordinary distillation processes.

Nitric acid works.—The decrease in manufacture is shown by the number of registered plants which fell from 96 in 1918 to 83 in 1919.

Chlorine and hydrochloric acid works.—The production of liquid chlorine, developed primarily for war work, has led to its use in a number of commercial processes. The precautions taken for the storage and handling of this dangerous material have proved efficient. A large proportion of it is produced electrolytically in the manufacture of soda. When the demand for the latter is high, there is a surplus of chlorine over the requirements for the manufacture of bleach, etc., and this surplus has been utilised for the production of pure hydrochloric acid by direct combination with electrolytic hydrogen. The pure acid produced has proved a successful competitor to the acid made by the older methods.

Tar works.—A fatality occurred at a tar works due to the victim entering a still contrary to instructions. During the inquiry reference was made to the use of respirators, and it is pointed out that in the absence of definite information as to the particular gases or vapours present, respirators should be used with caution, as the wearing of a mask which is possibly unsuited for the specific case only leads to a dangerously false feeling of security. The total quantity of tar distilled exceeded 1½ million tons, and the amount of pitch obtained was nearly 700,000 tons.

FUEL FOR MOTOR TRANSPORT. *An Interim Memorandum by the Fuel Research Board.*

As a result of the recommendations of the Inter-Departmental Committee appointed in 1918 (this J., 1919, 250 R), a permanent organisation has been established under the Fuel Research Board for the investigation of problems connected with power alcohol. Sir Frederic Nathan, Power Alcohol Investigation Officer, has prepared a summary of the present position, which shows that the difficulties to be faced are due to insufficient supplies and excessive cost of raw materials, rather than to the indifference or lethargy of the Government Departments controlling alcohol.

The Present Position.—In 1919 the world's production of crude petroleum was 17½ thousand million Imperial gallons, to which total the United States contributed about 74 per cent., but consumed a larger quantity. The petrol imported by this country during 1918 and 1919 amounted to 193 and 200 million gallons, respectively, and for 1920 the estimate is 250 million galls. A fuel with properties similar to those of petrol is essential for certain purposes and the most suitable is alcohol, probably best mixed with ether or hydrocarbons. Mixtures of alcohol and benzol have been successfully tried by the London General Omnibus Co. During 1918 gas undertakings produced 10 million and coke ovens 32 million galls. of benzol, and the total production in 1919 was 20 million galls. The output from coke ovens may increase, but only a relatively small output from gas works is anticipated.

Practically all alcohol is now made from grain or molasses, and before the war large quantities were obtained from potatoes in Germany. It can be produced from wood cellulose, the available quantity of which in this country is negligible, from calcium carbide, which cannot be manufactured in quantity without cheap power, and from the ethylene contained in coke-oven and coal gas, the recovery and conversion of which are still in the experimental stage. It is shown that alcohol could not be produced in any quantity from the vegetable materials growable in this country (barley, potatoes and mangolds), because of the acreage required, of the high cost of cultivation, harvesting and manufacture, and of the fact that the raw materials are also foodstuffs.

Molasses is the most suitable raw material in the Empire outside the United Kingdom, the quantity available being dependent upon the output of refined sugar. The estimated Empire production of refined sugar for the 1919-1920 season is just over one million tons, and the resulting molasses would only yield 17 to 18 million galls. of 95 per cent. alcohol. In this country seven or eight million galls. of 95 per cent. alcohol is produced from molasses, and in view of present costs of materials, labour and freight, the erection of additional distilleries is not commercially practicable. The molasses should be converted to alcohol where it is produced, any excess of alcohol over local requirements being exported. The quantity of molasses available should increase with the present increasing output of sugar, and its potentialities are being pointed out to the authorities of the countries concerned, but the quantities of alcohol available from this source must be small and will be mainly used locally to replace petrol.

The difficulties referred to above as existing in this country do not apply to the same extent to the cultivation of plants containing starch or sugar for the manufacture of power alcohol in other parts of the Empire. In many cases land is available and labour would be cheaper, but the supply of fuel, water and transport may be difficult and costly. Anything in the nature of a foodstuff, wherever produced, is likely to command such a price as would prohibit its use for the manufacture of alcohol unless grown in very large quantities. The special cultivation of raw materials is almost sure to increase the cost of power alcohol, and although this may not be ultimately the governing factor, it is considered essential to use a waste material or a natural product of no other value. Steps have been taken for the initiation of research work upon the possibility of obtaining alcohol from tropical vegetation by chemical or bacteriological processes.

A section of the Finance Bill for this session provides for the use of "power methylated spirits" for generating mechanical power, and for the payment of an allowance of 3d. per proof gallon as in the case of methylated spirits used for industrial purposes (this J., 1920, 205 R). A denaturant will shortly be authorised which should reduce to a minimum the cost of denaturing power methylated spirits. Clauses will be inserted into the forthcoming Revenue Bill, extending facilities for the importation and distribution of spirits in bulk and enabling the Board of Customs and Excise to regulate the use of power alcohol. The result will be to facilitate the use of power alcohol and to reduce the expense of any necessary restrictions.

Alternative Motor Fuels.—It is clear that so long as power alcohol is produced from foodstuffs, an adequate supply is impossible until other and cheaper sources of power have been exhausted or proved inadequate. Coal is the world's principal source of fuel, the output being about 1500 million tons per annum, as against 75 million tons of petroleum. Coal being the natural source of heat and power in this country, our energy should be concentrated upon the adaptation of its products, chiefly gas and coke, to the purposes of transport until it is proved that oil exists in very large quantities. The world's undeveloped oil resources cannot be compared with the undeveloped coal deposits, and this has a special application to the British position.

By carbonisation and gasification raw coal can be "sorted out" into gaseous, liquid, and solid fuels in some of which the potential thermal units are more available for the production of heat and power than in the raw coal. The gas industry obtains from each ton of coal about 6 million B.Th.U. in the form of gas, $1\frac{3}{4}$ million B.Th.U. in the liquid products, and 17 million B.Th.U. in the coke. By recent developments 8—9 million B.Th.U. have been obtained in the gas, $3\frac{1}{2}$ million B.Th.U. in the liquid products and 15 million B.Th.U. in the coke, and it is anticipated that in special cases 10 to 12 millions may be obtained in the gas. The thermal units being more available in the form of gas than in the form of coal, one million B.Th.U. in the form of gas finds a ready market at a present price of 8—9s. compared with 1s. 6d. in the form of raw coal. Gas tar with a fuel value of about 16,000 B.Th.U. per lb. can be still further "sorted out" into benzol, etc., fuel oil and pitch, the thermal units being most readily available in the more volatile hydrocarbons. The thermal units in the form of coke are of much the same value as in coal. At the Fuel Research Station accurate data are being obtained as to the thermal and economic effect of the "sorting out" of fuels from leading types of coal, special methods of treatment being selected for each type.

The cost of one million B.Th.U. in the form of petrol at 3s. per gall. is about 21s., or $2\frac{1}{2}$ times that in gas and 14 times that in coke. In the form of alcohol at 5s. per gall. the cost would be about 52s. per million B.Th.U. The availability of the thermal units is at least as high in gas as in petrol, but gas requires very large or very heavy containers for transit; it might, however, be used extensively in omnibuses, etc., if light yet safe containers could be constructed. If carbonisation at 600° C. were generally adopted, gas of twice the calorific value would be available for this purpose. Benzol and light naphtha are so relatively costly that they should be reserved for air transport or for the lighter road transport. The coke obtained from coal carbonised at 600° C. is a smokeless fuel, easily lighted, and suitable for use in suction-gas plants. The cost of thermal units produced in this way would be 3s. per million, or one-seventh the cost of thermal units in petrol.

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Legislation.

The Finance Bill was read a third time and passed on July 28. The provisions in regard to excess profits tax (60 per cent.) and corporation tax (5 per cent.) remain as originally proposed.

The Ministry of Mines Bill was passed, without substantial alteration, on July 29, and the Dangerous Drugs Bill on the following day.

Aluminium (Imports from Germany).

In a written reply to Sir A. Steel-Maitland, Mr. Bridgeman gave the following statistics showing the imports into the United Kingdom of aluminium and aluminium manufactures consigned from Germany during the first six months of 1920 and of 1913:—

	Imports into the United Kingdom. (U.K. Accounts.) Jan.-June, 1920.		Exports from Germany to the United Kingdom. (German Accounts.) Jan.-June, 1913	
	Tons.	£	Tons.	£
Crude metal in ingots, blocks, etc. ..	243	35,773	163	13,000
Plates, sheets, bars, tubes, wire, etc. ..	—	—	230	25,000
Hollow-ware, domestic ..	185	63,492	86	20,160
Aluminium manufactures not otherwise specified ..	72	28,624		

—(Aug. 3.)

Anglo-French Agreement (Oil).

The agreement between the British and French Governments concerning petroleum applies to Rumania, Asia Minor, territories of the old Russian Empire, Galicia, French Colonies, and British Crown Colonies, but can be extended to other countries by mutual consent. The two Governments undertake to support their respective nationals in joint negotiations for the acquisition of oil concessions, shares, etc., in Rumania and in territories of the late Russian Empire, interests so acquired in Rumania to be divided equally by the two parties.

The British Government will grant to the French Government or its nominee 25 per cent. of the net output of crude oil at current market rates, which may be secured from the Mesopotamian oilfields, should they be developed by Government action; should these oilfields be developed by a private company, the French Government may take a 25 per cent. share in it, but the company is to be under permanent British control. The interests of the native Government, or of the natives, shall not exceed 20 per cent. of the share capital, and the French shall contribute one-half of the first 10 per cent. of such native participation.

The French Government will give facilities to any Franco-British group or groups of good standing to acquire oil concessions in the French colonies, protectorates, or zones of influence, including Algeria, Tunis, and Morocco. Such groups must contain at least 67 per cent. French interests. The British Government will accord similar facilities to French subjects in the British Crown Colonies in so far as existing regulations allow.

HOUSE OF LORDS.

The Proprietary Medicines Bill, introduced on July 13, is designed to give effect to the recommendations of the Select Committee of the House of Commons on Patent Medicines, which reported in August, 1914. Provision is made for the establishment of a register of proprietary medicines and appliances and of the owners thereof, and the sale of unregistered goods is prohibited.

The Nauru Island Agreement Bill (*cf.* J., 1920, 224 R) was passed on August 3.

LEGAL INTELLIGENCE.

WHALE OIL AND SPERM OIL.—*Park Rynie Whaling Co. v. South African Oil and Fat Industries, Ltd.*

In the Supreme Court of South Africa, Durban and Coast Circuit, the Park Rynie Whaling Co., which owns a whaling factory on the coast of Natal, sued the South African Oil and Fat Industries, Ltd., soap and candle manufacturers, of Jacobs, Natal, for the balance of money owing for oil sold and delivered. The contract was for the sale and purchase of No. 3 Whale Oil. The defence asserted that the oil delivered consisted of a mixture of ordinary whale oil and sperm oil. The plaintiff company did not deny this, but averred that No. 3 Whale Oil may be (and is in practice) made from any kind of whale; that the trade custom was to keep separate only the better qualities of whale oil and sperm oil, Nos. 0 and 1, and that the inferior qualities, Nos. 3 and 4, may and do consist of the oil from any species of whale, whether they be Baleen whales (*Mystacoceti*) or toothed whales (*Odontoceti*). It is known that the oil from the head and blubber of the sperm whale is a wax, and that the oil from all parts of the baleen whales is glyceridic in constitution, but there was very little evidence concerning the constitution of the oil obtained from the meat of the sperm whale, Lewkowitsch, Allen, Ubbelohde, etc., all being silent on this point. Evidence was given by Mr. A. F. Bearpark on the technical methods and trade customs of the whaling industry, and at the request of the court he undertook analyses of the oil from the flesh of sperm whales. The results showed that the oil from the flesh of sperm whales is different in constitution from the oil derived from the flesh of baleen whales.

The case lasted twelve days, and the Hon. Mr. Justice Hathorn, in giving judgment for the plaintiff company, with costs, on December 28, 1915, stated that he was unconvinced that modern whale oil produced by factories—and known in commerce as "whale oil"—was oil extracted from the flesh only of whales other than sperm whales, but he inclined to the opinion that the term would include the oil in question.

The defendant company appealed against this decision, and the judge in the Appellate Division of the Supreme Court of South Africa, Sir James Rose-Innes, Chief Justice, decided in favour of the appellants, remarking, *inter alia*, that:—"It is clear from the evidence that oil derived from whales falls into two different categories. That yielded by the various species of the genus *Balaena* (such as the 'right' or the 'humpback' whale) is in one. That yielded by the sperm whale (Cachelot) and the Arctic sperm whale is in another. . . . Under these circumstances I am forced to the conclusion that No. 3 Whale Oil denotes for trade purposes the third grade of oil obtained from whales other than sperm whales. . . . That being so, the oil which formed the subject matter of the contract was not, in my opinion, No. 3 whale oil. . . . It is clear that the delivery by the respondent company of a mixture of whale oil and sperm oil was not a discharge of its contractual obligations," and granted the appellant company its costs in both courts.

The whaling companies operating on the South African coast are now keeping all grades of sperm oil quite separate from other whale oils.

COMPANY NEWS.

ALBY UNITED CARBIDE FACTORIES, LTD.

The thirteenth annual meeting of this company was held in London on July 30, the Rt. Hon. Lord Southborough presiding.

The chairman said that, after writing off £28,655 for depreciation, the net profit for the year ended December 31, 1919, was £27,221. The interest on the preference shares had been met, and £30,886 was left to be carried forward. The company had received 15 per cent. from the North-Western Cyanamide Co., but nothing from the A/S Meraker which, owing to the cessation of demand for ferro alloys, had been forced virtually to cease production. Investments in subsidiary companies had been conservatively valued at £933,653. In taking over the assets of the Nitrogen Products and Carbide Co. (*cf.* J., 1919, 443 R), a surplus book value was shown of £160,183, and this amount had been utilised to write off preliminary expenses and other intangible assets.

The year 1919 had been unsatisfactory. In the first period, carbide had been made and supplied in fair quantities, but there had been competition from Government sales; in the second quarter somewhat less carbide was sold; the third quarter saw a general strike in the Norwegian electro-chemical industries and the closing down of all factories; and production did not get properly under way until towards the end of the year. The output of carbide for the year was 42,086 tons, which was about one-half of the capacity. Throughout the year the question of coal supply had haunted the directors, and since the closing of the accounts no anthracite had been obtainable. The yearly requirements of the company were about 50,000 tons of anthracite for the carbide furnaces, and about 25,000 tons of gas coal for lime-burning. The policy of the Government in refusing to allow coal to be exported to a British company in Norway was inexplicable, and the company had not even been allowed to ship the coal from its own colliery at Workington. Efforts to obtain coke had been equally unsuccessful, but it was hoped that a patent fuel would enable anthracite to be dispensed with. Attempts had been made to obtain coal from America, Canada, and Spitzbergen, and only in the last case was there any prospect of success, although that would not be immediate.

The great hydro-electric works at Aura, upon which about £1,000,000 had been spent, constituted a valuable asset, but construction had been stopped by the war, and more capital was required to complete and work the property. However, the directors would not disregard a genuine offer to purchase. Since the close of the financial year, the Italian interest in the North-Western Cyanamide Co. had been acquired at a favourable price, together with the rights to sell and manufacture cyanamide in certain important countries where that company had possessed no rights or only part rights. There was no fear of want of markets, the difficulty was to obtain raw materials for a regular and uniform output.

A committee of shareholders was appointed to confer with the board on the position of the company and the best means to be adopted to promote its successful working.

BRUNNER, MOND AND CO., LTD.—At an extraordinary meeting, held in Liverpool on August 4, the resolution proposed at the annual meeting, but withdrawn, relating to the allocation of £100,000 for the promotion of scientific education and research (*cf.* J., 1920, 224 R) was reconsidered and carried by an overwhelming majority.

MOND NICKEL CO., LTD.

Mr. Robert Mond, in presiding at the ninth annual meeting held in London on July 29, stated that the authorised and issued capital of the company was now £2,400,000, but that it would be necessary to increase it in the near future. During the past financial year the refining works at Clydach, in Wales, had been extended, and in pursuance of its policy of finding new outlets for nickel, the company had purchased the business and works of Messrs. Henry Wiggin and Co., of Birmingham. The increase of over £1,000,000 in the value of stocks (£2,144,000) was due to the increase of matte which had been produced at a rate somewhat in excess of demand owing to the need for keeping together the organisation in Canada, and to have a reserve for contingencies; the large stocks of metal which accumulated at the end of the war had been substantially reduced, and at the present time production at the refinery had been started on a larger scale. The unsettled state of economic life on the Continent had made trading very difficult, and the valuable French and Italian markets for copper sulphate had, in particular, been disturbed by the fluctuation of the exchanges.

The net profit of £278,200 compares with £314,400 for the previous year, and an average of £247,400 for the period immediately preceding the war. The dividend on the ordinary shares is maintained at 17½ per cent., free of tax, and the carry forward is £114,794, compared with £165,056 brought in.

W. J. BUSH AND CO., LTD.

On June 22 Mr. J. M. Bush, chairman and managing director, presided at the twenty-third annual meeting in London.

Reviewing the past year, the chairman said that trade had been slack in the early months, but later there had been great activity, and the company succeeded in disposing of its large stocks to exceptional advantage. Hence both the gross profits and the net profits (£96,423) had been greater than in any previous year. At the present time sales were diminishing and values declining. The new budget had inflicted a further injury on British essence manufacturers by adding 22s. 6d. to the spirit duty. In 1914, a puncheon of 120 galls. of spirit cost £162, to-day it cost £790. The British Essence Manufacturers' Association and the Perfumery Section of the London Chamber of Commerce were again urging the Government to give some form of relief. There appeared to be no reason why the differentiation of duty between industrial alcohol and that for potable liquors should not be extended to essences as well as to medicinal preparations; the duty in the former case was 74s. and in the latter 14s. 9d. per proof gallon. Other branches of the business, *e.g.*, synthetic perfumes, drugs, and some dye-intermediates, had made satisfactory progress, and this was expected to continue.

In March last, £125,000 was capitalised out of reserves, and the ordinary share capital was doubled by distributing a cent. per cent. bonus. The original ordinary shares received an interim dividend of 5 per cent., and a further 10 per cent. is now payable on the increased capital. The carry forward is £38,161, out of which excess profits duty will be paid.

British Cellulose and Chemical Manufacturing Co., Ltd.—Owing to prolonged delay in plant construction, the directors have decided to postpone payment of the dividend on the cumulative preference shares. Good reports have been received as to the dyeing and weaving qualities of the silk produced, and the plant for making non-inflammable celluloid is nearing completion.

OFFICIAL TRADE INTELLIGENCE

From the Board of Trade Journal for July 29 and August 5.

TARIFF. CUSTOMS. EXCISE.

Argentina.—The Inland Revenue duty on whisky has been increased to 2 pesos 50 centavos (paper) per bottle of 1 litre or less.

Canada.—The Special War Revenue Act, 1915, has been further amended as from May 19. Among the articles affected are cut glassware, certain kinds of china, articles of gold, confectionery (with some exceptions), alcoholic beverages, and perfumes.

Germany.—A list of goods the import of which is prohibited may be seen at the Department.

Czecho-Slovakia.—The "turnover tax" of 1 per cent. of the purchase price is applicable to imported goods when sold in the country.

Among the articles subject to the "luxury tax" are china, certain kinds of glass, toilet articles, and photographic requisites.

Denmark.—The export of nickel coin is prohibited.

Finland.—Export licences are not required for, *inter alia*, caraway seed, certain kinds of wood, wood pulp, paper, pitch, wood tar, crude turpentine, matches, calcium carbide, and resin.

France and Algeria.—The decree, dated April 23, imposing certain import prohibitions has been abrogated and import prohibitions have been withdrawn except in very few cases. The "coefficients of increase" on certain articles of luxury have been augmented.

Greece.—Articles affected by the new tariff amendments include margarine, timber, dyewoods, tanning extracts, ochres, petroleum, tin, soap, benzene, condensed milk, hides, sugar, alcoholic liquors, earthenware, faience, paper, cardboard, rubber, and scientific instruments.

Details of the new municipal (octroi) taxes are set out in the issue for August 5. Among the articles affected are hair, bones, manure, dégras, vegetable fibres, raw cocoa, liquorice, certain oil seeds, dry pitch, tar, certain stones, clays, magnesite, sulphur, sand, lime, borax, emery, minerals, many metals and salts, quinine, certain kinds of soap, asbestos, firebrick, broken glass, paper pulp, paper, optical instruments, rubber, gutta-percha, and yeast.

Jamaica.—The increased import duties imposed by Laws No. 3 of 1916 and No. 11 of 1919 and the export Law No. 2 of 1919 are continued in operation until March 31, 1921.

Lithuania.—The export duties on certain woods and wood pulp have been increased.

Netherlands.—Export prohibitions have been temporarily raised from all fatty acids, edible fats, certain vegetable oils and waxes, mineral wax, ceresin and paraffin wax.

New Zealand.—The import of tin-pipe, solid drawn, not wrought, plated or polished, is duty free, but is subject to the "Primage Duty" of 1 per cent. *ad valorem* levied under the Finance Act, 1915.

Poland.—Among the articles of "luxury" the import of which is prohibited are vanilla, saffron, certain spices, chicory, fireworks, and certain leather wares

Sweden.—The amended regulations affecting the import of sole, welting and strap leather are given in the issue of August 5.

Tunis.—The export and re-export of certain kinds of timber and mineral oils are prohibited as from June 30.

Turkey.—The export of paints and foreign hides is now permitted.

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of firm or agent.	Materials.	Reference number.
Canada	Chemicals for paper mills, paper	119
"	Hard steel wire, black annealed sheets, electrical porcelain	120
"	China	121
"	Chemicals for pulp mills	153
"	Soap, toilet articles	154
"	Bottles	*
"	Bond papers	*
"	Cocoa butter substitute, gelatin, basic colours, citric and tartaric acids	†
New Zealand	Glass bottles, sheet and plate glass, roofing tiles, asbestos slate	157
South Africa	Galvanised iron	124
Belgium	Steel (all kinds)	125
"	Tallow, palm oil	160
Finland	Iron, steel, non-ferrous metals, leather, tanning extracts, chemicals, cement, glass, china	127
France	Raw materials for the manufacture of perfumery	128
"	Leather, rubber tyres	161
Latvia	Beef tallow, coconut oil, resin	134
"	Beef tallow, coconut oil, caustic soda and potash	135
Rumania	Chemicals	136
Serb-Croat-Slovene States	Vegetable fibres, sugar, leather, rubber, paper	138
Switzerland	Chemicals	141
Algeria	Chemicals, window glass, zinc white, white lead, oils, varnish	145
China	Metals, heavy chemicals, paper, cardboard	163
Syria	Iron and steel rolling mill products, cement, cast iron and earthenware pipes	143
United States	Coconut oil, palm oil, castor oil, rape oil	146
Venezuela	Twine, wire nails, china, porcelain, pottery, oils, paint, varnish	151

* The High Commissioner for Canada, 19, Victoria Street, London, S.W. 1.

† The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

TRADE NOTES.

FOREIGN.

Foreign Company News.—*France.*—The past financial year has been a profitable one for French chemical manufacturers. Thus, the "Etablissements Kuhlmann" made a net profit of 9,931,491 fr. in 1919, and it has been decided to raise the capital from 60 to 100 million fr.; the "Electro-Chimie et Electro-Metallurgie" company announces a net profit of about 3,700,000 fr., as against 1,546,000 fr. in 1918; and the "Produits Azotés" company is about to increase its capital from 10 to 20 million fr. Satisfactory progress is reported with the proposal to acquire the Toulouse powder works for the manufacture of synthetic nitrogen products by the Haber process. It is also reported that the "Stearineries et Savonneries Lyonnaises" is about to enter into close commercial relations with the "Société des Hydrocarbures" of St. Gobain, the "Air Liquide," and the "Poulenc" companies.—(*Z. angew. Chem., June* 25, 1918.)

The formation is announced of a new Alsatian company, the "Société des Mines de Potasse du Haut-Rhin," which will compete with another company now being formed, the "Société Alsacienne des Mines de Potasse." The latter company, with a capital of 75 million fr., seeks to bring about an amalgamation of all the potash undertakings, but the former intends to take over only a portion of them, in agreement with the scheme laid down by the French Government. The Haut-Rhin company takes the view that competition should have a good effect on the development and enlargement of the mines. The shares are of 2000 fr., and more than five will not be allotted to any one person.—(*Z. angew. Chem., July* 20, 1920.)

The Penarroya company has declared a dividend of 38 fr., and has decided to issue a loan of 60 million pesetas in Spain (peseta = 9½d.). A factory in the Nord department has been purchased from the Malfidano company, at which manufactures of lead will be produced. An agreement has been arrived at with the "Société Minerais et Métaux" respecting the sale of products from the company's factory in Belgium, which has recently resumed operations.—(*Rev. Prod. Chim., June* 30, 1920.)

Germany. — The German Gold- und Silber-Scheide-Anstalt in Frankfort is paying a dividend for 1919-20 of 17 per cent. on the increased capital of 40 million mk., as against 20 per cent. on 20 million mk. It is anticipated that the foreign trade in chemicals and dyes can be still further increased.

The net profit of the Dynamit A.-G., vorm. Alfred Nobel u. Co. in Hamburg for the year amounted to 6,193,891 mk. (5,796,835), which enabled the company to pay a dividend of 16 per cent. (15). It is hoped that the manufacture of a number of new goods, including materials or "staple" fibre, will be beneficial and lead to the employment of more labour. Together with two other works belonging to the company, it is undertaking the breaking up of ammunition, as prescribed by the Peace Treaty.

H. B. Sloman and Co., Salpeterwerke A.-G. in Hamburg, reports, for the year 1919, a gross profit of 7·8 million marks (3·7 in 1918), and a net profit of 1·9 million mk. (3·6), after making increased allocations to reserves. The dividend is 10 per cent. (20). Production of nitrate could not be resumed until November, 1919, when three factories restarted operations, and these are still working. The quantity of nitrate shipped was 691,514 quintals (q. = 101·42 lb.). The policy of the saltpetre producers in regard to prices and sales is held to be mistaken, and the company has not yet joined the Association of Nitrate Producers.—(*Z. angew. Chem., June* 22, *July* 20, 1920.)

Swedish Chemical Market in 1914 and 1920.—The prices of certain typical chemicals in Sweden in 1914 and in March, 1920, are given in the following list in kronor per quintal (krona = 1s. 1½d.):—

	1914.	March, 1920.
Alum	9	40–42
Ammonium carbonate (coml.)	65	120–135
Ammonium chloride (white)	43	125
Ammonium sulphate	24	95
Ammonium nitrate	52	60–62
Borax	34	120
Calcium chloride	10	40
Chile saltpetre	19·60	47
Chrome alum	28	220
Hydrochloric acid (20—21%)	4	18–20
Magnesium chloride	6	25
Nitric acid, conc.	20	70
Norwegian saltpetre	—	40–42
Oleum (12%)	21	20–24
Phosphorus	338	360
Phosphorus sesquisulphide	218	280
Phosphoric acid	91	170
Potassium carbonate (69—98%)	30	300
Potassium chloride	19	65–75
Potassium chlorate	56	140–150
Potassium hydroxide	21	310–330
Soda, calc.	7·20	60–70
Sodium sulphate	3·40	23–25
Sodium sulphite	39	50
Sodium sulphide	—	55
Sulphur	8·80	30
Sulphuric acid, conc.	6	18
Water glass	8	30

—(*Chem. Ind., May* 26, 1920.)

Wood Distillation Products in Sweden.—According to the Year Book of the Swedish Chamber of Commerce in London for 1919, the high expectations that were formed at the end of 1918 of regaining a market in the United Kingdom for Swedish wood distillation products have been fully realised. Large quantities of genuine peasant-made Stockholm tar have been imported into this country, but it can scarcely be stated that Sweden has had her share of the total import, as shown by pre-war statistics. Prices have been very high, and Finnish exporters have taken advantage of the favourable exchange to undercut, with the result that large quantities of Finnish tar have come in. It has been found that consumers would rather pay a slightly higher figure for the genuine valley-burnt tar, and in consequence the sales of kiln-burnt tar have fallen off considerably. At the end of the year stocks seemed to have reached a normal figure, and there is every indication that this trade is no longer subject to the fluctuations which are so harmful in re-establishing business. There has been a big demand for other distillation products, such as tar oil, acetate of lime, methyl alcohol, rosin, and turpentine.

REVIEW.

A Text-Book of Inorganic Chemistry. *Edited by* J. Newton Friend. *Vol. IX. Part I.: Cobalt, Nickel, and the Elements of the Platinum Group. By* J. Newton Friend. *Pp.* xii.+367. *(London: Charles Griffin and Co., Ltd.* 1920.) *Price* 18*s. net.*

This volume, the fifth of the series so far published, deals with the metals of Group VIII. other than iron, which has been assigned a separate volume. The general arrangement of the text matter is already familiar, as a uniform plan has been adopted for all the volumes of the series. It should be remarked, however, that Vol. IV. is the only one so far which contains a separate short paragraph on the thermochemistry of the element under discussion; in Vol. IX. the thermochemical data are almost confined to the halogen compounds of platinum. Again, crystallographic data are few, and though the constants for the platinocyanides are given fully, Tutton's classic researches on the double alkali-cobalt and alkali-nickel sulphates and selenates are very briefly referred to, no figures being reproduced. A few rather important compounds have not been described, *e.g.*, cobalt pyrophosphate, cobalt ammonium phosphate, nickel ammonium phosphate; the xanthates of cobalt and nickel; sodium chlororuthenite and chlororuthenate. The reduction of the solubility of nickel ammonium sulphate by ammonium sulphate might have been mentioned, as also numerical data for the solubility of potassium chloroiridate.

Apart from 25 obvious misprints noticed by the writer (*e.g.*, "Absolan," "Erythine," table, p. 20; "Breihauptite," pp. 78 and 80), substitution of words has occurred in several places. Thus we find calcium for cobalt (p. 45, last line); nickel for cobalt (p. 66, l. 17); oxidation for reduction (p. 210, l. 22.); potassium for sodium (p. 230, l. 4); hydrochloric for hydrofluoric (p. 236, l. 39); sesquioxide, for sesquisulphide (p. 333, l. 23); and hydrogen for hydrazine (p. 336, l. 11). The second equation on p. 233 is wrong; in the table shown on p. 100 the currency of Switzerland is given as "cents," that of U.S.A. as "paras" and "centesimos."

Attention must be called to a few inaccuracies and statements that may lead to misunderstanding. The following two passages appear contradictory: When potassium chloropalladite is "boiled with excess of water, potassium chloropalladate, K_2PdCl_6, is formed" (p. 196); and under potassium chloropalladate (p. 198): "on boiling with excess of water, potassium chloropalladite is formed." The colour of ammonium chloropalladite (p. 197) is given as "dark green"; olive-green would be more nearly correct. In the Table of Reactions, on p. 332, the yellow precipitate of potassium chloroplatinate has not been included; the precipitate produced by dimethylglyoxime is attributed to ruthenium in place of palladium, whilst palladous chloride is wrongly stated to give a "red ppte. of K_2PdCl_4"; this confusion occurs again on p. 335. As a matter of fact, the chloropalladite, K_2PdCl_4, is readily soluble in water, while the red chloropalladate, K_2PdCl_6, is not. Describing the distillation of ruthenium tetroxide in a current of chlorine, the author states (p. 333) that "the liquid in the distilling flask must be kept alkaline to prevent iridium chloride from distilling over with ruthenium." This statement, which is repeated on p. 340, is unsupported by any reference to literature and is at variance with the reviewer's experience. Deville and Stas, in their monograph, "De l'Analyse du Platine Iridié," remark that traces of alkaline chloride and iridium may be carried over mechanically during effervescence; whilst Leidié and Quennessen (Compt. Rend., 1903, **136**, 1399) say that the liquid must remain alkaline throughout "*à cause de l'action de HCl sur RuO_4.*" Mellor ("Quantitative Inorganic Analysis," p. 438), on the other hand, writes: "The liquid in the distilling flask must be kept alkaline to prevent the action of hydrochloric acid on the iridium tetroxide (*sic*) and the subsequent volatilisation of iridium chloride." To the writer's knowledge neither iridium tetroxide nor a chloride of the same metal volatile at or near 100° C. has ever been observed; in his opinion, the acidity of the liquid under treatment may cause retention of ruthenium, not volatilisation of iridium. The statement that hydrogen sulphide in acid solution precipitates osmium "monosulphide" (p. 337) is not quite in accord with the text on pp. 228 and 229. The first sentence on p. 341 requires qualification (*cf.* paragraph immediately following); neither ferrous sulphate nor stannous chloride reduces platinum salts to the metal in acid solution, and ferrous sulphate in neutral solution only on prolonged boiling.

However, the above are minor defects, which can be remedied in the second edition. The volume forms a most welcome and valuable addition to the existing reference books on the subject, whilst the whole series, once completed, promises to become a standard treatise of inorganic chemistry in the English language. W. R. Schoeller.

PUBLICATIONS RECEIVED.

Technical Methods of Ore Analysis. *By* A. H. Low. *Eighth edition, revised and enlarged. Pp.* 388. *(New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1919.) *Price* 19*s.*

Publications of the Canada Department of Mines. Mines Branch. *(Ottawa: Thomas Mulvey.* 1920):—

Graphite. *By* H. S. Spence. *Pp.* 202+*Plates LVI.*

Publications of the United States Geological Survey. Department of the Interior. (*Washington: Government Printing Office.* 1920):—

Cadmium in 1919. *By* C. E. Siebenthal.

Chromite in 1918. *By* J. S. Diller, E. F. Bliss, H. R. Aldrich, and E. F. Burchard.

Copper in 1917. *By* B. S. Butler.

Lead in 1917. *By* C. E. Siebenthal.

"ROPINESS" IN BREAD.*

J. GRANT.

The name "rope" or "ropiness" is given to a disease in bread that causes the crumb or interior of the loaf to become moist, sticky and capable of being drawn out into threads.

Very little was known about this disease until within the last forty years. Pflügge was probably the first to investigate the problem seriously. The writer's observations on the disease go back for more than thirty years. Some of his early days were spent in a country district in the south of England where wheat, barley, other cereals, and hops formed the staple crops. The wheats grown were milled in stone mills driven by wind or water power. Very little attention was paid to the thorough cleaning of the grain before milling; consequently, the flours were dull-coloured, weak, and contaminated by numerous micro-organisms. Moreover, it was not an uncommon occurrence for quantities of sprouted wheat to be used. Towards the end of the summer and early autumn, especially when the season was wet, string mould in bread was frequent. It has been long known that lightly baked bread was much more liable to the disease than bread baked so that it became covered with a thick, sweet-eating crust. The string mould was accompanied by a nauseating smell and taste, so that the bread became inedible. Very rarely did it reach the stage of forming a hollow centre surrounded by a dark, sticky, strongly smelling mass.

It should be remembered that in those days much more baking was done at home than in modern times. Again, little or no distillery yeast was obtainable, so that one had to depend on the local breweries for the yeast. This form of yeast works slowly, and usually produces a small-volumed, dark-coloured loaf of sweet-tasting bread. Sour bread, wherever brewers' yeast is employed, is the exception, but the same cannot be said of distillers' yeast and long processes. It is only the skill of the baker and short processes that yield a sweet-eating loaf with this yeast. Further, in the Mid-Victorian period it was quite an everyday matter to find bakeries in large towns placed underground, with the idea of keeping an even temperature.

Cleanliness and sanitation were unknown, so that it was no unusual occurrence to find bread attacked not only with "rope," but also with moulds and other micro-organisms. The introduction of sanitary laws and roller-milling, together with a thoroughly efficient system of cleaning and preparing the wheat for actual milling, practically revolutionised the industry, and put an end to "ropiness" and other similar diseases of bread except in the very lowest grades.

The disease is introduced into the flour from the outside of the wheat berry, where the disease germs find a secure refuge from the cleaning plant of a mill in the deep crease of the berry. As XX flour comes from the inside of the berry nearest to the bran, it can readily be understood that bakers' grade of bread, especially when lightly baked, is very liable to attacks from "ropiness" in hot, moist weather. Brown breads of the germ and malt type —those breads which possess the greatest food value—are peculiarly prone to suffer from ropiness.

During the period from 1904, when the Bakery and Confectionery School at the Manchester College of Technology was placed under the writer's direction, numerous cases of ropiness and many other bread diseases came under his notice. The phenomena accompanying the disease are not the same in all cases. In some instances, when the attacks are not very severe, casual observation reveals very little, except where the bread is closely stored, in which case a faint, unpleasant odour may be noticed. Given, however, favourable conditions the symptoms develop rapidly, and all the well-known and dreaded phenomena occur. One severe attack resulted in a cavity in the interior of the loaf identical with the shape of the loaf and actually conforming to it. In this particular case, the disease was caused by the presence of a group of bacteria belonging to the *proteus* group.

In 1906, Watkins showed that acidity checked the growth of bacteria causing "rope." (*Cf.* J., 1906, 350.)

Until the work done during the war, the classical researches of Pflügge and Emil Laurent were quite the best information bearing on the subject. The former studied the several variations of the *Bacillus mesentericus* as it occurs in the potato. He found it chiefly in the depression known as the eye.

The most common is the *B. mesentericus vulgatus*, which forms greyish-white colonies that can be drawn out into threads. This organism excretes three groups of enzymes:—(a) Peptonising, which liquefies the medium; (b) an amylase, that attacks the starch of the potato; (c) an enzyme resembling rennin.

Other forms are *B. mesentericus fuscus*, that in many ways resembles *B. m. vulgatus*, but is more delicate; and *B. mesentericus ruber*, which is very similar to the *vulgatus*. Streak cultures of the latter organism are at first reddish-yellow, but rapidly become rose-red. The endospores are very difficult to kill, as they withstand a temperature of 100° C. for six hours, but are killed at once at 130° C. It should be remembered that the interior of a loaf during baking rarely exceeds a temperature of 103—105° C., and is generally about 101—102° C.; hence it is obvious that heating for 40 to 60 minutes in the oven is not likely to kill the spores, though they may be much weakened.

Emil Laurent was the first to examine this disease of bread closely. He showed that it occurs regularly in the normal fermentation of dough, and gave it the name of *B. panificans*. That the disease of "ropiness" is not more frequent in bread is due to the strongly acid reaction of the dough. (Watkins had evidently not seen Laurent's work.) He (Laurent) also pointed out that *B. mesentericus vulgatus* is closely allied to the *B. liodermos* of Loeffler, the gum bacillus of cow's milk.

In July, 1917, the (War) Food Committee of the Royal Society published an important interim report on "rope" in bread. The subject had also been taken up in Cambridge by Dr. D. Jordan Lloyd and a group of bacteriologists, and the results they obtained were of the greatest interest to both miller and baker. The opening paragraph gives the cause of "rope" in the following words:—

"Rope in bread is due to the development in the bread, after baking, of one or more types of bacilli, all belonging to the potato bacillus group (*B. mesentericus*). This group consists of a large number of ill-defined species. Four distinct types of bacilli have been isolated from grain, flour, and ropy bread, which were all capable of producing rope."

The four types are as follows:—

A.—A non-motile bacillus } from wheat, barley, maize, "ropy" bread, flour.
B.—A motile bacillus }

C.—A motile bacillus, from "ropy" bread alone.

D.—A motile bacillus, isolated from bread.

The C. and D. types give no stain on bread. Rope bacilli are present on all grain and in all flours. The spores are not destroyed by less than five hours' heating at 100° C. They are, therefore, not destroyed by the heat of baking. These state-

* A paper read before the Manchester Section on March 5, 1920.

ments are in agreement with the work of Emil Laurent.

There are six factors concerned in determining the development of the "rope" bacillus in bread. These are:—(1) The degree of infection; (2) the chemical reaction of the flour; (3) the temperature; (4) the time; (5) the moisture; and (6) the chemical composition of the flour. Primary infection comes from the flour, but the danger is greatly increased by carelessness in the bakehouse. The full report of the work of the Food Committee, as published in the Journal of the Royal Society, may rightly be designated as the classic on this subject.

In 1918, the Ministry of Food published a short but interesting pamphlet on the subject. It is an undoubted fact that the "rope" disease has made its appearance in bread sporadically throughout the country. The Food Controller has been advised that "rope" is caused by the *B. mesentericus*, which is generally present in dirt or dust, and also on the outer husk of the wheat; hence, it is always present in flour. With the higher percentage of extraction and the use of low-grade wheats there is increased risk of infection by the germ. The same statement holds good at the present time, since there is a high percentage of extraction, and low grades of wheat are issued to the millers. The bacillus is normally harmless, but when conditions become favourable it causes fermentation and the bread becomes "ropy." The conditions leading to fermentation are warmth and excessive moisture. The combination of undercooked dough with a moist, warm temperature appears exactly suitable for the growth of "rope." In the early stages of the disease the bread is unwholesome, and in the later ones uneatable

Nearly two years ago the writer investigated the question as to the existence of any predisposing circumstances, such as the influence of previous crops on the abundance of these micro-organisms in the soil. Two fields, just across the Mersey, in the county of Cheshire, were cropped with wheat. In the previous year one field had yielded a heavy crop of King Edward VII. potatoes that had been singularly free from fungoid disease; the other had been sown with wheat. The year previous to this, both fields were under clover.

It is well known to agriculturists that wheat, like other cereals, thrives better if the preceding crop has been clover or pulses. In order to follow up this line of argument, the wheat was allowed to mature in the stacks, several samples were obtained from various parts of each stack, and a series of investigations was begun. The results showed that the wheat from the field previously cropped with wheat contained the usual soil micro-organisms found on the surface of cereals, including some *B. mesentericus* and quantities of the tetanus bacillus. The latter is not by any means unusual as, a number of years ago, the writer received a somewhat rude shock on finding many long rods of tetanus with numberless free-floating spores in some steep water from a lovely specimen of prize barley from Porlock, in Somerset. The wheat from the field previously under potatoes caused almost infinite trouble from the commencement of the work. The various forms of organism responsible for potato diseases were present in abundance and had to be eliminated from the cultures. Eventually cultures were obtained that readily and rapidly produced all the symptoms of "ropiness" in slices of sterile bread. These slices were next used to inoculate flour, and in this way the presence of "rope" organisms in abundance was established.

The work is of some importance, as it shows clearly that wheat to be used in flour mills ought not to be sown on land previously cropped with potatoes. The usual insecticides are practically valueless for destroying the spores of bacteria that induce "ropiness" in bread.

The Royal Society Food Committee states briefly that only the most drastic remedies are effective for eliminating "ropiness" from a bakery when once established therein. Such a statement is practically useless to a baker. Every part of the buildings, the whole of the machinery, the bread racks, vans, and other utensils should be thoroughly scoured with strong soda water, steamed, then every appliance covered with a thick coating of bisulphite of lime. This very drastic treatment must be repeated at least twice to be effective. Before starting work again, the bisulphite should be completely washed off all the utensils and machinery. Formalin has been used in the place of bisulphite of lime, but it is more costly and not quite so effective. Again, if the bread, on being drawn from the oven, is cooled rapidly to below 65° F., say in a passage open at both ends, there is very little risk of the disease developing in the bread.

THE EFFECTS OF AIR POLLUTION BY SMOKE AND ITS PREVENTION.*

J. B. COHEN.

The Smoke Abatement Committee appointed by the Minister of Health, after taking a large amount of expert evidence, has issued an interim report on what may be termed "domestic smoke." The object of this report is mainly to furnish information as to the best methods of preventing smoke in connexion with the new housing schemes to which the Ministry is offering large subsidies and which consequently have to receive its approval. Incidentally, the destructive effects of coal smoke and the wastage of fuel, as well as the efficiency or otherwise of domestic heating appliances, have been considered. The annual loss of fuel in the form of soot is estimated at nearly 2½ million tons. At the same time, it is pointed out that the presence of soot is an indication that a far more formidable loss is being incurred by the inefficient utilisation of the heat from the fuel. Moreover, domestic soot, by reason of its higher content of tar, which causes it to adhere to the objects upon which it falls, is far more destructive and dirt-producing than factory soot, which is a product of more complete combustion and contains less tar and more ash. The following analyses will make this clear:—[1]

Constituents.	Original coal.	Ordinary grate flue.	Top of boiler chimney —110 feet.
Carbon	60.30	40.50	27.00
Hydrogen	4.89	4.37	1.68
Tar	1.64	25.91	1.14
Ash	8.48	18.16	61.80

As regards the effect of a smoky atmosphere on health, statistics show that a town fog immediately increases the death-rate from respiratory diseases, and the cause underlying this high mortality, which invariably follows in the wake of a thick fog, must operate, though to a lesser degree, on the general health of the community in an industrial centre under normal conditions. More definite evidence was forthcoming of the effects of smoke on vegetation. By shutting out sunlight, by covering the leaf and blocking the stomata with tar, life, especially that of evergreen plants and trees, is seriously affected. Moreover, the sulphuric acid which is invariably associated with soot, destroys the nitrifying organisms and removes lime from the soil as

* *Vide* Interim Report of the Smoke Abatement Committee of the Ministry of Health, 1920. H.M. Stationery Office.

[1] Smoke, a Study of Town Air, by J. B. Cohen and A. G. Ruston. E. Arnold, London, 1912.

sulphate. This result has been observed at the experimental farm at Garforth attached to the University of Leeds, where the difference between limed and unlimed soils has exhibited in a remarkable way the action of acid soot. Another indirect result has been the diminished value of grazing land in smoke-infected areas, in consequence of which the rental of these pastures has steadily decreased from year to year.

Equally striking evidence was submitted to the committee by Sir Frank Baines, Director of H.M. Office of Works, as to the serious damage occasioned to public and other buildings by smoke and other impurities in the atmosphere, and especially by the deposit of acid soot. The effect in most cases was due to the removal of the calcium carbonate (which acts as a cement for grains of siliceous material) in the stone becoming dissolved as calcium sulphate, and thus causing the siliceous particles to crumble away. In the opinion of Sir F. Baines, the cost of repairs and upkeep of public buildings and monuments (a very heavy expense) would be diminished by one-half if the smoke and the accompanying acid could be eliminated.

This acid soot not only clings to vegetation and to stone, but corrodes brick and metal work, attacks fabrics, leather binding of books, and discolours paint. The Manchester Air Pollution Advisory Board find, in Manchester, in the cost of washing materials alone, apart from the labour involved, that more than £250,000 would be saved annually by the absence of smoke. A very careful and exhaustive inquiry by an expert committee of engineers, architects, and scientists estimated that in 1912, in Pittsburgh, U.S.A., the cost due to smoke was £4 per head of the population. If we take as a rough estimate the 20 towns of the United Kingdom of over 200,000 inhabitants having a total population of over 12 millions at 10s. a head, we get a sum of six millions, whilst the waste accruing from the non-utilisation of the by-products from raw coal, such as tar oils, sulphur, ammonia, and cyanogen compounds, so essential to our chemical industries and motor traffic, must amount to many millions more.

A considerable amount of expert evidence was placed before this committee on the efficiency of kitchen ranges and on that of coke and coal burnt in an open fire by Prof. Barker, of University College, London,[2] and Mrs. Fishenden,[3] of the Manchester College of Technology. There was a consensus of opinion that the old form of open kitchen range with back boiler was inefficient, wasteful in fuel and labour, and productive of smoke.

For cooking, warming rooms, and providing a hot-water supply, the following recommendations were made by the committee, and, in considering these they were guided by the utility, economy and efficiency of the proposals as regards smoke prevention. They do not recommend any one method, but make the following suggestions:—That gas cookers and gas fires are thoroughly hygienic when properly installed; that where an adequate supply of gas is available, a gas-cooker should be substituted for the ordinary coal range; that for intermittent use both gas cookers and gas fires are often more economical than coal fires; that from a hygienic and labour-saving point of view electric cooking and heating have much to recommend them, but the present high price of electricity precludes their general adoption. The cheapest and most efficient method of producing a supply of hot water is a coke-fired boiler. A gas boiler, though more expensive, is very convenient in hot weather. The warming of rooms may be effected by hot-water radiators or gas fires, both of which are quite hygienic if the rooms are adequately ventilated. In this way coal may be dispensed with, and this system has been successfully established at the Austin Motor Company's village at Northfield, near Birmingham, where the warming of rooms by radiators and the hot-water supply were provided for by a coke-stove and the cooking was done by gas. No coal entered the village and no smoke issued from it. The foliage and grass retained their fresh and clean appearance, and there was no discolouration of clothes and fabrics from the fall of soot. There is, however, a difficulty in dispensing with an open fire. Custom and sentiment are not easily eradicated, and there is no doubt that the appearance of warmth is even more important to the comfort of many people than its mere sensation. But this difficulty is in a fair way of being overcome. The production of what is known as low-temperature coke, or semi-coke, or "coalite," which ignites easily and glows with little or no smoke, is being investigated by the Fuel Research Board under the Department of Scientific and Industrial Research, and when this fuel is on the market at a moderate cost and in sufficient quantity the domestic smoke problem will be near solution. Meantime a coke stove which can be readily lighted is being perfected by a Halifax firm and has the advantage of being used as an open stove for warmth or closed for heating radiators or the boiler, or both, and for consuming kitchen refuse.

Hence efficiency, economy, cleanliness, and comfort can be obtained to-day, if we choose, without resorting to raw coal, thus producing an enormous national saving, with the added blessings of pure air, clear skies, and clean foliage.

Vide ([2]) *Report of the Fuel Research Board* for 1918–1919, Appendix B and p. 26.

([3]) *Coal Fires.* By Dr. Fishenden, Air Pollution Advisory Board, Manchester City Council.

METHODS OF METALLURGICAL RESEARCH.

Following established tradition, Mr. C. T. Heycock, F.R.S., in his presidential address to the Chemical Section of the British Association at Cardiff on August 24, gave a summary of the present state of our knowledge of metallic alloys, dealing for the most part with those of the non-ferrous metals. He dealt particularly with the manner in which our present detailed knowledge has been acquired, especially in view of the sparse information available forty years ago. The work of Sorby, published in 1864 and 1887, on the microscopic structure of iron and steel was specially mentioned as the foundation of modern metallography, and the value of the work of Mattheisen, Guthrie and Raoult was emphasised in connexion with modern theories of the constitution of metallic alloys. The question of pyrometers for the accurate determination of high temperatures received special attention and the importance of these determinations in connexion with the construction of freezing-point curves and equilibrium diagrams was shown. The remarkable accuracy of the determinations of the melting points of the metals made by Holborn and Wien in 1892, Callender and Griffiths in 1892, and Heycock and Neville in 1895 as compared with the later determinations made by Burgess and Le Chatelier in 1912 was clearly illustrated in a useful table. The pioneer work of the late Sir William Roberts-Austen, especially in connexion with the five reports of the Alloys Research Committee of the Institution of Mechanical Engineers 1891 to 1899, was given full recognition. The great value of these reports was considered in detail, and it was pointed out that the second report, dealing with the effects on the properties of copper of small quantities of arsenic, bismuth and antimony, showed that the presence of 0·5 to 1·0 per cent. of arsenic was highly beneficial. The fourth report contained a *résumé* of the Bakerian Lecture given by Roberts-Austen, on the diffusion of metals in the solid state, in which he showed that gold even at a temperature of 100° C. could penetrate into lead and that iron became carburised at a low red heat by contact with a diamond in a vacuum. The fifth report dealt with the effects of additions of carbon to iron, and gave a description of the thermal effects which were plotted, as well as photomicrographs of the various constituents of the steels. It was pointed out that the work contained in this report, together with the work of Osmond and others on steel and iron, provided much of the material on which Prof. Roozeboom founded the iron-carbon equilibrium diagram, which, although not representing the whole of the facts, affords the most important clue to the constitution of steels.

The work on the copper-tin series received special attention and provided a good illustration of the value of microscopical examination in conjunction with the thermal examination of alloys. In 1897, Heycock and Neville determined the complete freezing-point curve of this series, confirming and extending the work of Roberts-Austen, Stansfield and Le Chatelier, but at this time the real meaning of the curve was not understood. As a result of a suggestion made by Sir G. Stokes in 1900, the aid of the microscope was called in to assist in the interpretation of the singularities of the freezing-point curve. This work occupied more than two years and was published as the Bakerian Lecture, 1903. During the preparation of the alloys of this series, it was noticed that the crystalline pattern which developed on the free surface of the slowly cooled alloys was entirely unlike the structure developed by polishing and etching prepared sections from the interior, and it was concluded from this that changes were taking place within the alloys as they cooled. In making this investigation, the procedure of Sorby in the examination of steels was followed, that is, the alloys were quenched at definite temperatures during cooling in order to fix the changes by sudden cooling. In order to apply this method of examination to copper tin alloys, cooling curves were first obtained and subsequently samples of the alloys were cooled down to within a few degrees above and below the various halts obtained on the cooling curves. On examining the chilled specimens, the changes in structure due to the halts were ascertained and the method of chilling was also found useful in fixing definitely the points on the solidus, for on chilling an alloy when it is partly solid and partly liquid, micro-examination shows it to consist of large primary combs embedded in a matrix consisting of mother liquor in which are disseminated numerous small combs called "chilled primary." By repeating the process at successively lower and lower temperatures, a point is reached at which the chilled primary no longer forms, thus giving the upper limit of the solidus. In connexion with the constitution of the copper-tin alloys, Haughton's work (1915) has done much to clear up doubtful points in the tin-rich region of the diagram.

In conclusion, the value of the laborious preparation of elements and new compounds in research laboratories was emphasised, and it was pointed out that chromium, cerium, calcium, acetylene, etc., although unknown outside the laboratory of the purely scientific investigator a comparatively few years ago, are now essential to modern scientific industry, and it is evident that the obligation to provide financial aid for scientific research devolves upon those who have reaped the fruit of previous scientific discovery.

CORRESPONDENCE.

THE ARTIFICIAL SILK INDUSTRY.

Sir,—In the Journal of the Society of Chemical Industry for August 15, 1920, an article was contributed by Mr. L. P. Wilson, of Messrs. Courtauld's, Ltd., in which reference was made to the artificial silk manufactured by the British Cellulose and Chemical Manufacturing Co., Ltd., Spondon, in such terms as to convey an impression detrimental to the latter. So far as the first part of that article is concerned I wish to make no comment, but when serious and specific statements are published regarding the cellulose acetate silk produced by the British Cellulose Co., we are at least entitled to demand that criticisms should be based on knowledge and experience of the product.

The merits of the silk in question may be relied upon to establish its legitimate position in the industry, and I only desire to point out that the silk of the British Cellulose Co. surpasses in many respects that in which your contributor is interested. This is notably the case in regard to its resistance to moisture, as can easily be ascertained by pressing the two kinds of silk against the moist tongue; the old type of silk, so to speak, melts right away, whereas the new product remains resilient and strong, with its textile qualities preserved. In fact, the true elasticity of the silk manufactured by the British Cellulose Co. maintained both in the dry and moist condition, is one of its most remarkable assets, since it affords a range of textile effects not hitherto attained by any artificial silk. It causes the silk to work in the loom without any breakages even more regularly than natural silk, and is therefore highly appreciated by the weaver, who can use the new product not only for weft, but also for warp. This quality, moreover, enables the silk to be spun and manipulated in very much finer counts than have been commercially possible with the older varieties of artificial silk.

Finally, I desire to place the fact emphatically on record that, contrary to what is stated by Mr. Wilson's article, the acetate silk produced by the British Cellulose Co. can be easily and cheaply dyed, is actually being dyed, and has been publicly exhibited dyed, not only with basic colours, but also with the entire range of direct colours, the vat colours and the sulphur colours; in fact, with any and all of the dyes which are applicable to other artificial silks, both alone and in union with cotton. —I am, Sir, etc.,

J. F. Briggs.

Spondon, nr. Derby.
August 20, 1920.

PERSONALIA.

Sir Edward Thorpe has been elected president of the British Association for the forthcoming year.

The death is announced of Prof. Edward Kinch, an original member of this Society, and a well-known authority on agricultural chemistry.

We regret to record the death of Sir J. Norman Lockyer, which occurred on August 16, in his 85th year. Sir Norman Lockyer's achievements in astronomy included his discovery, with Frankland, of the presence of helium in the sun. He was elected a Fellow of the Royal Society in 1869, and, in the same year, he founded the weekly scientific journal *Nature*, which celebrated its 50th year in 1919.

NEWS AND NOTES.

FRANCE.

Industrial Notes.—*Metallurgy.*—Though the production of pig iron is progressing slowly but surely, the supply is still far from meeting the demand. Strong hopes are being entertained that the recent decree prohibiting the exportation of scrap cast iron and steel will tend to relieve the situation by supplying the different foundries and plants with all the raw material that they may require for increasing the output. The fact must not be lost sight of that this decree can only be a temporary measure and will lapse as soon as the production increases, as France, under normal conditions of work following on the circumstances resulting from the war, will be one of the world's great producers of iron and steel. However, the decree is very irksome to exporters of these metals, and many Belgian steelworks that imported much of their raw material from France are directly affected. To meet the claims of industrials and traders thus affected a special committee has been appointed by the Ministry of Commerce to examine all applications for export licences, which will be granted on the merits of each individual case submitted. Whatever may be the findings of this committee, it is certain that the production of pig iron is steadily improving, and that the results of the Spa Conference, by assuring a regular inflow of coal, cannot but better the situation still further. The output of the rolling mills is still very much below the mark, but is, however, superior to that of sheet iron, which is non-existent on the market.

Coal.—According to the recent decisions, from August 1, Germany will have to supply France with 80 per cent. of the 2,000,000 tons of coal she had originally undertaken to send to the Allies monthly. As regards payment, the arrangement falls under two main parts according as the coal is imported by land or by sea. The coal imported by land will be paid for at the price ruling in Germany, that is, according to the present exchange, at about 80 fr. a ton. To this price there will be added a premium of 5 marks in gold, or 14—15 fr., destined to improve the lot of German miners. The price of 80 fr. will not be paid in cash, but will be deducted from the German debt; the premium will, however, be paid in cash, and will apply only to coal imported by land. For coal imported by sea the price paid will be the price f.o.b. ruling for German exportation. The values that result will also be deducted from the German debt. The price f.o.b. of German coal will probably reach the price f.o.b. of British coal, that is, about 260—270 fr. per ton. The Allied advance to Germany will thus be the difference between 265 and 95, or about 170 fr. per ton.

Liquid Fuel.—The Ministry of Public Works has just issued a decree declaring that the establishment of a pipe-line for conveying liquid fuel from Havre to Paris is a work of public utility. The pipe-line will pass through Bolbec, Yvetot, Barentin, Rouen and Pontoise, and it is reckoned that it will convey 2400 tons of liquid fuel daily; the storage tanks will have a minimum capacity of 60,000 tons.

The Chemical Market.—Although this market remains steady, the tendency is towards a rise in prices resulting from the insufficiency of the production as compared with the heavy demand. The increase in the price of coal, the higher rates of transport, and the new taxes voted are not calculated to improve the cost price and, consequently, the selling price. The higher cost of living that will inevitably result will react on the price of labour, which so far had apparently reached a maximum.

There is a great dearth of chemical apparatus and of different containers for chemical products, among which may be mentioned carboys and their hampers, wooden casks, gas cylinders, enamelled pans, autoclaves, filter-presses, porous cylinders, etc.

Carbonate of soda is very scarce and has to be imported from America. This scarcity is due on the one hand to lack of coal, and on the other to the heavy increase in the demand. Formaldehyde is also in great demand, and is extensively used, together with phenol and cresol, for the production of artificial plastic material.

On the whole it is reckoned that, on account of the factors mentioned above, certain chemical products will rise in price by 8—10%. This is an alarming situation if the progress of foreign competition is taken into account, as it will make it impossible to export.

It is only the very great scarcity of certain products that allows of their disposal at enormously high prices, but such conditions will probably no longer prevail in two years' time, and the question is to know whether by then the cost price will have improved!

UNITED STATES.

A New Use for Gallium.—There has long been a demand for a lamp that would give a stable monochromatic red light of high intensity. It has been proposed to use a lamp of the mercury vapour type with cadmium in place of mercury, but neither pure cadmium nor a cadmium-mercury alloy can be used, as its high tensile strength tends to break the glass tubes. It has now been found that less than 1 per cent. of gallium will lower the tensile strength of cadmium, and the vapour pressure of gallium is so low that its spectrum does not interfere with the brilliancy and purity of the cadmium spectrum. As gallium alloys readily with cadmium and with lead seals (used to avoid leakage around the electrodes), lamps of the type described can be operated continuously with high intensity in the cadmium lines.

Research in the Manufacture of Alimentary Pastes.—At the annual meeting of the National Association of Macaroni Manufacturers, held on June 24, it was resolved to expend a part of the funds of the Association, and to supplement these by subscriptions, in the pursuit of a scientific programme relative to the manufacture of alimentary pastes. It was expected that through co-operative research of this character the whole level of the industry would be raised and a scientific foundation laid which would lead to the production of more nutritious and uniform products. The Association has declared itself opposed to the utilisation of any colouring matter in the preparation of alimentary pastes.

Jellies.—Recent work has disclosed the fact that the three ingredients upon which the successful manufacture of jellies depends are acid, pectin, and sugar. In commercial jellies the pectin content should not exceed 1·25%, acid calculated as sulphuric 0·27 to 0·5%, with 0·3 as a good acidity, and sugar 5 lb. per gallon of juice. The pectin can be determined with sufficient precision for factory control by allowing 10 c.c. of the fruit juice to drop from a pipette into 180 c.c. of alcohol, and if over 1% of pectin is present a cohesive gum-like mass will be formed. If the amount is less than that the precipitate will remain flocculent. Tables have been worked out based upon pectin content which indicate the amount of sugar to be used to produce a satisfactory material. In this connexion the Brix hydrometer has been found useful, and if 1 lb. of sugar be added to each gallon of juice for every degree Brix indicated by the raw juice, a fine clear jelly, firm enough to stand under nearly any climatic condition, will result.

Furfural in Caramel.—It has been found that caramel may contain furfural, especially if the sugar has been heated to a high temperature during caramelisation. Furfural is volatile in steam, so that no precautions are necessary in the preparations where caramel is heated with water. As furfural is toxic, it is therefore recommended that caramelised fruit syrups should be boiled with an equal volume of water for ten or fifteen minutes before serving them. It is also advisable to avoid the formation of caramel in baking fruits, and this can be done by lowering the temperature. Furfural is formed in greatest amount when caramelisation is carried on at about 200° C.

"Para-coumarone."—When suitable aromatic naphthas are treated with strong sulphuric acid, the coumarone and indene in them are polymerised and the products remain in solution. If the naphtha is then separated from the polymerising agent, neutralised and distilled to separate it from any unpolymerised material, a liquid residue results which solidifies on cooling. This product is known as paracoumarone resin. It resembles rosin, and has been found to be well adapted for certain types of varnishes in which a pure raw linseed oil and china wood oil, together with a cobalt linoleate dryer, are used. The resulting varnish resists hot and cold water as well as other varnishes, and has satisfactory rubbing qualities, hardness, toughness, and elasticity, which enable it to compete with natural gums.

Tyre Production.—The record production of tyres planned for 1920, amounting to 40 million and valued at 1000 million dollars, is not expected to materialise. According to *Financial America*, difficulties with cotton supplies and the necessity of storing the output that is held up owing to transport troubles have resulted in a curtailment of manufacture. The cotton shortage is attributed to want of skilled workmen and failure to re-adjust the machinery altered during the war. At the same time Egyptian cotton, which is much in demand, has yielded smaller crops during the last five years than during the previous five years. Most of the crude rubber is absorbed by the tyre trade, but as there are large stocks in America, supplies are not causing the manufacturers much anxiety.—(*India Rubber J., July* 24, 1920.)

Helium Resources.—According to a report presented by Dr. Manning to the Committee on Interstate and Foreign Commerce of the United States Congress, all the sources of natural gas containing helium in the United States can produce a total of 3 million cb. ft. of gas containing over 0·35 per cent. of helium for a period of from two and a-half to three years. This would indicate that about 858,300 cb. ft. of helium could be produced a day. The field most suitable for working is stated to be at Petrolia, Texas, although helium has been found in Kansas, Oklahoma, Ohio, California, and Wyoming. It is reported that the Air Reduction Co. is about to instal laboratories and plant for the extraction of helium from natural gas in Oklahoma, and that Dr. Cottrell, of the Bureau of Mines, is investigating the question. The situation as regards helium is not clear, but a Bill now before Congress in intended to regulate the production and exportation of the gas.—(*Oil, Paint and Drug Rep., June* 21, 1920.))

Qualitative Analysis by Means of the Electric Arc.—Mr. W. R. Mott has recently described before the American Electro-Chemical Society a new method of qualitative analysis in which the electric arc is employed. The unknown substance is put into a cup-like cavity made in one of the carbons, and the image of the arc is projected upon a screen with a magnification of 20 diameters. The phenomena to be noted include the nature and colour of the material deposited on the pole as the result of distillation, the smoke, sparks, flame-tipped coloration obtained, and the odour of the fumes evolved. Many elements have decidedly characteristic peculiarities, *e.g.*, molybdenum causes the emission of smoke from the hot upper carbon when the arc is broken, and traces of calcium produce an unmistakable red. Good tests have been developed for about 65 elements, whether uncombined, combined, or alloyed. It has been found that, on the average, out of a mixture containing ten of the sixty-five elements, nine can be identified with certainty by this method, and that many elements which are identified with difficulty by the usual method can be determined with comparative ease by the new one.

Bauxite and Aluminium in 1918.—The quantity of bauxite marketed in the United States in 1918 was 605,721 long tons which had a value at the mines of $3,447,992, representing an increase of about 7% in quantity and 11% in value over the production of 1917. About 69% of the domestic output was used in the production of aluminium metal, 10% in the manufacture of aluminium salts, 19% in the abrasives industries and 2% in the manufacture of bauxite refractory bricks. The mineral is sold on the basis of its analysis, a low silica and titanium content being essential to the producers of the metal and important to the manufacturers of salts, abrasives and refractories. A commercial grade should contain at least 52% of alumina.

Most of the metal produced was used for war purposes. The Government fixed the price at 33 cents per lb. midway through the year, and there was a production of roughly 40 million dollars' worth of primary metal and a quarter of this amount of secondary metal. [The "Mineral Industry during 1918" gives the U.S. production of aluminium metal at 102,000 metric tons out of an estimated world's production of 220,000 tons in 1918.—Ed.]

About 200,000 tons of aluminium sulphate was produced during the year, the average price being about $31 per short ton. About 7000 tons was produced by waterworks for their own consumption in water purification. Roughly 4000 tons of the chloride was also produced, part being used in the refining of mineral oils. The abrasives are made by fusing bauxite in the electric furnace, the same means also being employed for the production of refractories. The use of the latter seems to be expanding, particularly in the construction of copper, iron and lead furnaces and of cement kilns. Bauxite brick is produced by bonding calcined bauxite or high-alumina clay with fire clay, sodium silicate or lime.—(*U.S. Geol. Surv., Mar.* 16, 1920.)

Manganese and Manganiferous Ores in 1918.—A new classification of manganese ores was adopted in 1918 as a result of the recommendations of the American Iron and Steel Institute to its members, who include the officials of practically every steel company in the United States.

Materials which contain more than 35% of manganese are classed as manganese ore, those containing 10—35% of the metal as ferruginous manganese ore, the lowest grade with from 5—10% of the element being classified as manganiferous iron ore. It may be mentioned that certain ore is termed manganiferous silver ore when it contains more than 5% of manganese and sufficient silver to make it more valuable as a source of silver than manganese.

The domestic shipment of high grade ore (35% and over) was 305,869 tons, valued at about $8,000,000, of the intermediate grade (10—35%) 916,163 tons valued at about $4,500,000, and 254,299 tons of low grade ore (5—10%) valued at about $1,000,000.

The imports of ferro-manganese were 27,168 tons, and of high grade ore 491,303 tons, the latter being obtained mainly from Brazil and Cuba. The war showed that domestic deposits could supply about

35% of the nation's needs. In 1910-1913, Russia, India and Brazil supplied no less than 95% of the world's production. It was found when the Russian supply ceased in 1914 that as much as 2 or 3% of iron and as little as 70% of manganese could be used in making batteries without serious loss of efficiency, and considerable domestic supplies from Montana met these specifications.

In the United States more than 95% of the manganese used in the industries is added to steel in the form of alloys, the average consumption of manganese metal in making a ton of steel being about 14 lb. Several steel companies experimented with alloys of uncommon composition instead of the usual 80% ferro-manganese and 20% spiegeleisen. One company completely substituted 32% spiegeleisen for 80% ferro-manganese. The results obtained undoubtedly played a large part in the widespread revision of manganese alloy grades in April, 1918. (*Cf.* J., 1920, 148 R.)—(*U.S. Geol. Surv., April* 10, 1920.)

JAPAN.

Oil Production in Echigo.—The centre of the petroleum industry in Japan is at Echigo, where the total production of crude oil reached 1,174,909 koku (koku=47·65 galls.) and that of refined oil 1,051,134 koku in 1918. Details of the production for 1918 and 1919 are given below:—

	1918. Koku.	1919. Koku.
Naptha	124,604	131,736
Kerosene oil	211,153	179,805
Illuminating oil ...	372,038	359,354
Crude petroleum ...	166,103	120,832
Machine oil	301,011	259,408
Total	1,174,909	1,051,134

Mineral Output in the Hokkaido.—The following are the output figures for 1918, together with those estimated for 1919:—Gold, 1921·6 and 9445·1 oz.; copper, 1270 and 1300 tons; copper ore, 3911 tons (1918 only); pig iron, 1064 and 5270 tons; quicksilver, 25·2 and 6·5 tons; zinc ore, 4477 and 1739 tons; lead ore, 4331 tons (1918 only); iron ore, 91,234 and 137,000 tons; chrome iron ore, 1303 and 693 tons; petroleum, 300,569 and 311,685 galls.; coal, 4,135,561 and 4,650,000 tons; manganese, 7820 and 5995 tons; crude sulphur, 19,416 and 12,300 tons; sulphur ore, 19,416 and 12,300 tons; platinum, 65·65 and 172·25 oz.—(*Bd. of Trade J., April* 22, 1920.)

The Development of the Alcohol Industry.—Up to twenty years ago Japan imported from Germany all her alcohol, which is used principally as an ingredient for the national drink, *saké*. Then heavy import duties effectively checked imports from abroad, with the result that Japan is developing an alcohol industry of her own, utilising the by-products of the beet-sugar factories in Formosa. During the year 1919 about 3 million gallons of alcohol was produced there; during the following year the output fell to about 800,000 galls., owing to a decreasing production of sugar. There was consequently a corresponding rise in the price of alcohol, so that it was being quoted at about 8s. per gallon. —(*Z. angew. Chem., July* 2, 1920.)

The Soda Industry.—The Japanese soda industry began with the erection of the Kabushiki Kaisha alkali works in Ozaka in 1880, and in spite of the fact that the chief raw material for the industry—salt—was made a State monoply in 1908, thus forcing the manufacturers to pay prices that were more than double those current in Europe and America, the industry has developed sufficiently to be able to supply 30 per cent. of the needs of the country, the remaining 70 per cent. being imported. There are now 20 soda works in Japan, 10 of which have been founded since 1918. Nine works use the electrolytic process, five the Leblanc process, and one both of these processes, whilst three employ the ammonia-soda process. Figures showing the relation of production to consumption (in 1000 kin) are given below (kin=1·32 lb.):—

		Production.	Consumption.
Caustic soda	1913	9536	36,560
	1917	36,560	65,252
Calcined soda	1913	4756	73,826
	1917	4782	95,640
Sodium sulphate	1913	2139	3139
	1917	3603	3603
Soda crystals	1913	—	9989
	1917	—	6476

After the armistice the Japanese soda industry was forced either to decrease or suspend production, with the result that the price of caustic soda fell from 38 to 8 sen (100 sen=2s. 0¼d.) a pound, and, owing to over-production, bleaching powder was selling at 4·05 sen a pound, although its price has now improved. Most of the raw materials required for the soda industry—salt, sodium sulphate, lime, sodium bisulphate, and saltpetre—have to be imported, the requirements for 1920 being estimated at:—Salt, 67,167 metric tons; coal and coal dust, 9576 t.; sulphuric acid, 17,791 t.; sodium bisulphate, 1488 t.; Chili saltpetre, 33 t. In 1917, 110 million kin of soda was imported, two-thirds of which came from the United States and 660,000 kin from England, the imports from the latter country having since shown signs of increasing. It has been proposed to protect the Japanese caustic soda industry by raising the import duty from 70 sen per 100 kin to 25 per cent. *ad valorem*, but the best guarantee for its future would be a decrease in the price of salt.—(*Chem. Ind., July* 7, 1920.)

The Lead and Zinc Industry.—Lead is usually found in Japan as galena associated with zinc blende. The output of lead ore from 1913 to 1918 in Japan was as follows (long tons):—

	Tons.	Value. £		Tons.	Value. £
1913	3747	63,297	1916	11,281	384,785
1914	4526	84,752	1917	15,682	579,949
1915	4718	100,028	1918	10,599	425,451

The Okayama Prefecture has the biggest lead production, 3381 tons having been mined in 1918. Producers and smelters were buoyed up by the high prices ruling during the war and by the expectation of a world shortage in the metal. These hopes have not been fulfilled, and owing to the increased cost of labour and materials, combined with renewal of European competition in the Indian and East Indian paint markets, the output has fallen considerably since 1917, and many companies, especially the smaller and less economically managed, are in financial difficulties. Prices for Australian lead in Yokohama were highest at £3·165 per picul (133·28 lb.) in September, 1918, compared with £1·202 in June, 1914, and £2·715 in March, 1920. The cost of production is estimated at 33s. per picul at the smelters at the present time.

The imports of lead products from 1915 to 1918 were as follows:—

	Lead ore. Tons.	Lead ingots and slabs. Tons.	Other forms of lead. Tons.
1915	Unknown	14,444	1283
1916	Unknown	20,638	1590
1917	22,554	15,636	700
1918	3566	53,697	640
1919	147	35,457	Unknown

In 1915, Japan imported 10,982 t. of lead slabs and ingots from Australia and 2585 t. from the United States; in 1919 the figures were 14,449 and 12,160 t. respectively. The Japanese lead consumption was estimated at 19,533 t. in 1914 and at 64,293 t. in 1918.

The imports of white lead and litharge were as follows:—1916, 144 t.; 1917, 6½ t.; 1918, 8 t.; 1919, 95 t.

Previous to 1913 no zinc ore was smelted in Japan; the production since then is given in the following table:—

	Zinc ore. Tons.	Zinc ore. Value. £	Refined zinc. Tons.	Refined zinc. Value. £
1913	34,128	97,061	—	—
1914	13,915	28,926	5866	140,250
1915	6024	36,118	20,964	1,326,900
1916	2152	18,753	38,684	2,778,100
1917	160	2790	54,284	2,766,550
1918	—	—	39,598	1,819,400

The largest zinc mine is the Hikoshima in the Yamaguchi Prefecture, which produced in 1918 12,354 t. of zinc and 103 t. of lead. The estimated consumption of zinc in Japan rose from 11,389 t. in 1914 to 27,126 t. in 1918, since when, however, it has considerably decreased.

Owing to the great demand for zinc in Great Britain and Russia, prices rose abnormally at the beginning of the war, but have been going down again since 1916, whilst working costs have tended to rise. Hence many of the newer companies are in financial difficulties, and the output has therefore seriously fallen off. The estimated cost of production of refined zinc at the smelters is about 45s. 6d. per picul, and the price of 98% zinc per picul has varied from 25s. 9d. in June, 1914, to 114s. in December, 1918, and since then has been round about 50s., but rose to 58s. in March, 1920. The principal producing districts and their outputs for 1918 are:—Yamaguchi Prefecture, 12,300 t; Fukuka and Okayama Prefectures with over 8000 t. each. The following table shows the imports of zinc products into Japan during the last five years in long tons:—

	Ore.	Ingots, slabs and grains.	Sheets.	Waste.	Zinc white.
1915	Unknown	2896	540	4967	283
1916	Unknown	3223	550	1965	258
1917	92,610	4470	1203	729	43
1918	59,401	2430	1331	724	222
1919	27,610	5638	1463	323	95

The exports of zinc and zinc ore from Japan are shown below in long tons:—

	Zinc ore.	Zinc ingots and slabs.
1915	6363	Unknown
1916	2172	23,029
1917	162	36,542
1918	5	16,848
1919	Unknown	5638

In the mining of lead and zinc the smaller companies use primitive hand methods, but the operations of the larger companies compare favourably with those used in the States; 2364 miners are employed in zinc mining and 1046 in lead mining. The leading companies pay their miners an average of 3s. per day with two holidays a month; the underground miners work 56 hours, and the surface workers 77 hours per week.—(*U.S. Com. Rep., May* 24, 1920.)

CANADA.

Maple Sugar in Quebec.—The production of maple sugar in the province of Quebec has trebled during the last year. This improvement may be ascribed not only to the increased price of cane and beet sugar, but also to the establishment of sugar schools by the Government and the giving of lectures by sugar experts in the chief centres of sugar production. So far three such schools have been started, with the object of giving instruction in the most up-to-date methods of producing sugar and syrup. The total production of maple sugar during 1919 is estimated at 13,000 tons, whereas during 1911 it was only 4500 tons.—(*Deuts. Zuckerind., May* 28, 1920.)

The Paper Industry.—In 1901 there were in the Province of Quebec 10 mills representing a capital of $1,000,000. According to the latest statistics, there are now 31 mills owned by companies with a total capital of $100,000,000. At the present time, not including the money spent on improvements, enlargements, etc., a sum amounting to $15,000,000 is being spent on the erection of new factories connected with this industry.

A paper mill is about to be erected in Saskatchewan at a cost of £200,000, and will utilise waste straw, of which large quantities are available, as raw material. It is believed that the necessary fuel can be obtained from the lignite fields in southern Saskatchewan. This will be the second straw-paper plant to be established in Canada.—(*Official.*)

SOUTH AFRICA.

Fibre Factory in Rhodesia.—A new company, the Northern Rhodesia Fibre Co., has been established at Umtali for the purpose of utilising the fibres of *Hibiscus cannabinus* and other plants. Several hundred tons of wild fibre have been collected this year, and it is reported that *Hibiscus* will be grown over large areas for next season, as the company will pay £10 per ton for good fibre. The services of an expert have been obtained, and farmers with large acreages of fibre will be instructed, free of cost, how to ret and handle the fibre.—(*S. African J. Ind., June,* 1920.)

Iron and Steel Industry.—*Market for Steel Goods.*—It is estimated that the country's annual requirements of iron and steel goods include 77,000 tons of rails; 25,000 tons of fencing standards; 21,000 tons of bar, bolt, and rod iron; 10,000 tons of plate and sheet iron; besides smaller amounts of angles, beams, castings, etc., making in all 175,000 tons.

Reserves of Iron Ore.—Iron ore deposits include three of the first magnitude containing a variety of ores. There are the siliceous ironstones of the Pretoria series, the titaniferous magnetites (suitable for manufacturing spiegeleisen) of the Bushveld complex, and the hæmatite deposits in the Rustenburg District; whilst the breccia deposits of Griqualand West probably contain millions of tons of commercial ore. Reserves of clayband ore are found in the Pretoria town lands.

Flux.—Pure limestone deposits occur, but are commercially inaccessible. Dolomite, however, exists in unlimited quantities, and has been used successfully with coke low in sulphur.

Fuel.—Large coal fields are available with good coking coal produced at a cost of about 5s. 8d. per ton.

Cost.—The cost of producing 200 tons of pig iron per day in Pretoria is estimated at £2 4s. 9½d. per ton, plus 10s. for capital charges.

Labour.—Highly-skilled labour requires to be imported, but there is a good supply of semi-skilled white labour.

Water Supply.—Geological conditions favour the maintenance of a good water supply, and provision is being made for a consumption of 250,000 gallons per day.—(*S. African J. Ind., June,* 1920.)

New Enterprises.—The Pretoria Iron Mines, Ltd., has been taken over by the South African Iron and Steel Corporation with a capital of £1,500,000. A fully equipped modern plant, consisting of coke ovens with recovery plant, furnaces and rolling mills for the manufacture of pig iron, wrought iron, and steel, is to be erected. The site is on one of the largest iron deposits, and in close proximity to the Transvaal coal fields. A Natal undertaking at Newcastle also hopes to be producing shortly. On August 13, the Union House of Assembly confirmed the draft agreement made between the Pretoria company and the Government, by which, for a period of 17 years, the Government railways will purchase 50 per cent. of their requirements in rails, etc., from the company at imported cost.—(*Financial Times, June* 21, *Aug.* 16, 1920.)

GENERAL.

Radium Supplies.—Since Mme. Curie discovered radium, in 1898, the total amount of radium that has been produced is about 120 gm., and supplies are steadily increasing. The total output of the Standard Chemical Co. (Pittsburgh, Pa.) up to 1920 is reported to be 50 gm. of radium element, and although its present output is only 18 gm. per year, the company is said to be prepared to produce 50 gm. of radium element yearly, should the demand justify it. Since 1913 three new radium factories have been started in America and several in France, where an average of 18 gm. of radium per annum was produced during the war.—(*J. Röntgen Soc., July,* 1920.)

Barytes Supplies.—The importation of barytes decreased considerably during the war, falling to 1500 tons in 1917—18. In 1919, the amount increased to 20,000 tons. These imports were for the most part of fine white ground barytes, the home product being of lower quality. Owing to cheap rate of transport along the Rhine in pre-war days, it was possible to market German barytes at a cheaper rate in this country than the native article. Furthermore the foreign material was of better colour. Alterations and improvements in methods now being carried out offer prospects of improved quality and increased consumption of the home product.—(*India Rubber J., July* 3, 1920.)

Para Rubber-Seed Oil.—Investigations at the Imperial Institute have shown that Para rubber seeds contain considerable amounts of a drying oil, to the extent of 20 per cent. in the seeds and 45 per cent. in the air-dried kernels. The residual (decorticated) cake is comparable in nutritive value and digestibility to linseed and decorticated cottonseed cakes, and should find a ready sale as a feeding-stuff. When the large area now under rubber is considered it is evident that large quantities of kernels could be obtained, but up to the present no trustworthy statistics as to the costs of collection and yield of seed have been furnished. Para rubber seed and cake are worth quite two-thirds of the values of linseed oil and cake. (*Cf.* J., 1919, 330 R.)—(*Bull. Imp. Inst., Oct.-Dec.,* 1919.)

National Association of Industrial Chemists.—At the meeting of the Executive Council held on August 7, it was stated that the outlook for many industrial chemists is distinctly discouraging. The number of unemployed chemists is increasing very rapidly, and there is evidently a great slump coming in the engineering and allied industries in which chemists are chiefly employed. A large amount of work has been done in connexion with the Employment Bureau, but it was pointed out that, unless chemists were more united and enabled the Council to secure their co-operation, little could be done to help them.

A considerable amount of time has been devoted to the improvement of the status and salaries of members, and definite arrangements have been made whereby a considerable number of firms has agreed to consult the Association's officials when requiring fresh chemists and in the event of disputes between the firms and their chemical staffs. A number of firms has also undertaken to consult the Association in all matters relating to chemists, including appointments, salaries, and hours and conditions of work. A committee of the Association has issued a report giving a schedule of minimum salaries for chemists of various ages.

Mr. A. B. Searle was elected president of the Association and Mr. J. W. Marchant was appointed secretary. In order to cope with the large amount of propaganda work required, it was decided to appoint an organising secretary.

The Research Association of British Rubber and Tyre Manufacturers notifies that laboratory accommodation has been secured in the Chemical Department at University College, London; also that Mr. H. Tiltman has been appointed research assistant.

Patents in Sweden.—The new Swedish Law (No. 294) of June 18, 1920, provides that requests for the reconsideration of a patent application which has been refused or rejected during the period August 1, 1914, to June 30, 1920, by reason of the failure of the applicant to answer objections by the patent authorities or writs of opposition, or requests for the restoration of a patent which has expired during the same period by reason of non-payment of renewal fees, may be made to the patent authorities before July 1, 1921. It is also provided that the above-mentioned period shall not be reckoned in the period of three years within which a patent must be worked in Sweden. The Crown is empowered, subject to reciprocal treatment, to decree that the provisions of the Law shall apply, wholly or partly, in favour of nationals of a foreign State.—(*Bd. of Trade J., July* 29, 1920.)

Italian Patent Rights and the War.—The Royal Decree No. 279, of March 7, 1920, provides that owners of Italian patents still in force who have not paid the prescribed fees or have not worked the patents during the war, can obtain prolongation on payment of the fees in abeyance. If any person has worked such a suspended patent in good faith during the period July 31, 1914 to December 31, 1918, he can continue to do so without fear of infringement. Those who have exploited enemy patents during the war can continue to do so for one year after the date when the Peace Treaty comes into force, after which they will be required to compensate the owner of such patent should they require to work it for a further period. The Decree, which also regulates the question of priority of application, thus extends to the owners of Italian patents the facilities provided for in the Treaties of Versailles and St. Germain, but, contrary to recent Belgian and French laws, does not prolong the life of patents for a period corresponding to the years during which the patents were not worked owing to the war. (*Cf.* J., 1920, 74 R).—(*G. di Chim. Ind. ed App., Apr. and June,* 1920.)

Tarred Roads and Fish Life.—A large number of trout and coarse fish died in the river Chess in Buckinghamshire last winter. The surface of the adjacent main road through the town of Chesham had been tarred for the first time in its history in the summer of 1919, and the subsequent fish mortality was popularly connected therewith. The matter has been looked into by a Departmental Committee, which was appointed early in 1919 for the investigation of road tarring in relation to injury to fisheries, and this Committee has now issued a report on the destruction of fish in the river Chess. The report states that neither the road-tarring in Chesham, nor epidemic disease, appears to have been responsible for the death of the fish, which was probably due to a temporary increase in the industrial pollution affecting the arm of the river known as the Town Ditch—which arm may now be regarded as an industrial sewer. The Committee failed to obtain direct and convincing evidence of the nature or source of this increased industrial pollution, perhaps because the matter was not brought to its notice until the wave of mortality had nearly spent itself.

Rubber Situation in Indo-China.—The prohibition on the export of rubber to any country but France, which was imposed during the latter half of 1918 by the French Government, had a bad effect on trade. This, coupled with deliveries of rubber of irregular quality and appearance, assisted in the crisis which led to the storage of 25,000,000 fr. worth of rubber and nearly caused the plantations to suspend work. The tension has now relaxed, and the decision of the planters to reorganise the industry and establish a laboratory at Saigon should make the prospects brighter.—(*India Rubber World, June,* 1920.)

The World's Pyrites Production. — The world's pyrites production is estimated (in metric tons) as follows:—Norway, 475,000 t.; Spain, 3,000,000 t.; Portugal, 600,000 t.; United States, 350,000 t.; France, 300,000 t.; Italy, 250,000 t.; Germany, 220,000 t.; Canada, 140,000 t.; Greece, 120,000 t.; Hungary, 100,000 t.—(*Mining J., May* 29, 1920.)

"Yield Value": A New Constant in Plastics.—Important investigations on the plasticity of substances intermediate between solids and liquids have recently been published by Bingham and Green* and Perrott and Thiessen.† The former writers have recognised that paints are classed as plastic solids rather than as viscous liquids, the characteristic of plastic solids being the existence of an additional factor in Poiseuille's viscosity equation, to which the authors have given the name "yield value." In simple language, the "yield value" represents the pressure which must be applied before movement through a capillary takes place. In the case of a truly viscous liquid, such as thickened linseed oil, in spite of very high viscosity, slow flow will take place from a deformed to a plane surface merely under the effect of gravity, viscometric determinations showing a constancy in the value of the product of pressure and inverse of volume passed in unit time in capillary viscometers. With plastic solids, however, a deformed surface retains its shape, and conformity with Poiseuille's equation as to the constancy above referred to does not manifest itself until a pressure has been applied in excess of such yield value, and the value of the same deducted from the recorded pressure. Both papers deal with the subject in reference to paints, and that by Perrott and Thiessen describes a special investigation of this physical property as applied to carbon blacks.

The importance of the existence of yield values and their determination will be readily recognised by all paint technologists, the determination of such constant placing in their hands a method, long sought for, whereby the hitherto empirically determined properties of "flow," "stringiness," etc., of paints may be investigated. The influence of various pigments in paints and enamels as affecting their behaviour on application is a field which has not yet been investigated in a scientific manner, and it is fair to predict that the publication of the results of the investigations on yield value will help to place on a scientific footing an industry in which "rule of thumb" has too long held sway. Yield values will also be of considerable importance in connexion with tar and bituminous coatings

A few words of warning are necessary to discourage too sanguine hopes as to the significance of results obtained by indiscriminate investigation of a diversity of systems of plastics. The value of viscosity determinations depends on the conformation of the *liquid* in a capillary to Poiseuille's law, in that the velocity of the moving column of liquid diminishes from a maximum in the centre to zero at the walls; although it is probable that fair conformation to this law obtained in the experiments described in both papers, in view of the necessarily low yield values in paints of the usual consistency, such a plastic system as, *e.g.*, petroleum jelly, would most probably so far depart from the law that inconsistent results would be recorded. Nevertheless, it is conceivable that plastic solids may approximate in their behaviour to true liquids when the diameter of the capillary is small and the velocity of flow therein so great that rigidity of the column as a whole gives way. This would indicate that readings should be taken at points considerably removed from the actual yield value.

* Proc. Amer. Soc. Testing Mat., XIX., 11, 640-664; this J., 1920, 495 A.

† J. Ind. and Eng. Chem., 1920, 12, 324-331; this J., 1920, 377A.

REPORTS.

Report on the Destruction of Bacteria in Milk by Electricity. *By* Prof. J. M. Beattie *and* C. F. Lewis. *Special Report Series* (*No.* 49) *of the Medical Research Committee, National Health Insurance. Pp.* 32. (*London: H.M. Stationery Office.* 1920.) *Price 9d.*

The destruction of bacteria in milk by electricity was found to be most effective with alternating currents and using an apparatus in which the milk was kept in constant flow, every portion of it receiving equal exposure to the current. It was found that there was a speed of flow at which sterilisation takes place at a temperature which apparently precludes the possibility of heat energy taking any except a minor part in the bactericidal action. Temperature is not considered to be the factor determining sterilisation. Milk can be freed from *B. coli.* and *B. tubercolosis* by the electrical method without raising the temperature higher than 63°—64° C., the temperature effect being very short in duration. Although the milk was not absolutely sterilised, yet the percentage reduction of the bacteria taken over a fortnight was 99·93 and the keeping power of the product was considerably increased. The taste of the milk is unaltered by the treatment and, as far as chemical examination can determine, its properties are in no way impaired. The treated milk can be described accurately as "raw milk" free from pathogenic bacteria.

Thirty-seventh Report of the Comptroller-General of Patents, Designs, and Trade Marks, 1919. *H.M. Stationery Office.* 1920. *Price 4d.*

The volume of business done by the Patent Office in 1919 exceeded all previous records. The number of patent applications filed was 32,853, which was 11,014 more than in 1918 and 2250 more than in any of the previous 10 years. In the five years immediately preceding the war, the average was about 30,000, but in 1915–17 it fell to about 18,500. Since the number of provisional applications was also abnormally high, viz., 23,852, against 21,553 in 1909, it may be concluded that the remarkable increase for 1919 was not due to cases from abroad under the Peace Treaty, and that, generally, there was a healthy activity in invention.

Designs applications were only 14,094, compared with a pre-war average of about 37,000, and an average of about 16,000 during the war. Trademark applications showed a great increase, viz., 12,479, against a pre-war average of about 10,000, and a war average of about 6000.

Other indications of the enormous volume of business transacted were the sales of patent specifications, which amounted to 247,387, and the number of letters and correspondence forms despatched, 214,000 (or an average of four per case). There were about four "hearings" (*i.e.*, appeals from the decision of the examiner) per day on the question of anticipation of patents, but only two appeals to the Law Officer.

The number of readers who made use of the library was 98,618, compared with 65,076 in 1918, and the approximate number of volumes (exclusive of duplicates) was 177,100.

The statement of receipts and expenditure shows that £364,380 was received in respect of patents fees (renewals £247,408) and £7477 for designs fees. The total receipts amounted to £404,474, and the total expenditure to £350,150, leaving a net profit of £54,324, which represented 13 per cent. on the total receipts.

REPORT ON THE FINANCE, INDUSTRY AND TRADE OF PERU AT THE CLOSE OF THE YEAR 1919. *By* F. W. MANNERS, *Commercial Secretary to H.M. Legation, Lima. Pp.* 26. (*Cmd.* 769. 3*d.*) *London: H.M. Stationery Office*, 1920.

Practically no raw materials are imported into Peru, as it is largely a country which produces them for export, although a certain amount of cotton and wool is manufactured. The chief agricultural products, in order of importance, are sugar, cotton, wool, hides and skins. Sugar is grown in the irrigated valleys of the coastal belt, and the estates are almost entirely owned by Peruvian capitalists and English and American firms. The Peruvian sugar industry has the advantage that planting and cutting continue throughout the year, so that the mills can work continuously and shipments can be made at any time. The price of sugar rose from about 10s. per quintal f.o.b. Peruvian port in 1913 to 51s. after the armistice, the 1918 export being valued at £4,163,000. Cotton is also grown in the irrigated coastal valleys, and the area planted has increased of late owing to the prevailing high prices. It is mostly of high quality, the Metafifi variety rivalling Egyptian cotton and appearing on the market at a different season of the year, but it is largely shipped ungraded, and thus fetches a lower price. Until recently, Great Britain took about 75 per cent. of the crop, but now the demands from the United States are increasing. The value of the export in 1918 was £3,761,000. The pre-war price of Peru soft cotton (corresponding to American middlings) of 34s. per quintal advanced to about 240s. in June, 1919. Both sheep's and alpaca wool are produced, and each constitutes about half of the total export which, for the last ten years, has averaged 5155 metric tons. Hides and skins are mainly produced in the Arequipa district, and the export, chiefly taken by the United States, was valued at £340,000 in 1916 and 1917, but only £170,000 in 1918. In 1918, rubber to the value of £323,000 was exported.

Peru is very rich in minerals, and with increased transport facilities production would increase enormously. The output of copper in 1914 and 1918 was 27,000 and 44,500 metric tons, respectively, and the shipments for 1919 are estimated at 39,470 t. The chief producers are the American Cerro de Pasco Copper Co. and the Backus and Johnston Copper Co.; the latter is extending its plant so as to increase the copper output from 3000 t. to 4000 t. a month. The other producers have a total monthly output of about 3000 t. Only one petroleum field is being worked, but indications have been found in the Montana district and between Lake Titicaca and Cuzco. There are three important petroleum companies, two of which refine some 200,000 t. of crude petroleum per annum. The total storage capacity available is 182,398 cb. metres, and the total value of petroleum exported was £1,415,000 in 1918. The production of silver was 300 t. in 1918; it is found and shipped principally with copper and lead sulphides. The output of gold for the last ten years was 1358 kg., the metal being usually found associated with other ores. One of the two chief companies engaged in gold mining is installing new machinery, and an increased output is expected. There is an abundance of coal in Peru, but its development is hindered by lack of transport facilities. Practically only one coalfield is worked, the average production being 309,918 t., against an import of 90,736 t. The Minas Ragra mine, situated west of Cerro de Pasco, is the chief vanadium mine in the world, there being an estimated quantity of 36 million lb. metallic content in sight. The ore averages 19 per cent. metal, and the deposit is said to represent 95 per cent. of the total known vanadium in the world. The export amounted to over 2787 t. in 1919 (2200 in 1918). The output of lead, which is usually argentiferous and contains 600—700 oz. of silver to the ton, averages 2381 tons. Tungsten, molybdenum, antimony, bismuth and mercury all occur in Peru, but are not now shipped to any extent owing to high freights and lack of market. Salt and borax are mined, about 200 t. of the latter being shipped yearly to Borax Consolidated, Ltd.

In 1918, the total imports and exports of Peru amounted to £9,700,000 and £20,000,000 respectively, the three principal exporting nations being Great Britain, the United States and Germany. In the year under review, the share of Great Britain in the exports and imports was 31·7 and 16·2 per cent. respectively (37·3 and 27·7 per cent. in 1914), whereas that of the United States was 46·5 and 54·3 per cent. (34·7 and 32·5 per cent. in 1914). There is a great demand for all British manufactured articles, and as manufacturing is practically nonexistent in the country, there is a valuable opportunity for an increased trade with Peru. Competition, especially with the United States and to an increasing extent with Japan, was very great during the war, and it is pointed out that the market is becoming accustomed to the American prices and quality, so that unless British goods appear promptly and on a closely competitive basis a certain amount of trade may be permanently lost. The 1919 tariff was for revenue and applied equally to all goods, the only case in which it was used for protection being the flour-milling industry, which is in British hands.

REPORT ON THE COMMERCIAL AND INDUSTRIAL SITUATION OF GREECE FOR THE YEAR 1919. *By* E. C. D. RAWLINS, *Commercial Secretary to H.B.M. Legation, Athens. Pp.* 42. (*Cmd.* 793. 4*d.*) *London: H.M. Stationery Office*, 1920.

Though Greece has been handicapped by an almost continuous state of war from 1911 to 1919, the country is fairly prosperous. The total imports during 1918 were valued at 735,916,511 francs, the imports for the period January—April, 1919, being given as 382,379,965 francs. During this portion of 1919, Great Britain supplied 28 per cent. of the total imports, followed by the United States with 20 per cent., a figure which most probably includes a proportion from Canada. The values of some of the chief imports in 1918 were:—Vegetable dyes and tanning materials, 3,420,050 fr.; raw minerals and metals, 19,263,026 fr.; chemicals, medicines, drugs, 55,147,866 fr.; glass and pottery products, 2,858,066 fr. Amongst the imports of chemicals, caustic soda, carbonate of soda and copper sulphate were formerly supplied by the United Kingdom, but since the war the United States has taken a large share of this market. There is a considerable demand for tanning extracts, chiefly South American quebracho, imported viâ the United Kingdom, Havre and Marseilles, as well as for chemical tanning preparations. The dyeing industry is developing at Piræus, and dyeing materials, formerly imported from Germany, have for some time past been demanded from England, but have been obtained with difficulty, owing to restriction of export. The general position now is that the United Kingdom has regained her former lead in Greek trade, but to retain and increase this lead it is necessary that United Kingdom manufacturers should pay more attention to the requirements of the market, *i.e.*, quote prices c.i.f. Greek ports, not ex factory or f.o.b., and use local currency, measures, etc.

The exports in 1918 and during the first four months of 1919 amounted in value to 296,860,261 fr. and 188,157,776 fr., respectively, Great Britain taking the largest proportion (47,444,213 fr.), followed by the United States (26,533,563 fr.). Amongst the exports were:—Agricultural products (including 23,244,800 kg. of olive oil), animal skins and fats, wood products and fibre, raw materials and metals, etc.

The leading industries of Greece are tanning and soap-making, the total production being 654,800 kg. of leather and 32,817,900 kg. of soap. A number of minerals is mined, the output of ores in 1918 being as follows:—Iron, 67,890 metric tons; ferro-manganese, 977 t.; lead, 18,416 t.; zinc, 4343 t.; nickel, 12,166 t.; chrome, 10,890 t.; magnesite, 39,340 t.; lignite, 208,797 t.; iron pyrites, 12,446 t. The lignite is used industrially, mainly in combination with coal or wood; it is stated that briquetting plant is to be erected. At present 8000 t. of iron pyrites is used for the production of sulphuric acid, which is used for the manufacture of fertilisers. From 33 to 50 per cent. of the magnesite produced is exported as caustic and twice-fired magnesia. The emery produced at the Naxos mines was all taken by France during the war, but the market is now free.

It is pointed out that public opinion in Greece at present is very much in favour of Great Britain, so that it is an opportune moment for British manufacturers to begin to open up trade relations with that country. It should be noted that, although trade mark regulations are in force, there is no protection for patents in Greece.

PARLIAMENTARY NEWS.

HOUSE OF LORDS.

The Committee stage of the Ministry of Mines Bill was taken on August 4. On Clause 1, providing for the appointment of a Minister of Mines, the Marquess of Salisbury moved an amendment proposing that the official appointed for this purpose should only hold the position of a Secretary of the Board of Trade, and this was agreed to. On August 11, during the third reading, two amendments by Viscount Peel, proposing that the mining industry should be administered by a Mines Department of the Board of Trade under a Secretary for Mines, and that the fund to be established for improving the social conditions of the workers should be allocated to districts, were also agreed to, and the Bill, now known as the Mining Industry Bill, was then passed.

The Dangerous Drugs Bill was read a third time on August 9, and passed. The Lords' amendments were agreed to by the House of Commons on August 10.

HOUSE OF COMMONS.

British Empire Exhibition.

A resolution, moved by Mr. F. G. Kellaway, was passed authorising the provision of a sum not exceeding £100,000 for the fulfilment of any guarantee against loss given by the Board of Trade in respect of the holding of the British Empire Exhibition, 1921. The guarantee will become operative only if a further sum of £500,000 is guaranteed by private interests.—(Aug. 10.)

Rubber Manufactures (Foreign Competition).

In a written reply to Mr. Jesson, Mr. Bridgeman stated that he had no information as to the alleged fact that American tyre and rubber footwear manufacturers allow a discount to British buyers of 50 per cent., whereas British manufacturers cannot allow more than from 5—12½ per cent. under present conditions; however, he would be glad to receive definite evidence on the subject. The goods in question have not at any recent time been subject to import duty, but the whole matter of dumping is being considered by the Government.—(Aug. 11).

China Clay Exports.

Mr. Bridgeman, replying to Mr. Hailwood, stated that the exports of china clay have declined from 629,703 tons in 1913 to 232,464 tons in 1918. Since then there has been an improvement:—286,543 tons was exported in 1919 and 211,636 tons for the first six months of 1920. It is hoped that improved transport facilities will accelerate the rate of progress.—(Aug. 11).

Manganese Ore Supplies.

In answer to Mr. Gutten, Sir R. Horne stated that the position as regards manganese supplies had for some time past been receiving the consideration of the Board of Trade in consultation with the India Office, with the result that the imports into the United Kingdom had shown a steady improvement during the last three months. The questions as to shipments to Antwerp and the suggested import duty were matters for the India Office and the Government of India.

Mr. Montagu informed Mr. Gutten that he had asked the Government of India to take all possible steps to facilitate the transport of manganese ore to the ports. There were 74,374 tons of the ore at Calcutta on July 10 and 9000 tons at Bombay on July 30, and provision had been made for the carriage of 500 tons daily to the latter port. He was aware that there are American and Japanese agencies in India for buying ferro-manganese ore, but he did not know that 33,650 tons had recently been shipped from India to Antwerp and Dunkirk for the use of foreign manufacturers. As regards the suggested export duty, the Joint Select Committee that considered the Government of India Act, 1920, recommended that the Government of India should have full liberty to devise those tariff arrangements which best suit India's needs as part of the British Empire, because a belief that India's fiscal policy is dictated from Whitehall in the interests of Great Britain would be dangerous.—(Aug. 16).

Ministry of Mines Bill.

The Lords' amendments to the Ministry of Mines Bill were considered on August 16, and were agreed to, with the exception that the clause limiting the expenses of the new department to £250,000, which was omitted by the Lords, was reinserted. An amendment moved by Sir R. Horne, providing that the salary of the new Secretary of Mines should be limited to £1500 a year was agreed to.—(Aug. 16.)

German Potash (Sales).

Replying to Sir R. Cooper, Sir R. Horne said that 4000 tons of 80 per cent. and 2500 tons of 90—95 per cent. muriate of potash from Germany were exported to the United States, as purchasers for these particular grades could not be found in this country.—(August 16.)

The Women and Young Persons (Employment in Lead Processes) Bill was presented by Sir John Bland on August 10.

The Fertilisers (Temporary Control of Export) Bill was passed on August 10, and the Mining Industry Act on August 16.

The Royal Assent has been signified to the Finance Act, 1920 (August 4); the Dangerous Drugs Act, 1920 (August 16); the Fertilisers (Temporary Control of Export) Act, 1920 (August 16); and the Mining Industry Act, 1920 (August 16).

COMPANY NEWS.

SALAR DEL CARMEN NITRATE CO., LTD.

The twenty-third annual meeting of this company was held in London on July 8, Mr. W. H. Sillem presiding.

The chairman said that the last year had been satisfactory in spite of the heavy accumulation of nitrate stocks in Chile after the armistice and the policy of the Allies to refuse shipping licences for nitrate until Government surplus stock had been disposed of. The world's requirements for the coming season were estimated at about 2½ million tons, and the total quantity already contracted for or sold exceeded 2 million tons. Of this amount, 1,600,000 tons had been sold at an average price of rather over 16s. a quintal, and the average price for the remainder was about 17s. per quintal. At the beginning of the year the f.o.b. price of nitrate for shipment over 1920 was 11s. 3d. to 12s., and market values had now increased to 15s. 6d. for spot, 16s. 7½d. for July-September, and 17s. 3d. December-March. A year ago it was pointed out that the company need not fear the possible competition of synthetic nitrogen products, and it could now be said with confidence that the output of synthetic nitrogen products was small and likely to remain so for some time yet. In addition, under normal trading conditions, Chilean nitrate could be put on the market at a lower price than the synthetic product. The world's production of all nitrogenous materials in the period July 1, 1919, to June 30, 1920, was estimated at 3,630,000 tons, including 1,910,000 t. of Chilian nitrate, 970,000 t. of sulphate of ammonia, and 750,000 t. of synthetic products. The output for 1920–21 was estimated at 4,300,000 t., comprising 2,500,000 t. of Chilean nitrate, 950,000 t. of sulphate of ammonia, and 850,000 t. of synthetic products (including 600,000 t. produced in Germany). As regards the project of Messrs. Brunner, Mond and Co. for the manufacture of certain nitrogenous substances, it appeared that no fertiliser was likely to be provided by this source for two or three years, when a production of some 100,000 t. a year in terms of nitrate of soda might be available. As by then the output of Chilean nitrate would probably surpass three million tons, competition from this quarter can be regarded with composure.

In the past year the company produced 231,240 quintals of nitrate, which represented 7 months' production. The net profit, including profit on sale of iodine, was £9183, and a dividend of 5 per cent. is payable, together with an interim dividend of like amount in respect of the current year. The outlook for 1920 is considered to be satisfactory.

ANGELA NITRATE CO., LTD.

The nineteenth annual general meeting was held in London on July 15, with Mr. H. W. Morrison in the chair.

In presenting the report, the chairman said that the effect of income tax and excess profits duty on English nitrate companies was very serious, in view of the wasting nature of their assets, and it might lead them to change their domicile to Chile. The results of the past year were as good as could be expected, seeing that as it was impossible to sell or ship the nitrate the works had to be closed, and nitrate was produced during only 6½ months in 1919. The prospects for 1920 were promising, as most of the company's production had been sold at remunerative prices. There seemed to be small probability of increasing the output by erecting new works on account of the difficulty of obtaining new plant and its almost prohibitive cost, whilst production was still further hampered by shortage in the supplies of fuel oil.

On December 31, last, the company had stocks of nitrate amounting to 217,613 quintals, which were actually sold by the Nitrate Association on that date, mostly for forward deliveries. A dividend of 10 per cent. is payable, and stoppage expenses and repairs have been written off, the reserve fund having been drawn on to the extent of £5000.

Amalgamation of Nitrate Companies.—An agreement has been made by which the Liverpool Nitrate Co., Ltd., will take over the San Lorenzo Nitrate Co., Ltd., and the Buena Ventura Nitrate Co., Ltd. The terms of the agreements, which take effect as from June 30, are, respectively, that the shareholders in the San Lorenzo Nitrate Co., Ltd., will receive one 5s. share from the Liverpool Nitrate Co., Ltd., in exchange for every £1 share of the former company; and that the shareholders in the Buena Ventura Nitrate Co., Ltd., will receive one 5s. share in the Liverpool Nitrate Co., Ltd., in exchange for every seven shares in the former company, plus a cash payment of 5s. in respect of each share held by them.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for August 12 and 19.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference number.
Canada	Lubricating oils and greases	211
"	Kapok, rubber, sheet tin, terne plates, soap makers' materials	212
"	Glassware, crockery	213
"	Essential oils	216
"	China, glass	223
Egypt	Iron, steel, leather, soap, chemicals, paint, oils	226
Belgium	Refractories	192
"	Colza, flax seed, linseed	194
"	Brass bars, strips and sheets	195
"	Whale oil, cod oil, fish oil, products for the deglycerination of oils and the manufacture of fatty acids	228
France	Chemicals, ammonia, basic slag	232
Netherlands	Electrolytic copper rods, sheets and wire	236
Syria	Denatured spirit	238
Smyrna	Chemicals, pharmaceutical products	240
United States	Porcelain, pottery	241
"	Charcoal iron sheets	242
Argentina	Artificial silk, asbestos packing	202
do. & Uruguay	Earthenware and cast iron pipes, galvanised and black fencing wire, copper and brass wire, tubes and sheets, lubricating oils and greases, colours, paint, varnish, bar iron, tinplate, antifriction metals, fireclay, firebrick, asbestos packing, cement, chemicals	203
Brazil	Earthenware	204
"	Paper, industrial chemicals, iron constructional materials	205
"	Drugs, inks, leather	247
"	Chemicals, pharmaceutical products	249, 251
"	Chemicals, cement, tinplate	250

MARKETS SOUGHT.

A firm in Trinidad able to export cocoa, copra, starch, and vanilla wishes to get into touch with U.K. importers. [189.]

A firm in Smyrna wishes to hear from U.K. importers of gum tragacanth and opium. [240.]

TARIFF. CUSTOMS. EXCISE.

Austria.—Export licences are now required for chinaware, sodium sulphate and bisulphate and terrar (enamel substitute).

Belgium.—Export licences are again required for vegetable and mineral black.

Crimea.—An export tax has been levied on, *inter alia*, linseed and salt.

Denmark.—Export prohibitions have been removed from colours, hides, skins, linseed oil varnish, manures, shellac, turpentine, and blue and green vitriol.

The consent of the Ministry of Justice is not now necessary for the export of linseed oil.

France.—The reduced rates of import duty on newsprint paper and cellulose pulp continue in force until December 31.

Germany.—The charges in respect of export licences have been amended. Among the articles affected are beer, chemicals, colours, perfumery, leather, paper, glass and pottery.

Ferruginous mass for the purification of gas is now subject to export licence.

Italy.—Export licences are not required until further notice for certain spices, cocoa butter, carnauba wax, gums, resins, pyrites, turpentine, harmless dyes, soap colours, sulphur black, gypsum, potassium chloride, tanning extracts, certain hides and skins, certain waste metals, medicines (with some exceptions), tiles, and cement bricks.

Japan.—The modifications of the tariff came into force on August 1. Among the articles affected are alcoholic beverages, alcohol, alcoholic medicinal preparations, beef tallow, salicylic acid and derivatives thereof, antifebrin, coal tar derivatives (with some exceptions), artificial indigo, coal tar dyes, minerals and manufactures thereof, and certain metals.

Japan (Corea).—A summary of the proposed tariff changes is given in the issue for August 19.

Luxemburg.—The export taxes on cast iron and semi-manufactured iron and steel have been reduced as from August 1.

Export prohibitions include mineral hydrocarbides, chemical and pharmaceutical products, colouring materials, ores, metals, wood pulp, paper, celluloid, hides, skins, leather, and fertilisers.

Mexico.—The rates of customs duty have been amended as from July 1. Articles affected include iron piping, sulphur, sulphuric acid, sulphurous acid, carbonic acid, hydrochloric acid, nitric acid, rubber tyres, bones, hoofs, sugar and molasses.

Newfoundland.—Among the articles affected by the amendments to the Import and Export Duties are raw leather, kerosene, oil cake and other cattle food, bark, extract of bark, cutch, potassium dichromate, logwood, manures, sulphuric acid, printing paper, printers' ink, sand, china and fireclay.

Norway.—Export licences are no longer required for alcoholic beverages, fish guano, and unsweetened condensed milk.

Serb-Croat-Slovene State.—The export is still prohibited of, *inter alia*, edible fats and oils, sugar, hides, soda, soda products, iron, and mineral oil.

Spain.—Printing paper may be imported duty free as from August 9.

Switzerland.—A General Export Licence now covers celluloid waste, glass jars, and pharmaceutical products not specially mentioned in the tariff.

Chemical pulp is no longer covered by General Export Licence.

United States.—General Export Licence "P.B.F. 37" now covers all goods from all countries except synthetic organic chemicals and drugs, dyestuffs, coal-tar products and intermediates.

TRADE NOTES.

BRITISH.

Mauritius in 1918.—The total imports in 1918 were valued at Rs.42,921,250 (Rs.42,094,708 in 1917), the share of the United Kingdom and British Possessions being respectively 16·3 and 70·2 per cent. (26 and 52·4 per cent. in 1917). The value of the exports in 1918 was Rs.55,652,480 (Rs. 58,319,728 in 1917), of which the United Kingdom took 38·1 and British Possessions 57·1 per cent. The area under sugar showed a slight increase, but there is not much scope for extension as practically all the land suitable for the purpose is already under this crop. In 1918, the sugar crop did not exceed 225,970 t., of which 183,222 metric tons, worth Rs.53,882,000, was exported, as against 190,821 m.t., worth Rs.54,539,232, in 1917. The description of sugar manufactured is 95·5 per cent. of white and 4·5 per cent. of low-grade sugar. Although the number of sugar factories has decreased from 104 to 55 between 1892 and 1918, the total capacity is greater, owing to the tendency to centralise the industry. The output of aloe fibre was much restricted owing to lack of tonnage; the export was 391 m.t., valued at Rs.140,135. Some small areas were planted with sisal, but the cultivation of this plant shows no great progress. Other exports were:—Coconut oil, 966 t. (Rs.72,572); molasses, 8 t. (Rs.125); and copra, 15 t. (Rs.400). The figures for molasses and copra showed very large decreases. During the year tobacco production showed an increase, but little or no extension of tea growing has taken place, in spite of preferential treatment for the local product. An experimental plantation of limes has been made and the results obtained indicate that this might become a profitable industry in Mauritius.—(*Col. Rep.-Ann., No.* 1036, *June*, 1920.)

FOREIGN.

Foreign Company News.—*France.*—During 1919, The "Compagnie Nationale de Matières Colorantes et de Produits Chimiques" took over the "Société des Produits Chimiques et Colorantes Français" and, in consequence, has raised its capital to 71 million fr. The company has completed the erection of a large indigo works at Villiers St. Paul and has obtained the use of a works at Oissel, near Rouen. The output of the company's products has increased rapidly, and by April, 1920, it had trebled. The net profit for 1919 was 3,912,499 fr,. and the dividend payable 5 per cent., or 25 fr. per share; 166,874 fr. was carried forward.

The capital of the "Société anonyme des Matières Colorantes et Produits Chimiques de Saint Denis" is to be raised from 7 to 24 million fr., by the creation of 68,000 new shares of 250 fr. each.

The "Société l'Air Liquide" has declared a dividend of 12 fr. per share; 2,768,594 fr. was allocated for amortisation and reserves. M. Georges Claude, the retiring director, was re-elected. The flotation was authorised of a loan amounting to 10 million fr.

A number of companies manufacturing artificial silk have issued their reports; the net profits and dividends for 1919 were as follows:—"La Soie Artificielle": 1,860,681 fr. (1,151,954); 56·169 fr. per share (36·08 fr.); "Soie Artificielle d'Izieux": 1,343,752 fr., 32 fr. per share; "Société Ardèchoise de la Soie Viscose": 1,993,960 fr., 36·95 fr. per share.

The "Etablissements Chiris" is maintaining its dividend at 6 per cent.; the net profit is 2,911,440 fr. (2,854,419 fr. in 1918).

The "Société Produits Chimiques Coignet" has made a net profit of 1,797,195 fr. (2,160,935 fr.); a dividend of 85 fr. is payable.—(*R. Prod. Chim.*, *July* 31, 1920.)

Germany.—It appears from the annual report of the Deutsche Salpeterwerke A.-G. in Hamburg that during the year 1918 no saltpetre was produced in Chile and that no sale of reserves took place. The total loss of the company for the year was 1,279,335 mk. The time during which the works lay idle was utilised for working out improved methods of manufacture, and some valuable results were obtained.

Chemical Trade of Switzerland in 1919.—Some of the principal chemical products imported into and exported from Switzerland during 1919 were as follows:—

		Imports. metric tons.	Exports. metric tons.
Alkaloids		21·2	23·3
	1918	5·5	4·6
Aluminium sulphate, hydroxide, sodium aluminate, etc.		14628·5	
Ammonia liq.		692·6	46·8
Aniline and salts		796·3	58·3
	1918	1835·5	49·2
Benzine		13654·9	—
	1918	6703·7	—
Benzyl chloride, nitrobenzene, naphthol, etc.		769·9	68·7
Borax		274·1	—
Calcium carbide		4·0	36891·6
	1918	0·1	75837·4
Caustic potash and soda		2895·2	2·4
	1918	3454·8	—
Chlorates, perchlorates, persulphates		27·7	551·5
	1918	0·2	1452·5
Chloride of lime		600·1	328·4
Chlorine, liquid		135·0	—
Chlorsulphonic acid, oleum		1053·9	—
	1918	1346·1	—
Citric, acetic lactic, tartaric acids, acetone, etc.		998·7	47·6
Coal-tar derivatives and intermediates		2399·9	26·8
	1918	3428·9	30·9
Copper sulphate		1062·2	1·6
	1918	3185·3	2·7
Formaldehyde, aldehydes, denatured		—	72·8
	1918	163·0	0·1
Glue and size		148·9	179·3
	1918	20·5	97·2
Hydrochloric acid		1149·0	91·4
Magnesium chloride		1980·7	22·3
Nitric acid		279·0	379·7
	1918	4·8	—
Oils, ethereal		13·4	3·3
Oil of turpentine		1544·5	1·0
Oil of cloves, lavender,-camphor, etc.		244·6	11·5
Phthalic acid, resorcinol		48·7	1·7
	1918	117·0	—
Pitch		22219·4	14·4
	1918	5706·7	105·4
Potassium ferrocyanide, ferricyanide, thiocyanate, cyanide, etc.		441·8	67·5
Saccharin		5·0	76·5
	1918	—	47·4
Salicylic acid		76·3	3·3
	1918	22·5	0·3
Soda, crystals		1·5	12·7
Soda, calcined		101·7	853·4
	1918	839·9	568·8
Sodium salts		3123·8	2550·5
Spirits, denatured		2975·9	0·8
Sulphates of iron and zinc		40·6	4·4
	1918	54·2	0·1
Sulphur, all kinds		408·1	—
	1918	5660·5	—
Sulphuric, sulphurous acids		2276·8	84·1
	1918	1575·0	0·4
Tar		1360·2	116·4
Tartar, crude		2·8	47·6
Water glass		1547·4	38·1
	1918	1163·5	—
Dye and colour wares:—			
Alizarin, artificial		89·6	—
	1918	15·9	—
Aniline dyes, etc. (unspecified)		221·9	6457·9
	1918	394·4	4932·4
Chemical colours, prepared		83·1	31·5
Cinnabar, ultramarine, Schweinfurt green, bronze colours, Paris blue		118·8	15·6
	1918	411·0	0·5
Indigo and indigo solution		18·7	1647·6
	1918	10·3	936·5
Lithopone, etc., unprepared		299·1	0·4
Logwood extract, etc.		504·3	123·2
Mineral colours (crude and manufactured)		3815·5	81·5
Pigment or lake dyes		64·7	20·5
White lead, prepared		0·9	426·1
Zinc white, unprepared		392·9	0·6
Technical fats and oils:—			
Animal oils		444·5	5·8
Castor oil, crude		162·5	0·2
Technical Fats and Oils.—(continued.)			
Coconut and palm oils, crude		2955·6	826·1
	1918	1077·5	—
Linseed oil		2440·9	319·3
	1918	1208·0	—
Liquid fats and oils, unspecified		2146·1	16·5
Lubricants		214·9	24·6
	1918	66·5	2·8
Machine oils, unprepared		8421·9	19·9
Olive, almond oils, olein		1302·9	7·2
Paraffin and ceresin		980·8	0·1
Resin oils		51·8	2·0
Stearin, degras		161·0	11·6
Varnish, lac, dryers		216·9	162·7
	1918	11·3	8·3
Vaseline		168·1	0·3
Fertilisers:—			
Artificial manures, etc.		3960·1	7555·7
Basic slag		46443·5	—
Bones, bone meal, crude phosphate		14858·8	20·4
Manure salts (potash)		29336·3	—
Potassium chloride		4775·7	0·2
Saltpetre, crude, ammonium salts		1078·2	1·5

—(*Chem. Ind., June* 9 *and* 16, 1920.)

Resources of the Cali District, Columbia.—Cali is the trade centre for the department of El Valle, which extends from the Central Cordillera on the east to the Pacific on the west. In spite of its natural resources, the development of this district has been retarded, chiefly owing to the climate, which is almost tropical, and to the lack and inferior quality of labour. The chief industries are cattle raising and sugar planting. Sugar is the most important agricultural product and occupies an area of 19,760 acres, with a total annual output of some 5156 tons of refined sugar, 1011 tons of unrefined sugar, and 3828 tons of molasses. It is estimated that, with the use of scientific methods, and if sufficient capital and labour could be obtained, the export of refined sugar could be increased by 20,000 tons. Although both climate and soil are suitable, all attempts to grow cotton have failed. Coal is found in the area between Guachinte to Punta Yumbo, a distance of about 51 miles, and an annual output of about 36,000 tons is obtained. The proximity of this reserve to the Panama Canal makes it probable that the industry will become very important; the coal is bituminous, somewhat friable, but cokes well. The development of this industry is held back by the limited carrying capacity of the Pacific Railway between Cali and Buenaventura. No other minerals, except coal, are produced in the department of El Valle, but its port, Buenaventura, is the chief shipping centre for the rich platinum and gold-mining district in the Choco Territory. During 1917 and 1918 the exports of platinum were 247 and 352 kg. respectively, and of gold dust 396 and 326 kg. respectively. There are practically no manufactures in the department of El Valle.—(*U.S. Com. Rep., Apr.* 22, 1920.)

REVIEWS.

Imperial Institute Monographs. Tin Ores. *By* G. M. Davies. *Pp.* 111. Manganese Ores. *By* A. H. Curtis. *Pp.* 118. Tungsten Ores. *By* R. H. Rastall *and* W. H. Wilcockson. *Pp.* 81. (*London: John Murray.* 1920.) *Price per volume*, 3*s.* 6*d. net.*

These three monographs on mineral resources with special reference to the British Empire have been prepared under the direction of the Mineral Resources Committee of the Imperial Institute with the object of giving a general account of the occurrences and commercial utilisation of the more important minerals. Each monograph comprises three chapters, dealing respectively with (1) the particular ores, their occurrence, character and uses, (2) sources of supply within the Empire, and (3) foreign sources of supply, and concluding with an adequate list of references to the literature on the subject.

Under each country are given tables showing imports, exports and production, and short descriptions of the geology and of the mineral occurrences. The statistical information relative to market prices, output and consumption, notoriously difficult to obtain in many cases, is well presented by means of tables and diagrams and is, on the whole, probably as accurate as was possible in the existing circumstances although, especially in the case of "Tin Ores," several unexplained discrepancies are noticeable when the tables of exports and imports are compared.

An effort has been made to include particulars concerning new deposits or potential sources of supply but, whilst much interesting information has been collected from official and unofficial sources and put into a convenient form for reference, it varies in reliability, and little regard appears to have been paid to the relative importance of such occurrences. Mr. Curtis appears to have been the most successful in overcoming these difficulties, and his monograph throughout shows care in its compilation.

The effect of the war upon the ore-minerals in question is clearly brought out in all three cases. The United States, the largest consumer of tin but not a producer before the war, now takes the place of Germany as a purchaser of Bolivian ores. Practically all the tungsten ore produced within the British Empire was taken by Germany before the war; now there is more than adequate plant capacity in England for this country's needs. Brazilian manganese ores could not compete seriously with those of Russia and India before the war but, owing to the cutting off of the Russian supplies and the Indian production being required by Great Britain, the United States increased its importation from Brazil, whose output of ore rose from 70,000 tons in 1913 to 495,000 tons in 1916. Much has been written in the press concerning the war period increase of tungsten ores. The increase in the world's production was approximately from 8000 tons in 1913 to 22,000 in 1917, a special feature being the production of China, which is stated to have risen from a negligible quantity before the war to 1200 tons in 1917 and to over 4000 tons in 1918. As a matter of fact, China produced approximately 8000 tons in 1918; equal in amount to the world's production in 1913.

William G. Wagner.

Animal and Vegetable Oils, Fats, and Waxes. *By* Geoffrey Martin. *Manuals of Chemical Technology IX. Pp.* 218. *(London: Crosby Lockwood and Son.* 1920.) *Price 12s. 6d. net.*

Several attempts have been made during recent years to cover in a short treatise either the whole or a considerable part of the wide field outlined by the above title. The present attempt to deal with the whole field of the nature, manufacture, analysis, and uses of oils in the brief space of some two hundred pages (including a good deal of space given up to diagrams and illustrations) is obviously a bold one, and the result cannot be said to be particularly successful.

In spite of the concentration of a large amount of information into a small space by the copious use of small type, and by cutting down descriptions of methods or processes so far as to render them frequently of little use, valuable space is often wasted by needless repetition. Chapter XI., for example, dealing with analytical methods, is to a large extent covered by Appendix II., consisting of a reprint of the Report of the Committee of Analysts on Standard Methods of Analysis of Seeds, etc., to the Ministry of Food.

The attempt to deal in five pages with the manufacture and analysis of butter is obviously futile, especially as nearly two pages are devoted to tables of tests for added colouring matter; whilst the chapter on margarine occupying six pages, and including three pages of statistical information, is also poor, although in this case there is more excuse, as the literature of the subject is scanty and manufacturers are somewhat reticent as to details of certain processes.

Chapter X., entitled "Varieties of Fats, Fatty Oils, and Waxes," is, unfortunately, one of the weakest in the book. A notable omission is to be traced under castor oil, no reference being made in the description of this oil to its characteristic acetyl value, and, although figures for acetyl values of various oils are given in the tables of analytical constants, no reference is made to this constant in the chapter on methods of analysis.

There is throughout an unfortunate lack of system; botanical names of plants furnishing oilseeds are sometimes given (in several cases inaccurately), and in many other places are omitted, whilst no serious attempt is made to indicate the relative commercial importance of different oils. The information is at times not so "up-to-date" as it might be—*e.g.*, no mention is made of the most important modern source of whale oil, viz., the South Atlantic fisheries, though less important sources are referred to (p. 32).

One must confess relief at finding that the author realises that edible oils may be manufactured by the solvent extraction process, though even now he appears hardly to realise, or else is reluctant to admit, that enormous quantities of edible oils have been manufactured in this way for some years past.

In spite of its many faults this book possesses redeeming features, such as the numerous diagrams and illustrations of modern plant and machinery (largely from machinery manufacturers' catalogues), the inclusion of brief descriptions of the manufacture of fish oil and meal, and of the recovery of oil from engineering-shop waste, whilst the important subjects of the hydrogenation of oils and extraction of oils by solvents appear to be dealt with as well as it could be in the small space available.

After a careful perusal of this book one is tempted to ask, to what class of reader is it likely to appeal most. It seems to be written in too condensed a form to prove of much value as a work of reference to the technologist, manufacturer, or chemist; it should, however, enable anyone with little previous knowledge of oils to obtain rapidly, and with a minimum of labour, a general idea of the subject, and serve to indicate where more detailed information is to be found.

Russell G. Pelly.

PUBLICATIONS RECEIVED.

Publications of the United States Bureau of Mines. Department of the Interior. *(Washington: Government Printing Office.* 1920):—

Effects of Gasolene Removal on the Heating Value of Natural Gas. *By* D. B. Dow.

Waste and Correct Use of Natural Gas in the Home. *By* S. S. Wyer.

Approximate Quantitative Microscopy of Pulverised Ores. *By* W. H. Coghill *and* J. P. Bonardi.

The Mineral Industry of the British Empire and Foreign Countries. War Period. *Imperial Mineral Resources Bureau. London: H.M. Stationery Office,* 1920:—

Magnesite. *Price* 1s. 3d.

Felspar. *Price* 6d.

Fuller's Earth. *Price* 6d.

Chrome Ore and Chromium. *Price* 1s.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. CARDIFF, 1920.

The 88th Annual Meeting of the British Association was held from August 24 to 28 last in Cardiff under the presidency of Prof. W. A. Herdman. Despite the increased railway fares and a local strike of municipal employees, the number of members reached the satisfactory total of 1387, the general and sectional meetings, social functions, and excursions all being, in the main, well attended. It would be difficult to conceive of a better environment than that afforded by Cathays Park, where the accommodation provided in the City Hall, the University College, and the Technical College was all that could be desired. At the Inaugural General Meeting, Prof. Herdman delivered the presidential address on the subject of oceanography, in the course of which he advocated the initiation of a New Challenger Expedition. This proposal was supported by resolutions passed by various sectional committees, including that of Section B (Chemistry), and adopted by the General Committee; as the Research Department of the Admiralty regards it with favour, it is probable that preparations for its execution will be taken in hand in due course. Prof. Herdman also pleaded for the establishment and maintenance by the Local Authority of a Marine Biological Station at Cardiff, a suggestion which was well received by the Rt. Hon. the Lord Mayor and the local press. The Evening Discourses were delivered by Sir R. T. Glazebrook on "Some Requirements of Modern Aircraft," and by Sir A. D. Hall on "A Grain of Wheat from the Field to the Table." At a special conference on "Science Applied to Public Services," Prof. Herdman presiding, Mr. F. E. Smith, director of research to the Admiralty, described the organisation, actual and prospective, of this new department. An important feature of the scheme is the provision for co-operation with other research institutions and with independent workers, who are to be remunerated for their services. Pending the completion of a new laboratory at Teddington, estimated to cost between £25,000 and £30,000, work is being carried on at the National Physical Laboratory with a staff of 28. Mr. Smith was followed by other speakers from Government Departments, each of whom described, and inferentially eulogised, the work of his department, but Prof. Stanley Gardiner, of the Ministry of Agriculture and Fisheries, struck a critical note in pleading for the raising of scientific men in State employ to the rank of ordinary civil servants, a status which they do not at present enjoy. The subject of the status of scientific men, and their emoluments, was also prominent at a meeting of the National Union of Scientific Workers. Prof. F. Soddy presided, and Major A. G. Church, the secretary, in discussing the aims and organisation of the Union, laid stress on the point that although circumstances had rendered it advisable to register as a trade union, there was no intention of adopting any trade-union method, *e.g.*, the strike, which was subversive of industrial peace and progress.

A resolution was passed by Section I (Physiology) urging the formation of a new section of Psychology (at present a sub-section), and this was endorsed by the General Committee, and remitted to the Council for consideration. The criticism emanating from an influential quarter that the number of sections should be reduced rather than increased has met with little support. It is felt that although the discussion of general questions and the popularisation of science are undoubtedly among the chief objects of the Association, it would be unwise to make any move which would tend to discourage the attendance of specialists and the presentation of contributions by them. On the other hand, it is generally recognised that it would be wise to hold more joint meetings of cognate sections, for such always prove attractive and useful, the joint meeting of Sections A and B to discuss Isotopic Elements during this meeting being a case in point. It has also been suggested, with considerable force, that the popularising function of the Association would be facilitated by securing extended and better publication of suitable matter in the non-technical Press. On the whole, the daily press has served the Association well, but better results would undoubtedly accrue if the "copy" were supplied by authors, and then suitably fashioned by a journalist with some knowledge of science.

The addresses of the sectional presidents, which have been published in a separate volume*, were, with the exception of that by Mr. C. T. Heycock to Section B, (*cf.* J., 1920, 285R) of but little direct interest to the chemist, but, nevertheless, the ubiquity of chemistry, to borrow Lord Moulton's expression, was manifest in many of them.

In his address to the Mathematical and Physical Science Section, Prof. A. S. Eddington dealt with the internal constitution of the stars, and came to the conclusion that the source of a star's heat cannot be accounted for by the energy of gravitational attraction, rather has it to be ascribed to subatomic energy set free within the star. The work of Aston and Rutherford supports the view that the stars are the crucibles in which the lighter atoms which abound in the nebulæ are compounded into more complex elements. The end of this address was devoted to an interesting disquisition on the *rôles* of hypothesis and speculation in the development of a science. In the Engineering Section, Prof. C. F. Jenkin urged an extensive revision of the theory of the strength of materials in order that anisotropic substances, like timber, might be included, and for more research into the physical properties of materials used by engineers. An interesting address was given by Mr. J. Barcroft to the Physiological Section on anoxæmia, or lack of oxygen in the blood. Cases of anoxæmia may be classified as follows:—(1) Anoxic, too little oxygen pressure and too much reduced hæmoglobin in arterial blood, as in pneumonia; (2) Anæmic, too little hæmoglobin, but normal oxygen pressure, as in anæmia and carbon-monoxide poisoning; and (3) Stagnant, normal oxygen pressure, but blood-flow too slow, as in shock and back pressure. Prof. F. W. Keeble addressed the Agricultural Section on the subject of intensive cultivation, and in regard to the important question of the relation of the expert to the administrator in Government Departments stated his conviction that no administrator, save the rare genius, can direct the expert, but the latter, if he has a trained scientific mind and fair administrative ability, can direct any but a genius for administration. Work in a Government office dealing with purely administrative matters can be left to the trained administrator, but if it be of a creative kind it must be directed by a mind trained in the methods of scientific research.

The proceedings of the Chemical Section, which were presided over by Mr. C. T. Heycock and "managed" by Prof. C. H. Desch (who acted as recorder in the absence, through an accident, of Dr. A. Holt), covered a numbered of topical subjects and were, on the whole, well attended. Captain Desborough's paper on "Industrial Alcohol,"

* The Advancement of Science, 1920. (London: John Murray, 1920.) Price 6s. net.

which is given elsewhere in this issue, dealt with the practicability of producing alcohol direct from agricultural products, and led to the conclusion that the question of the manufacture from home-grown products is still *sub judice*. In the discussion Prof. C. H. Desch stated that experiments at the works of the Skinningrove Iron Co. had shown that about 70 per cent. of the ethylene formed in the manufacture of coke was recoverable, and that 70 per cent. of this recovered gas was convertible into alcohol. The results had so far been obtained with an experimental installation, but a large-scale plant had just begun working, and it remained to be seen if the process was an economic one. If the ethylene were recovered from all the coal carbonised in this country, some 23 million gallons of alcohol could be obtained yearly on the basis of the above figures of yield. A resolution was passed by the Sectional Committee endorsing the value of, and claiming support for, such experiments as were being undertaken by Capt. Desborough, and this was approved by the General Committee and remitted to the Council.

To a symposium on "Lubrication" were contributed papers by Messrs. H. M. Wells and J. E. Southcombe, A. E. Dunstan and F. B. Thole, and H. T. Tizard. The first of these dealt with the authors' work on the effect of introducing small amounts of free acid into mineral oil, whereby the usual fatty oil used for blending purposes becomes unnecessary and wasteful. Messrs. Dunstan and Thole discussed the chemical nature of heavy mineral oil, bringing out the point that the "unsaturated" components of lubricating oil were removable by means of sulphuric acid; they possessed iodine values which steadily increased with the concentration of Wij's reagent, and with time, but were unaffected by hydrogen in conjunction with nickel catalyst. They suggested the possibility of the presence of closed saturated rings which were opened up under the influence of acid and iodine chloride. Mr. Tizard discussed the nature of lubrication from the point of view of adsorption phenomena, and criticised Southcombe's falling-drop method of measuring interfacial surface energy, pointing out that when mercury fell through castor oil the droplets did not coalesce, whereas through glycerol of the same viscosity and drop number coalescence was observed.

Papers on tungsten and zinc were presented by Mr. J. L. F. Vogel, Prof. Desch, and Mr. S. Field. Mr. Vogel's paper on the tungsten industry followed closely on the lines of his article in this Journal (1920, 130 R), and that by Dr. Desch dealt mainly with the manufacture of the ductile metal. This is made by pressing the powder into rods and sintering these together by heat produced by an electric current, heating in hydrogen, swaging at a very high temperature, and drawing, first hot and then cold. So prepared, a wire of 0.0014 in. diameter has a tensile strength of nearly 270 tons per sq. in. The possibility of drawing cold depends upon the grain size of the original sintered ingot, and this is kept under control by microscopical examination. In order to prevent undue growth of grain, a small amount of thorium oxide is added to the tungsten powder in making the original ingot. Mr. S. Field contributed a long paper on "Electrolytic Zinc," in which he advocated the development of the industry in this country, enumerated the advantages of the electrolytic process, described the various operations involved in its practice, and gave the results of original work that had been carried out at Swansea during the past four years.

Prof. W. A. Bone presented the Third Report of the Committee on Fuel Economy, of which an abstract is given on page 308 R of this issue, and copies of the Report of the Committee on Absorption Spectra of Organic Compounds, drawn up by the secretary, Prof. E. C. C. Baly, were distributed.

Other papers and communications contributed were:—"Researches on Atmospheric Pollution and its Measurement," by Dr. J. S. Owens; "Research Work at High Temperatures, and the Determination of Surface Tension and Electrical Conducitvity between −100° and 1650° C.," by Prof. F. M. Jaeger, of the University of Groningen; and two short papers by Dr. R. V. Stanford on methods of estimating (a) carbon in organic compounds by combustion, and (b) amino acids, using very small quantities in each case. The four afternoons were devoted to visits to works in the neighbourhood.

Among the papers contributed to other Sections which are of interest to chemists were: Section C.:—"Crystal Structure," by Prof. W. L. Bragg; Section E.: "The Iron Industry of South Wales," by Dr. A. E. Trueman; Section G:—"Testing Materials at High Temperatures," by Prof. F. C. Lea; "Specific Heat and Dissociation in Internal Combustion Engines," by H. T. Tizard; "The Pneumatic Conveying of Materials," by Prof. W. Cramp; Section I.:—"The Energy of the Human Machine as Measured by the Output of Carbon Dioxide," by Prof. A. D. Waller; "On the Estimation of Sugar in Blood," by Miss H. Walker, Prof. A. R. Ling and Mr. E. A. Cooper; Sections K and M:—"Soil Acidity," by Mr. E. A. Fisher.

The next meeting of the Association will be held at Edinburgh from September 7-14, 1921, when Sir Edward Thorpe will assume the presidency. The 1922 meeting will be held in Hull, that in 1923 probably in another northern city, and for 1924 theee are prospects of a meeting in Canada.

THE DYE-WORKS CHEMIST.

B. LEECH.

In the dyeing industry the gradual replacement of natural by synthetic dyestuffs has led to the disappearance of the old-time craftsman. The materials which the old dyer used were of such uncertain and variable composition, and the chemical aspect of the processes he employed was so incompletely understood, that experience and the accumulation of detailed empirical knowledge were of greater practical value than a knowledge of chemistry. As in many other industries, the necessary technical knowledge was carefully guarded, and the possession of "trade secrets" was the basis of commercial success. With the introduction of synthetic dyestuffs the dyer was offered materials which his previous experience had not taught him how to use, and he was dependent for the necessary information on the makers of the new dyestuffs. In this way it came about that all problems of the special application of the new dyes was referred to the colour makers for solution, and ultimately the dyer appealed to the colour maker in all cases where a difficulty arose which appeared to him to present a chemical problem. This state of affairs is well illustrated by the reply recently given by a number of dyers to an inquiry by a local education committee as to the desirability of starting classes in chemistry and dyeing in the local technical school. The reply was to the effect that the directions given by the colour makers for the use of their dyes were so complete and simple that no knowledge of chemistry was required by a dyer! This surely is a policy of despair as regards the future of dyeing as an independent industry. If the art of dyeing has become so simple that anyone can carry it on without special training, competition must inevitably reduce the dyer to the position of the unskilled labourer. It would be almost equally ridiculous to pretend that the issue of drugs in tablet form, with pamphlets describing their therapeutic value and giving directions for their administration, would make special training unnecessary for the medical profession. Surely a saner view would be to regard the new synthetic dyestuffs as presenting wider opportunities for the dyer's ingenuity and invention. The dyeing and printing industries as a whole present a vastly more complicated picture from the technical point of view than that offered by these industries in the days before the universal use of synthetic dyes. The actual chemical materials now in use are much greater in number and variety; at the same time they are of greater chemical purity and less obscure and uncertain in their properties. The consequence is that the problems now presented to the dyer, though of greater variety and complexity than in the past, require for their solution a wide knowledge of chemistry and kindred sciences rather than the special and intimate experience of his materials which the old craftsman possessed. Dyeing has, in short, become an applied science. Like other industries, the dyeing industry is in a state of transition, and very different stages of progress are represented by different works. Thus we find a large number of small dye-houses in which a very limited number of processes is used and the equipment is of the simplest; very extensive works which are specially equipped for mass production by a few processes; and finally works with a highly complex organisation for a great variety of processes.

Most dye-works of importance now employ a chemist, but there is still room for very considerable progress in the direction of scientific organisation and control of the processes carried on. On the one hand there is a deficiency in the supply of adequately trained men, and on the other there is a failure to appreciate the value of scientific control. The dye-house chemist is to-day employed chiefly for the analysis and evaluation of materials as a guide to the buying department, but it is desirable that he should have a far greater share in management and responsibility, and that remuneration should be offered which would attract men who are fit to take such responsibility and have a place on the board of directors. It is not generally realised that a manager who possesses no scientific training cannot employ a trained man under him in such a way as to get the greatest benefit from his services. Such a manager fails to see the opportunities for the application of scientific method which are actually under his eyes, and the problems which he passes on to the trained man are most frequently presented in a form which precludes any likelihood of the latter drawing up a report of real value. Given the trained man, the only way in which to bring him into contact with his work is to give him complete technical control and a free hand. It is often far easier to solve a technical problem than to explain it to a board of untrained directors and teach them to arrange the facts and draw the inferences in a scientific manner. However, the supply of men capable of taking responsibility is very restricted, and a much broader scientific education is needed in the technical school. When Nature presents a technical problem she has no regard for the examination syllabus. A problem which at the first glance appears to be a chemical one often involves a knowledge of physics or biology for its solution. The first requirement for the dye-works' chemist is a broad and thorough training in scientific method. In addition to chemistry he requires at least a sound knowledge of physics and mathematics, and he must be familiar with the technique of the microscope. The best training for such a man is a broad scientific course at a university, followed by special training in a technical school. At present the university-trained man knows too little of the technical side, and the technical college man knows too little of the scientific side.

It will now be interesting to pass in review some of the features in dyeworks' management in which the services of such a trained man, as suggested above, would prove of considerable value. His advice will be needed as to the plan and construction of buildings, the materials of the walls, roof, floor, and drains, for wise decision on these points involves a knowledge of the processes for which the building is to be used. Ventilation (which is generally either very bad or immensely expensive), steam and power equipment, and the arrangements for artificial lighting also demand his attention.

Further, there is the important question of plant. The modern tendency is to dye all textile materials at as late a stage of manufacture as possible. If goods can be woven " in the grey " and dyed in the piece the output of a given number of looms is far greater, and there is much less risk of damage than if they are woven from dyed yarns. But piece-dyeing involves a great variety of machinery, and almost every one of the new fabrics which has appeared in recent years requires special machinery for dyeing and finishing. The problems involved in devising means of dyeing expeditiously a new fabric, having regard to the choice of dyestuffs and contents and temperature of the dye-liquor to which one is restricted, and the final finish which the fabric is required to have, are such as require an intimate knowledge of the properties of the dyestuffs under very varied conditions, as well as of the physical properties of the fabric and of the materials which can be used in constructing the special machinery. In this connexion it may be remarked that the most conspicuous successes have only been attained when the designer of the cloth and the dyer have worked in close collaboration.

This invention of new fabrics will be a most important factor in enabling this country to maintain its pre-eminence in the textile markets. Conditions in other countries, notably the United States and Japan, are very favourable to mass-production of the more common and less complex fabrics, and the British manufacturer is being forced more and more to abandon the trade in the commoner and lower-priced materials and to turn his attention to those which present greater technical difficulties in production and command a higher price. The problems before the dyer in this respect include not only those of dyeing itself, but involve the question of chemical or physical treatment of the fabrics in very special ways, which, combined with the weave and design, produce quite novel results. The weighting of silk, mercerisation of cotton, and the production of artificial fibres are instances to the point. An interesting fabric consisting of a mohair warp and wool weft, of fairly recent invention, affords another illustration of the kind of possibilities that are open. The mohair warp, as it existed in the finished fabric, was too weak to stand weaving; the warp originally consisted of a mixed yarn of mohair and cotton, and the latter was entirely removed from the piece, after weaving, by carbonisation.

Another valuable part of the work of the dyeworks' chemist is the detection of the cause of damages which arise during one or another of the processes and the prevention of the same. Such problems almost always involve skill in chemical microscopy, and experience in this special technique is a valuable asset to the dyeworks' chemist. Timely use of the microscope in this way may lead to the early detection of an impurity in one of the chemical materials used or a defect in a machine and so prevent heavy loss.

The question of large production is one which involves in the dyeworks many intricate physical and chemical problems. In the case of each fabric, yarn, or fibre there is an optimum amount which can profitably be dyed on one machine. It is generally possible to decide on the approximate limitations without actual trial.

In the control of drying and finishing processes the trained man will find many opportunities for the application of his knowledge. To give a simple example:—The difference in efficiency in the ordinary drying stove achieved by the correct control of the ventilation, based on observations of a wet and dry bulb thermometer, is very striking. The finish of a cloth varies in a very remarkable way with the conditions of the final drying, namely, the previous and final moisture content of the cloth, length of time taken, and the temperature at which drying is carried out. The difference in effect between low and high temperature drying is one of the problems which are ripe for thorough investigation. The mixings, for finishing purposes, of stiffening, softening, or thickening materials and the like present a fine field of investigation to the colloid chemist. The sizing of yarns before weaving and the removal of the size before dyeing may be included in the same class of problems. Closely related are problems involving fermentation and the growth of moulds on fabrics and fibres and the destructive effect of micro-organisms. The production of materials with special physical properties such as waterproofing, fireproofing, making them impermeable to gases and resistant to abnormal conditions, offers another large field of scientific problems. Finally, it must not be forgotten that we are still very ignorant of what is actually going on in the dye-bath when a textile material is being dyed.

The above short sketch of the general character of the work of a modern dyer will show that the training suggested is by no means too wide or liberal if the industry is to attain the rapidity of progress necessary to keep this country at the head of the textile trade. It will also be seen that the occupation is one in which a man of high education may find work which can be of great commercial value, and is at the same time intellectually interesting and satisfying.

INDUSTRIAL ALCOHOL.

A. P. H. DESBOROUGH.

With the ever increasing consumption of petrol we are approaching a stage in which the supply of this commodity will not equal the demand. In consequence we shall find that the price of petrol will rise rapidly, and that in a comparatively few years the cost of energy in this form will be out of all proportion to that of energy in the form of solid fuel. The most important use of petrol is its employment as a fuel in the internal combustion engine. Therefore, the industrial problem which demands immediate attention, is the finding of a substitute available in considerable quantities and suitable for use in these engines. Alcohol alone, or in admixture with various substances such as benzol or ether, has repeatedly shown its merit as a liquid fuel, not only as a substitute for petrol, but actually as an industrial rival. Its future, however, depends entirely upon the practicability of producing it economically, and it is mainly to this dominating aspect of the problem of industrial alcohol that the following considerations are directed.

Let us consider briefly the possible sources from which alcohol may be obtained. As far as the manufacture from calcium carbide is concerned, it is difficult to obtain definite information about costs of production. The most concrete figures available are given in a report (1918) on alcohol by the German Government, according to which a firm at Lonza, Switzerland, contracted to supply a rectified alcohol to the Swiss Federal Government at approximately 1s. per gallon. It is important to note that the report considers it problematic whether the manufacture of alcohol from carbide will ever be able to compete with that by the fermentation process, and it is shown that, if converted into calcium cyanamide and in this form applied as fertiliser to a potato crop, the calcium carbide would indirectly yield four times as much alcohol as when converted into the alcohol direct. The Lonza factory, however, is understood to have been closed down, as the manufacture of alcohol was found to be unprofitable. Lately it has been suggested that considerable quantities of ethyl alcohol may be produced from the ethylene present in coke-oven gases. No information is available as to the manufacturing costs of this alcohol, but in estimates from the Skinningrove Iron Co. the value of it is put at 2s. a gallon.

All other methods for the manufacture of ethyl alcohol are based on the conversion of carbohydrates by fermentation, the carbohydrate being cellulose, starch, or sugars. It is possible to get reliable information as to cost, especially in the cases of conversion from starch or sugar. For the conversion of cellulose to alcohol several processes have been worked out. There is the well-known process of fermenting sulphite liquors which, in countries of extensive timber and pulp production, has attained considerable importance. According to a report of the Honorary Advisory Council for Scientific and Industrial Research of Canada, the sulphite liquor from all the pulp mills in Canada could supply 5 million gallons of 95% alcohol per annum at a cost of about 1s. 6d. a gallon. In the Simonsen and the Classen processes, sawdust and waste wood are digested with sulphurous and sulphuric acids, respectively, at high temperatures. Part of the cellulose is thereby converted into dextrose, which may be fermented. A factory in the United States was working this process during the war. Taking into account the enormous quantities of waste cellulose materials which are produced annually all over the world, there is no doubt that here is a potential source of large amounts of alcohol, provided the serious difficulties met with in dealing with the waste cellulose could be overcome. It must be remembered that this material is, more often than not, found in very inaccessible places, and the cost of transport to the fermentation factory would, usually, be considerable. Another difficulty is the large quantities of mineral acid required for hydrolysis of the cellulose, the supplies of which would probably have to be brought from afar. This objection applies equally to Willstätter's hydrochloric acid treatment. Other cheap sources of carbohydrates such as peat or seaweed have been suggested and even investigated on a small scale, but the extensive utilisation of these materials is very problematical.

Coming to the more readily fermentable carbohydrates (starch and sugar materials), let us consider briefly the possibility of industrial alcohol production in this direction.

To place alcohol on the market at, say, 3s. 2d. per gallon retail, the manufacturer will have to sell at 2s. 2d. per gall., one shilling being absorbed by distribution and other charges. Now, is it possible to manufacture 95% alcohol at 2s. 2d. per gall. and still leave a sufficient margin of profit to the manufacturers?

The cost of manufacture of 1 gall. of 95% alcohol by fermentation in a modern factory may be put at 9d. per gall., including depreciation on plant. If the wholesale price is 2s. 2d., there is there-

* Communicated by Section B (Chemistry) of the British Association for the Advancement of Science, Cardiff, August, 1920.

fore 1s. 5d. left to pay for raw materials used, and for interest on the capital invested in the factory. Leaving 4d. per gall. for the latter purpose, there is 1s. 1d. available to pay for the raw material required for the production of 1 gall. of 95% alcohol. As on an average 120 galls. are obtained from one ton of fermentable carbohydrates, it will be seen that the maximum price which can be offered per ton of pure carbohydrates is £6 10s., supplied at the fermentation factory.

The table below gives the corresponding prices (based on the carbohydrates present in the material) for some of the more common crops:—

Material.	Maximum price payable per ton.
Fermentable carbohydrates (100%)	£6 10s.
Jerusalem artichokes	£1 3s.
Potatoes	£1 3s.
Mangolds	11s.
Sugar-mangold (13% sugar)	17s.
Maize	£4 8s.
Rice	£4 17s.

It is obvious that with present-day prices for, say, artichokes, potatoes or mangolds, it would be impossible to attempt the manufacture of cheap alcohol.

Whether it is possible to bring the cost of mass-production of the raw materials within the figure stated above is the crux of the whole question. The information available as to this question is in some instances exceedingly meagre. For instance, in the case of Jerusalem artichokes, estimates of yield per acre vary from 5 tons to over 30 tons per acre. Now, if the cost of mass cultivation is put at £28 per acre, it will be seen that a yield of 5 tons of tubers to the acre would make it impossible to use artichokes as raw material, whereas at the rate of 25 tons to the acre the production of alcohol from this source could be regarded as economic. What has been said about the artichokes holds good, more or less, for the other materials mentioned. One of them, however, deserves especial comment. Maize is to-day offered in the open market at about £20—£25 a ton. This price, however, is as abnormal as that of artichokes or those of most other foodstuffs at the present time, but there is little doubt that in certain South American countries, such as Peru, where two or three crops of maize may be harvested yearly, this raw material could be produced at a very much lower figure, somewhere in the neighbourhood of £2 per ton. As the maximum economic price for maize is £4 8s., it will be seen that here at least is a raw material which, in certain localities, is eminently suited for the manufacture of cheap alcohol, and it is stated to be in use in South Africa at the present time.

I am fully aware of the objection that foodstuffs ought not to be used for the manufacture of alcohol while there is the present shortage of food supply. I have been informed that in both Egypt and India much land that was formerly employed for the production of food has recently been utilised for growing cotton, which at the moment was commanding higher prices, and that this was a matter of grave concern to the respective Governments.

I would not for one moment suggest that the objection is not valid, so far as cultivated land already in existence is concerned. There can be no such objection, however, to the reclamation of waste land. Indeed, owing to the need for rotation of crops, land reclaimed for the purpose of growing raw material for alcohol production would automatically increase the food supply of the country. I understand that in the south of England the cost of reclamation, when carried out on a small scale, is generally prohibitive, but that when it is effected on a large scale by mechanical means, the same objection does not arise. May I emphasise in this connexion, that in my opinion it is essential that the producers of the raw material should also have a direct interest in the manufacture of the finished article? In other words, if alcohol is to be produced economically, a co-operative system presents the most favourable chance of success.

As to the fertility of reclaimed heath land, I would quote the following instance which has come to my personal knowledge. On land of this description, in the neighbourhood of Bournemouth, a small-holder has within the last few years reclaimed 3 acres of land, and during the past five years has obtained an average crop of 14 tons of artichokes per acre.

If, then, it may be assumed that carbohydrate crops may be grown for alcohol production without detriment to food supplies, the question arises as to where land can be most suitably reclaimed. Many people appear to think that the tropics are the most suitable place, but available figures do not entirely support this assumption with the exception, perhaps, of maize in certain climates. Take for instance the case of the sweet potato, which is one of the best known examples of prolific tropical crops. According to good authority, the average yield amounts to 4—6 tons per acre, or barely that of the potato yield in England. Of other materials, yam yields 4—5 tons per acre, sugar sorghum 8—10 tons per acre, and sugar cane 10—15 tons per acre. As against this may be quoted the following figures from temperate climates:—Sugar beet 14—16 tons, and mangolds 24—30 tons. On the whole it would appear that root crops are more prolific in a temperate than a tropical climate.

It will thus be seen that the temperate zone cannot, *a priori*, be excluded from the production of carbohydrates on account of the inefficiency of the soil to yield large quantities per unit of land. This being so, there are certain advantages in growing at any rate some portion of the total quantity of the raw materials in this country. The reclamation of waste land not only increases the available food supply of the country (on account of the need for rotation of crops), but also provides employment for a considerable number of people. The alcohol produced in this manner would also be independent of overseas transport.

At the Royal Naval Cordite Factory, Holton Heath, we have for some time past been studying the production of cheap alcohol, and the work is now proceeding in conjunction with the Department of Scientific and Industrial Research. The experiments, however, are not sufficiently advanced to warrant any useful deductions being made. In the first place we have been, and still are, carrying out cultural experiments to investigate the economics of production. Several acres of heath land have been reclaimed and have been planted with artichokes, different plots receiving different treatment. Experiments have also been carried out to ascertain the nature and economic possibilities of the cellulose contained in the artichoke stalks. We are also growing a special beet introduced by M. de Vilmorin for the manufacture of alcohol in France. Further, we are now able to experiment with a tuberous plant (a *Helianthus*), which grows in the Andes at an autitude of about 6000 ft. and which is already the subject of experiment in France. This plant, *Polymnia edulis*, is said to produce tubers of from 0·5 to 2 lb. weight, and to have a sugar content comparing favourably with that of mangolds. Finally, the possibility of dealing with cellulose on parallel lines to the Boulard process is being studied. It remains to be seen whether it will be possible to obtain an organism which will convert cellulose into fermentable sugars.

To sum up the position, it appears that, though it is perfectly certain that the total demand for power alcohol can never be met solely by home production, it is too early to say that the home manufacture is uneconomic.

NEWS AND NOTES.

AUSTRALIA.

Cement Works in Tasmania.—For a long time past there has been a considerable shortage of cement in the principal States of Australia, and this has been severely felt in Tasmania. A large deposit of limestone exists on Maria Island, which is situated on the south-east coast of Tasmania. It is reported to be of very high quality, and, provided other materials are available, should justify the erection of a cement plant. Coal is found in the neighbourhood of St. Mary's, but so far it has not been worked owing to its poor quality. Shale is also plentiful and within easy reach.

A company has been recently floated with which such well-known men as Sir John Monash, Mr Bice and Mr. Boas Kelly are associated, having for its object the establishment of a cement works with a capacity of approximately 50,000 tons per annum. There is no doubt that extreme care will have to be taken to avoid making initial mistakes. Trouble has already been experienced in one plant in Australia owing to the high and variable percentage of ash which occurs in low-grade coals. Such ash, almost invariably high in alumina, has proved an endless source of worry owing to the tendency to cut rings in the lining of the rotary kilns, besides interfering with the uniformity of the final product.

The Zinc and Iron Industries.—The Electrolytic Co. of Australasia has announced that within the next few weeks the weekly output of electrolytic zinc from the Risdon plant in Tasmania will be increased from 100 to 140 tons, by the use in a portion of the new large plant of an extra 1750 h.p. of electric energy to be supplied by the Tasmanian Government, which has almost unlimited supplies. Construction of the first half of the new 100-ton zinc plant is being steadily advanced, and work on the buildings and plant for the treatment of by-products and the development of subsidiary industries are also proceeding.

The Austral Nail Co. is about to undertake the manufacture of galvanised wire. The plant is to be extensive, and will probably start working in about six months. Up to the present the operations of this company have been confined to the manufacture of wire for nail making, black fencing wire, and wire for general manufacturing purposes. Steel supplies are still rather short, but normal conditions are steadily being reached.

The future of iron production in Australia is considered to be promising. Large works are to be constructed at Newcastle, mainly for the manufacture of wire rope, for which all the raw materials can be obtained in Australia. The Broken Hill Proprietary Co., Ltd., is making extensive additions to its steel works at Port Waratah, New South Wales, at a cost of many millions.

Mining.—It is stated that a very rich discovery of silver-lead ore has been made some 200 miles west of Broken Hill, specimens obtained near the surface showing about 82 per cent. lead and 35 oz. silver. Promising ore was found near the same locality in the late seventies.—(*Official.*)

SOUTH AFRICA.

New Talc Mine.—A new talc mine has been opened in the Barberton district, where the resources of talc are apparently capable of great expansion. The new mine, known as the Scotia talc mine, lies to the north of the Sheba railway bridge, and the deposits appear to be a series of beds up to 400 ft. in thickness. Judging from the workings that have been opened, a superior bed of talc, varying from 15 to 25 ft. thick, has been struck 400 ft. below the outcrop. There appears to be a sufficient tonnage in sight to establish a permanent industry, and the working facilities are such that the mineral can be delivered on the surface at the cost of a few shillings a ton. The company's works are some two miles away, with easy access by rail and road, and a new plant capable of handling 500 tons a month has been erected to deal with the output. Grades of talc are produced that are suitable for industrial as well as medicinal and toilet purposes.—(*S. African J. Ind., June*, 1920.)

Association of Technical and Scientific Societies.—A body has been formed which will be known as the Associated Scientific and Technical Societies of South Africa, and which will bring together eight or ten of the chief technical societies in that country into a common institution at Johannesburg. The necessary funds will be obtained by a loan from the Chamber of Mines, by contributions from the capital funds of each society, and by an appeal to their respective members.—(*Bd. of Trade J., Aug.* 5, 1920.)

CANADA.

Natural Gas.—It is reported that the San Joaquin well in the Peace River district is yielding a steady flow of 20 million cb. ft. of gas every 24 hours. The well is now being capped, and drilling operations are being carried out in search of further sources of oil.—(*Official.*)

Oil Developments in Western Ontario.—For over 60 years the bulk of the oil produced in Ontario has come from the corniferous formation at depths varying from 250—500 feet. Large quantities of high-grade oil have been produced, and now the flow tends to settle down to a small but fairly steady production. In 1917, a well sunk to a depth of 3185 feet at Dover, Kent County, Ontario, showed the existence of a lower and entirely new gas and oil horizon consisting of an extension of the new Trenton formation from Ohio and Indiana across Lake Erie and south-western Ontario. The product from the new field is free from sulphur, and thus has a higher market value than that from the shallower wells. The success of this development work has attracted much attention, and several companies, including an English syndicate, will complete deep wells during this summer.

Developments in New Brunswick.—Active exploitation of the gypsum deposits and the oil and natural gas fields of New Brunswick is anticipated during the present year. The great demand for houses throughout the Dominion has created an insistent inquiry for gypsum, and although the adjoining province of Nova Scotia is a big shipper of this mineral to the United States, New Brunswick has only made a few sample shipments. The New Brunswick Gypsum Co., however, has made extensive plans for the development of its gypsum deposits at Hillsboro, on the shores of the Bay of Fundy, and is planning a large export trade. The company has several mills manufacturing plaster, and the home market has in the past absorbed the greater part of the output. American manufacturers are anxious to obtain the crude gypsum for their mills, and although the province has large deposits of the mineral, they are not being worked. The development of this industry on a larger scale is only a matter of capital and labour.

The D'Arcy Exploration Co., a subsidiary of the Anglo-Persian Oil Co., will carry on extensive exploration work in the province in the hope of discovering new natural gas fields. Borings made in the Moncton district last year will be followed up and extended, and preparations have been made for boring at three different points this summer. The fact that the Anglo-Persian Oil Co. has already invested $300,000 in leases in the district would indicate that its experts have considerable faith in its possibilities.—(*Agricultural and Industrial Progress*, May, 1920.)

FRANCE.

Industrial Notes.—*Metallurgy.*—There has been a slight falling off in metallurgical business during the holiday season. The production of cast iron is steadily progressing, and the Comptoir de Longwy will soon be in a position to meet the full requirements of the foundries in certain grades. The very marked reduction in the prices of all metallurgical products in Germany resulting from the recent measures adopted by the siderurgical association of that country, and the reduction in prices in Belgium, are bound to react on the French market. With the approaching return of more normal conditions of supply and demand, increased market stability seems to be assured.

Great interest is being taken in a new process of producing steel direct from the ore, and it is reported that a company with a capital of 60 million francs is being formed to exploit it on a large scale. Particulars are lacking, but the main principle is stated to be that of heating a mixture of ore, coal and flux, all thoroughly pulverised, in a revolving furnace, such as is used in the cement industry. Among the objections brought against it are, that whereas the chemical composition of a cement may vary considerably, those of steel are restricted to within much narrower limits; and the cost of breaking down and pulverising such large quantities of raw materials will be very great. The author of the process, M. Basset, has carried out experiments at Dennemont, near Mantes-la-Ville, in a cement factory containing revolving furnaces 56—60 metres long. He has produced ingots of cast iron, steel and wrought iron, and the results seem encouraging. There is no doubt that a process of this kind would do much to free the country from constant grave anxiety in regard to supplies of foreign coke.

Coal.—A question of immediate importance is whether means of transport will be available to carry the 1,600,000 tons of coal due to France, under the Spa agreement. The transport authorities state that it can be done, but the fact must not be lost sight of that the quantity of coal now imported into France is much greater than in pre-war days, and that the available rolling-stock and other means of transport are notably reduced. To cope with present requirements the transport by rail alone would have to be increased by 200 per cent. During July the total amount of foreign coal imported into France was 1,500,000 tons, to which total America contributed 300,000 tons. It is reckoned that on an average a French miner in pre-war days raised 200 tons of coal a year. During the war this figure came down to 135 tons, and now it has dropped to 100 tons.

The Chemical Industry.—This industry has been noticeably affected by the crisis prevailing in the hide and textile industries. The unfavourable rates of exchange do not allow trading with foreign countries, including Germany, where the prices are very high. This fact, coupled with difficulties resulting from obstacles put in the way of a speedy delivery of goods, makes trading with this country very difficult. The United States is trying to compete on the French market for the supply of dyes, but the absence of fixed prices, delays in delivery, and the lack of depôts in France make the attempt appear but very half-hearted.

Demand and consumption are diminishing, and if a few materials are more abundant, requirements in other respects are barely met. The position of the industry is becoming critical.

Franco-German Synthetic-Ammonia Convention.—On November 11, 1919, the French Minister of Industrial Reconstruction signed a convention with the Badische Anilin-und Soda Fabrik, with the object of obtaining the assistance of the German company in regard to the technical details necessary for the economic working of the Haber patents owned by that company but acquired by the French War Minister under the Peace Treaty. As the period during which the convention could be denounced had expired, the agreement came into force on April 1, 1920, and a Bill intended to carry it into effect is now before the French parliament. The Bill provides that the French Ministers of War and Finance can jointly concede the benefits accruing from the convention to a French individual or company, or failing that, to a French company in trust on behalf of the State, such company to be assigned a suitable portion of the National Powder Factory at Toulouse. A credit of 10,000 francs will be opened in order to provide for the initial cost of applying the convention.

The convention is intended to secure national independence as regards military requirements in time of war and food production in time of peace, and will enable a considerable portion of the expenses incurred during the war to be recovered.—(*Rev. Prod. Chim., July* 31, 1920.)

Electrochemical Industries in the Pyrenees.—The water-power resources of the Pyrenees are being rapidly developed, and about 150,000 kw., or ten times the quantity in 1914, is now being utilised. In the Pyrenees, aluminium (1500 metric tons a year) is manufactured at the Auzat works (Vic d'Essos), carbide (4000 t. a year) at Auzat, at Castelet on the Ariège and Boussens on the Garonne. Cyanamide is to be made at a large State factory on the plateau of Lannemezan; it will consume 50,000 h.p., and another, at Marignac, will have a daily output of 120 t. of cyanamide, with a consumption of 40,000 h.p. Nitric acid is made by the Birkeland and Eyde process at the Soulom works of the Norwegian Nitrogen Co. Chlorine, calcium chloride and caustic soda are made electrolytically at Boussens, on the Garonne, utilising the saline springs at Salies-du-Salat. Abrasives are manufactured at the Sarrancolin works, which produces aloxite by melting bauxite in the electric furnace, and at the Mercus works (near Foix), which makes boron carbide. The electro-metallurgical industry is also rapidly extending, particularly in regard to the production of ferro-alloys.—(*Schweiz. Chem.-Zeit., June* 24, 1920.)

UNITED STATES.

Asphalt and Allied Substances in 1918.—The production of asphalt in the United States in 1918 was 1,237,853 short tons, valued at $18,540,032. The output is classed in two main categories—solid and semi-solid (penetration less than 200) and liquid (penetration greater than 200). The former category includes binder for pavements, and the latter road-oil and asphalt flux. The heavy residuals from American and Mexican crude oils form the great bulk of the petroleum asphalt produced, whilst native asphalt is largely imported from Trinidad (52,492 tons in 1918).

The following data give the asphalt production abroad:—

Mexico (barrels of crude asphaltic base oil): 1916, 40,545,712; 1917, 55,292,770; 1918, 63,828,327.

Trinidad (native asphalt): 1916, 133,204 tons; 1917, 132,742 tons; 1918, 74,254 tons.

Venezuela (native asphalt): 1916, 49,176 tons; 1917, 54,410 tons; 1918, 47,314 tons.

Austria (tons of ozokerite and asphalt): 1911, 7541; 1912, 10,377.

France (tons of asphalt): 1911, 169,651; 1912, 311,763.

Germany (tons of asphalt): 1911, 81,880; 1912, 96,117.

Russia (tons of asphalt): 1909, 2418; 1910, 24,988.

Japan, Spain, and Italy were also producers.—(*U.S. Geol. Surv., Mar.* 31, 1920.)

JAPAN.

Hydro-electric Power in Korea.—A large hydro-electric power scheme, supported by the Oriental Development Co., is contemplated, with the object of utilising the River Hwangsu-wou, a tributary of the river Yalu, in South Hamkyeng Province. The capital will be 10 million yen (yen=2s. 0½d.), and it is anticipated that there will be a large demand for electric power, as South Hamkyeng is rich in timber and minerals.—(*Bd. of Trade J., July* 29, 1920.)

The Camphor Industry.—With the exception of an annual export of about 200,000 kin (kin=1·32 lb.) from China and of the output of the synthetic product in Europe and America, practically the whole world's supply of camphor is controlled by Japan. On account of the greatly increased demand from Europe and America, Japan has been able to supply only 60—70 per cent. of the requirements. The consumption of camphor in Japan itself is shown in the following table:—

Year.	Kin.	Year.	Kin.
1912	2,521,000	1916	5,530,547
1913	2,775,344	1917	3,948,392
1914	4,060,968	1918	2,605,550
1915	5,729,335		

The exports to the chief consuming countries from 1912—1918 were as follows:—

Year.	England. Kin.	France. Kin.	America. Kin.
1912	1,151,000	1,113,000	2,310,000
1913	902,000	1,104,000	2,569,000
1914	834,000	414,000	2,815,000
1915	848,000	414,000	3,814,000
1916	969,000	202,000	4,923,000
1917	586,000	126,000	1,121,000
1918	491,000	126,000	1,553,000

The demand is still in excess of the supply, and the decrease in production has induced the authorities to examine the question very carefully. The extraction of camphor from the leaves will probably be investigated shortly (*cf.* J., 1920, 76 R).—(*Chem. Ind., July* 21, 1920.)

GENERAL.

The Textile Institute.—The Autumn Congress of the Institute will be held in the premises of the Royal Society of Arts, London, from September 30 to October 2, inclusive. The proceedings will open with the delivery of the "Mather" Lecture, by Prof. H. M. Lefroy, on "Insects as Controlling Factors in the Supply of Cotton and Textile Materials." On the morning of October 1, after an address by the president (Sir Herbert Dixon, Bart.), Mr. Oscar S. Hall, of Bury, will submit a paper on "Woven Fabric: Achievements and Possibilities," and exhibit an interesting collection of fabrics produced on modern looms. Subsequently, the Institute members will be entertained to lunch by the Clothworkers' Company, at the Clothworkers' Hall, and later in the day there will be a visit to the British Institute of Industrial Art at Knightsbridge. On October 2, a visit will be paid to the National Physical Laboratory.

The Foundation Fund, which was initiated in 1917 by Sir William Mather, has now reached £11,000, and it is hoped to increase it to £50,000. The "Mather" Lecture was instituted with the object of promoting interest in the technical and scientific aspects of the textile industries, and a special gift of £2000 from Mr. J. Crompton, of Manchester, has enabled the Institute to inaugurate an annual competition in connexion with the design and structure of woven fabrics. The Journal of the Institute has been considerably developed, more particularly with regard to the abstracting and indexing of textile literature, and for this work substantial assistance is being received from the various textile research associations. The Institute has sections in Yorkshire, Lancashire, Ireland, and in the south of Scotland.

The Swiss Celluloid Industry.—Switzerland has a modest celluloid industry of quite recent date. Before the war Germany was its chief provider of raw celluloid and celluloid goods; France could not compete, and England exported but very little to Switzerland. The war caused a revolution in the Swiss celluloid market. For lack of raw celluloid, several plants manufacturing celluloid goods had to curtail production, but one decided to produce on its own account, and in this it was supported by the Swiss Government, which was in need of several products of the celluloid industry.

Germany is still unable to export celluloid to Switzerland, whilst France has succeeded in sending considerable quantities of combs, as Paris supplies Switzerland with most of her requirements in this direction. The manufacture of hair decorations and combs is a domestic industry, and several important Swiss firms are now making these goods.

The most important firm for general celluloid goods is the Swiss Celluloid Goods Manufacturing Co., of Zollikofen, near Berne. This firm began to manufacture in 1907, and in 1917 it built a plant for producing crude celluloid. Since then the production has been constantly increasing, and a new plant has been added at Worblaufen, where the Swiss Government manufactures explosives. In 1913, the study and production of non-inflammable celluloid was taken up by the Cellonite Co. (Dreyfus and Co.), in Basle, which worked with the Dreyfus patents, producing cellulose acetate, largely used for aeroplane varnishes, gas masks, etc. During the war the manufacture of cellulose acetate has been transplanted by this firm into England, France, Italy, and the United States. The difficulties of obtaining supplies of camphor gave rise to the erection of a new plant for the production of synthetic camphor at Worblaufen, in the above-mentioned Government nitrocellulose plant. This was taken up by the Camphorn Co., Ltd., using terebenthene oil as starting material.

The guncotton for the manufacture of crude celluloid is produced by the new gunpowder works at Wimmis (Canton Berne) belonging to the Swiss Government. At present the daily production of celluloid in Switzerland is less than 1000 kg.

Unfortunately, no official figures are available in regard to exports and imports of celluloid, as in the Swiss customs tariff no distinction is made between celluloid and rubber. It may be noted, however, that Germany exported to Switzerland in 1913, 45,000 kg. of crude celluloid, valued at approximately 200,000 francs, and combs, buttons, cloth, etc., worth about 900,000 francs.

The Glass Industry in Czecho-Slovakia.—In Czecho-Slovakia there are 156 glass factories, 15 of which use wood as sole fuel, 21 wood and coal, and the rest coal. There are also over 3500 independent firms that finish partly-manufactured glass products, and a large amount of work is done in the homes of the people. Before the war the hollow and cast glass section of the industry produced an output worth 120,500,000 kronen (par value of krone=10d.); the present monthly output is about 25,000 metric tons, and will probably soon reach 35,000 t., as eighty per cent. of the production is exported. In 1913 the window-glass section, including blown mirror glass and photographic glass, produced nearly 11 million sq. metres of glass and is now working at 75 per cent. of capacity. The bottle-making plants were working at 35 per cent. of their capacity, which has recently been increased to 240 million pieces. With the use of improved plant and the construction of new factories, it is expected that the normal pre-war capacity will be surpassed by 50 per cent. when the industry can obtain sufficient coal. The annual imports of raw materials used are:—Potash, 1000 metric tons; nickel, 2 t.; cobalt, 2 t.; saltpetre, 600 t.; Glauber's salt, 12,000 t.; boric acid, 240 t,; selenium, 1200 kg.; and gold, 20 kg.—(*U.S. Com. Rep., June* 22, 1920.)

The Industrial Situation in Belgium.—The industrial situation in Belgium in May showed a decided improvement over the position six months previously; in most cases production has increased, and raw materials have been in better supply. The delivery of industrial coal from Germany under the terms of the Peace Treaty has now reached about 55,000 tons a month, and larger deliveries are expected. The home production of coal is still insufficient for industrial purposes, although the output of non-industrial coal is well above the 1914 rate, and a surplus is left for export to France. Owing to the shortage of fuel and raw materials, the iron and steel industry is still far from meeting the home demand; stocks on hand are scanty, prices are continually fluctuating, wages are unstable, and delivery can seldom be guaranteed. On May 1, 14 blast furnaces were in operation as against 52 before the war, and their combined daily output amounted to 2165 metric tons.

The zinc industry is hampered by lack of ore, and the plants are still suffering from the effect of war damages, as reparation and reconstruction are held back by difficulty in obtaining materials. The output of zinc in April (6261 tons) was 36 per cent. of the 1913 output.

The plate and window glass industries are in a favourable position, for the output is higher than in 1913, and could be still further increased if sufficient coal and sodium sulphate were obtainable. There is an increasing tendency to sell all varieties of glass for export as the prices are so high that only countries with a favourable exchange can afford to buy.

Thus the two chief factors delaying resumption of Belgian production are lack of fuel and shortage of raw materials. Once this shortage is remedied, production in Belgium should increase rapidly, as the labour situation is much more satisfactory there than in any other belligerent country.—(*U.S. Com. Rep., June* 30, 1920.)

Future of the Chemical Industry in China.—The chemical industry of China is still in its infancy. Those chemicals for which there is any demand, such as sulphuric acid, alkalis, alcohol and so forth, are imported from Japan. The three sulphuric acid factories which China possesses are not sufficient to supply her daily requirements of sulphuric acid, estimated to amount to about 1000 lb. As the Chinese Government imposes moderate import duties, there are good openings for trade in chemicals with China and even for establishing native industries, especially an alkali industry.—(*Z. angew. Chem., July* 2, 1920.)

CORRESPONDENCE.

THE ARTIFICIAL SILK INDUSTRY.

Sir,—I have read Mr. Briggs' letter in the *Journal of the Society of Chemical Industry* for August 31 with considerable interest, because he has ascribed various statements in my article in the previous issue to the product of Messrs. The British Cellulose Co., Ltd., and has then proceeded to contradict them.

It seems to me clear that the statements with regard to cellulose acetate silk describe, in a general way, the properties of the various makes which have, from time to time, been available—summarising what is already well known to the people concerned in the industry.

If the British Cellulose Company's product should eventually prove to be something new in the way of acetate silk, any future description of artificial silk would naturally make mention of their improvements; but, although I have been able to test samples ascribed to them, I have not been able to purchase any of their silk, and, therefore, cannot comply with Mr. Briggs' demand that criticism should be based on knowledge and experience of their particular product, and give it special mention.

I can only repeat that I have not yet obtained from any source, British or foreign, an acetate silk as strong in the wet condition as, nor with 70 per cent of the dry strength of, some of the viscose product. The latter is commonly used for warp, and has been for a number of years, and it can be obtained, if required, in fine counts which have a greater covering power than the same count in other artificial silk. With regard to the dyeing properties, it will be observed that my statements referred to dyeing by "ordinary methods"; I am aware that acetate silk may be dyed by other methods, although Mr. Briggs does not disclose the easy and cheap processes to which he refers.—I am, Sir, etc.,

Coventry. LEONARD P. WILSON.
Sept. 9, 1920.

PERSONALIA.

Dr. J. C. Kernot has been appointed chief research chemist to British Glues and Chemicals, Ltd.

Dr. R. M. Caven, principal of the Technical College, Darlington, has been elected to the chair of inorganic and analytical chemistry in the Royal Technical College, Glasgow.

Dr. J. Kenyon, of the British Dyestuffs Corporation research colony at Oxford University, has been appointed head of the chemical department at the Battersea Polytechnic.

Mr. R. S. Glennie, lecturer at the Battersea Polytechnic, has been appointed chief lecturer in pharmaceutics and materia medica at the Royal Technical College, Glasgow.

Prof. J. B. Farmer, of the Imperial College of Science and Technology, has been appointed a member of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research.

Mr. W. C. Bridgeman, M.P., has been appointed the first Secretary of Mines under the new Mining Industry Act, and Major Sir P. Lloyd-Graeme, M.P., succeeds him as Parliamentary Secretary to the Board of Trade. Mr. Bridgeman has appointed Mr. E. A. Gowers as Permanent Under-Secretary for Mines.

We regret to announce the death, on August 11, of Mr. C. C. Moore, a member of this Society since 1887, and managing director of Charles Moore and Co., Ltd., chemical manufacturers, of Lymm, near Warrington.

Prof. Armand Gautier, who died recently at Cannes, aged 83, was a chemist of more than national repute, and also an authority on physiology, hygiene, and therapeutics. Perhaps his best-known researches were those on the therapeutic uses of arsenical compounds, and his most widely read book that on the chemistry of the living cell. Among other posts of honour, he served as president of the Academy of Sciences and of the Academy of Medicine.

REPORTS.

FUEL ECONOMY.

THIRD REPORT OF THE COMMITTEE APPOINTED BY THE BRITISH ASSOCIATION FOR THE INVESTIGATION OF FUEL ECONOMY, THE UTILISATION OF COAL, AND SMOKE PREVENTION.

Since its reappointment (*cf.* J., 1919, 355 R), the Committee has been investigating (a) present official methods of obtaining coal mining statistics, (b) the effect of the war upon our coal exports, (c) the constitution of coal, (d) low temperature carbonisation, (e) thermal efficiencies of carbonisation and gasification systems and of the utilisation of fuel, and (f) sources of supply of liquid fuels.

Coal Outputs and Prices.—According to information supplied by the Board of Trade, the estimated output of coal in the United Kingdom during 1919 was 229,668,000 tons, or 197·5 tons per person employed in the mines. The pithead prices per ton of coal raised in 1913 and in July, 1919, respectively, were as follows:—

	Average for 1913.	On July 16, 1919
	s. d.	s. d.
Labour	6 4	19 5½
Timber and Stores	1 0	3 2¼
Other Costs	0 11	1 2½
Royalties	0 5½	0 6¾
Owners' Profits	1 5	1 2
Compensation	—	0 3¼
Administration, etc.	—	0 2¼
Total	10 1½	26 0½

The average cost per ton of coal raised during the year ended March 31, 1920, was 27s. 3¼d., so that the pithead cost of coal has nearly trebled as a result of the war. The amounts of coal exported from the principal ports during each of the years 1913—1919 are given in tabular form; after the Committee has collected information as to the average prices obtained for this coal, the effect of the war upon the export trade will be reviewed.

Standards of Gas Supplies.—The report refers to the visit of a deputation from the Committee to the President of the Board of Trade last February, when its views upon gas standards were outlined (*cf. J.*, 1919, 191R). It was desired that the charge for gas should be based upon the *ascertained net calorific value* of the gas supplied rather than upon its *declared calorific value*, as proposed by the Fuel Research Board, and that a pressure not less than two inches of water should be maintained up to the exit of the consumer's meter. Importance was attached to the maintenance of a constant gas pressure and to the removal of cyanogen and sulphur impurities from the gas. It was also considered that the inert constituents in gas should be restricted, that no public supply should contain less than 20 per cent. of methane or more than 20 per cent. of carbon monoxide, and that the gross calorific value should not be less than 450 B.Th.U. Several clauses relating to the supply of gas upon the heat unit basis, the regulations as to gas supply and the setting up of an inquiry upon the question of limiting the proportion of carbon monoxide in gas are reproduced from the Gas Regulation Bill introduced last May. It is pointed out that in the Committee stage the section limiting the amount of incombustible constituents permissible in gas was deleted and that this was made the subject of a further inquiry by the Board of Trade.

Coal Mining Statistics.—Professor Louis drew attention to the considerable variations in the modes of arriving at official data concerning coal outputs in various countries, and in a memorandum upon the subject states that for most studies of coal mining statistics the number of workers employed is most important, but the methods of arriving at this figure vary so widely in different countries that many erroneous deductions and comparisons have been made. In this country no definition exists of "persons ordinarily employed" on mine premises, with the consequence that different pits arrive at the number of employees by widely variable methods. In Canada a statement is made of the actual amount of labour in terms of days worked rather than the number of individuals engaged, which is obviously the correct way of dealing with the subject. The Canadian returns, however, differ from ours by the inclusion of coke-oven workers. In the United States and in Belgium, information is collected as to the average number of men employed during the year, but there is lack of uniformity of method in computing this average. In France the number of employees is considered to be the number of men on the pay roll. It is thus obvious that in comparing statistics one has to deal under the same heading with two entirely different conceptions of the number of employees.

The production of coal in this country included until recently the stones and dirt sent up to the bank and subsequently removed from the coal. An allowance is now made for this, but the Home Office instructions are vague, and the practice in making up the return of output varies in different districts. In some cases the coal consumed on the colliery and by the miners is deducted, and in others the tonnage upon which royalty is paid is given. In Canada the term "production" is restricted to marketable coal, whilst the term "output" includes everything drawn out from the colliery. Although all coal-mining countries publish a return of fatal accidents, there is no definition of what constitutes a fatal accident, and this important matter is in a chaotic condition. Attention is drawn to the importance of summoning an international conference to determine the manner in which mineral statistics shall be collected, tabulated, and issued.

Alcohol from Coke-Oven Gas.—Professor Bone gives an outline of the Skinningrove process, devised by Messrs. Bury and Ollander, for the production of alcohol from debenzolised coke-oven gas (*cf.* J., 1920, 94 A). Durham coking coal gives a gas containing 2·0—2·5 per cent. olefines consisting chiefly of ethylene. This is absorbed by means of 95 per cent. sulphuric acid, and the ethyl hydrogen sulphate thus formed is subsequently hydrolysed by dilution of the acid with water, yielding alcohol and sulphuric acid. It was found that at temperatures between 60° and 80° C. the time of contact between gas and acid required for a 70 per cent. absorption of the ethyene was only 2½ minutes, and that under these conditions ethyl hydrogen sulphate was the only product formed. At lower temperatures the absorption is slow, and at higher temperatures decomposition occurs. Prior to the ethylene absorption, tar, ammonia, naphthalene, benzol, sulphuretted hydrogen, higher olefines, and water vapour are removed from the gas in the order named. For the removal of sulphuretted hydrogen it is proposed to utilise the sulphur dioxide arising from the reduction of sulphuric acid during the ethylene absorption. The propylene and other higher olefines, together with 97 per cent. of the water vapour, are removed from the gas by means of 80 per cent. sulphuric acid at ordinary temperatures. The removal of the ethylene is carried out on the counter-current principle, the acid being used until it has absorbed 5 per cent. by weight of ethylene. The acid is then taken to a distilling column, where it meets a current of steam, which reduces its strength to 75 per cent. and hydrolyses the ethyl hydrogen sulphate, the heat of dilution being sufficient to effect the distillation of the alcohol, which leaves the plant at 95 per cent.

strength. The diluted acid is re-concentrated in a Gaillard tower and is then ready for further absorption of ethylene.

REPORT ON THE COMMERCIAL SITUATION IN SIAM AT THE CLOSE OF THE YEAR 1919. *By* J. CROSBY. *H.M. Acting Consul-General, Bangkok. Pp.* 20. *London: H.M. Stationery Office,* 1920. [*Cmd.* 795. 2*d.*]

During the official year April 1, 1918, to March 31, 1919, the imports into Siam were valued at £7,930,147, as against £6,962,334 in 1913–14. It is difficult to arrive at an exact estimate of the origin of the imports, as a large proportion of British manufacturers is returned as having arrived from Singapore, which is a port of transshipment for European goods; but the following percentage figures show the approximate distribution of imports in 1918–19 and in 1913–14, respectively:—United Kingdom, 20·5 (21·5); Singapore, 14·6 (17·1); Hongkong, 18·7 (16·0); United States, 6·5 (3·2); and Japan, 11·6 (2·0) per cent. The imports for the year 1919–20 are estimated to be worth some £12,000,000. The feature of the import trade during the year under review was increased values and decreased quantities. Japan has largely taken the place of Germany as regards the supply of cheap manufacured goods and, to a certain extent, that of the United Kingdom, even in the matter of piece-goods, whlist America has in some measure replaced the United Kingdom and Germany in regard to iron, steel and machinery. It is estimated, however, that the United Kingdom will recover and even improve its old position in this market, provided that home manufacturers will quote firm prices for forward contracts for reasonably prompt acceptance, with terms of reasonably quick delivery. During the year 1918–19 the exports reached a total value of £12,463,956, of which no less than £10,161,260 (845,323 tons) represented rice. Amongst the exports were teak, 36,930 t., £430,570; buffalo and cow hides, 2346 t., £130,265; coal, 14,313 t., £94,848; and sapphires, £43,828.

As regards local industries, apart from rice and timber milling, tin-mining, hitherto confined to the central part of the Siamese Malay Peninsula, is being gradually extended, chiefly by Australian companies, over the greater part of Siam. Wolfram mining is carried out mainly on the east coast, but the output is still small; certain amounts of rubies and sapphires are mined. There are local factories for the manufacture of cement, soap, leather, ice, etc. Native industries include silk and cotton weaving, and silk dyeing. In the main, although Siam producees its own raw materials for such few industries as it possesses, it is essentially a producer of food and raw materials; manufactured articles are almost exclusively imported.

GOVERNMENT ORDERS AND NOTICES.

DANGEROUS DRUGS AND FIREARMS ACTS, 1920.—The Home Secretary has given notice of the prospective issue of regulations concerning the marking of packages containing raw opium destined for exportation, and has issued an Order deferring the coming into operation of Sections 1, 2, 3, 8, and 10 of the Firearms Act until November 1, 1920.

PROHIBITED EXPORTS.—The following headings have been removed from the list of prohibited exports by order of the Board of Trade:—Calf skins; hides, British and Irish.

PERMITTED EXPLOSIVES.—The Home Secretary has made an Order under the Coal Mines Act, 1911, the effect of which is to add Super-Excellite No. 4, and Monarkite No. 2, to the list of permitted explosives.

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for August* 26 *and September* 2.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of firm or agent.	Materials.	Reference number.
Australia	Photographic supplies	304
"	Glassware	*412/20 7/159
British India	Glass, china, paper	257
"	Glassware	259
Canada	Gelatin, food colours, cocoa-butter substitute	265
"	Whiting, glue	268
"	Linseed oil, barium chloride, aluminium sulphate, cream of tartar, tartaric acid substitutes, sulphuric acid, β-naphthol, lead acetate, sodium ferrocyanide, heavy chemicals for paint, rubber, paper and printing ink manufacture	270
"	Paint, oil, varnish, glass	309
"	Industrial chemicals, heavy metals iron, steel	311
"	Gold, bronze and aluminium paints	310
"	Iron and steel bars, black steel sheets, chequered plates, galvanised sheets, brass and copper bars and sheets	312
"	Rapeseed oil	†
"	Copper sulphate, arsenic acid	†
South Africa	Asbestos and rubber goods, copper wire, grease, graphite	274
"	Oil, paint, varnish	276
"	Glass, crockery	‡
Belgium	Industrial chemicals, formol, acids, oils	320
"	Heavy oils	321
France	Sugar	324
"	Chemicals for the tanning, dyeing and paper making industries, colours, varnish	325
Germany	Vegetable oils, fats, wax, shellac	326
Latvia	Iron and steel sheets and plates	—
Portugal	Pottery, paper, paint, varnish	288
Serb-Croat, Slovene States	Oil, paint, varnish	290
Spain	Chemicals, colours, varnish, glass	291
"	Chemicals, aniline colours, varnish, glue	329
Near East	Leather, paper	331
Persia	Chemicals, dyes, perfumes, paint, glassware	293
United States	Chemicals, dry colours, whiting, clay	332
Mexico	Perfumery	336
Argentina	Metals and metal goods	297
"	Drugs, medicines, pharmaceutical preparations	298

* The High Commissioner for Australia, Australia House, Strand, London, W.C. 2.

† The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

‡ The Trade Commissioner for the Union of South Africa, 90 Cannon Street, London, E.C. 4.

TARIFF, CUSTOMS, EXCISE.

Argentina.—The increased customs duties affect, *inter alia*, galvanised iron, rubber and rubber tubes, lead pipes, plates and ingots, red lead, white lead, ebonite, glucose and mineral waters.

Australia.—Clay rings and asbestos string for use in the manufacture of incandescent mantles may be imported duty free under the British Preferential Tariff.

Customs duties when paid in bank notes must be paid at 25 times the rate prescribed by the Tariff effective as from August 5.

Belgium.—Export licences are again required for residues of burnt iron pyrites.

British India.—The valuation of raw hides and skins for export duty has been revised as from August 14.

Cameroons.—The import, distribution, sale, disposal and possession of "trade" and "injurious spirits" are prohibited.

The rates of customs duty on spirits, wines and perfumes have been amended.

Canada.—Recent customs decisions affect toluene, xylene, copper bars and rods, "monopole" oil, powdered wax and wrought or seamless iron or steel tubes.

Ceylon.—The export of sugar, lubricating oils and British specie is prohibited to all destinations.

Crimea.—The export of gold, silver and platinum is prohibited except under licence.

Cyprus.—The law conferring a preference on goods consigned from and grown, produced or manufactured in the British Empire is set out in the issue for August 26. Among the articles that pay duty at two-thirds of the full rate are beer, matches, soap, china, earthenware, and dyes. Spirits of all sorts pay 95 per cent. of the full rate, and all goods not specified in the schedule five-sixths of the full rate.

Federated Malay States.—The schedule of export duty valuations may be seen at the Department.

Fiji.—The export of, *inter alia*, ammunition, certain explosives, cocaine, opium, and gold and silver coin is prohibited except under licence from the Collector of Customs.

France.—The export and re-export of methyl alcohol (crude and refined) and acetone are prohibited except under conditions to be determined by the Minister of Finance.

Gambia.—The import, distribution, sale and disposal of "trade" and "injurious" spirits are prohibited.

The import and distribution of opium are prohibited except under certain conditions as from July 1.

Japan (Korea).—The modifications of the Customs régime became effective on August 29.

Kedah.—The import of dyes is prohibited except under licence.

Mexico.—The export duty on sugar has been increased, and the previously existing import duties on iron piping are to be re-enforced.

Mozambique.—Recent customs decisions affect groundnuts, sesame seeds, mafura seeds and copra.

Norway.—Among the articles of "luxury" the import of which is prohibited are certain kinds of glassware, common pottery (except unglazed), porcelain, biscuit ware, and wares of silver, gold and platinum.

Austria.—The consumption and licence tax on artificial sweetening substances has been increased fourfold

Nyassaland Protectorate.—The export of ammunition, certain explosives, cocaine, opium and silver is prohibited to all destinations except the U.K. or British Possessions or Protectorates.

Poland.—Export permits are not required for, *inter alia*, edible nuts (with some exceptions), cocoa, spirits, beer, vinegar, mineral waters, horns, mineral wax, certain kinds of earthenware, bottles, lamp glasses, turpentine, sal-ammoniac, perfumes (with some exceptions), zinc white, polishes, liquid inks, and artificial silk.

Portugal.—Condensed milk may now be imported under licence.

Roumania.—Petroleum products (with some exceptions) may as from August 1 be exported freely on payment of the export taxes and commission on a collective guarantee being given by the factories that home requirements will be fully satisfied.

Spain.—The import duty of 5 pesetas per 100 kg. has been re-imposed on zinc bars, lumps, cakes and scraps.

Straits Settlements.—The prohibition of the export of gold sovereigns is cancelled.

Tunis.—The export and re-export of cast iron, scrap of cast and wrought iron and steel, and oil cake are prohibited.

COMPANY NEWS.

SOUTH METROPOLITAN GAS CO.

A letter has been addressed to the shareholders by the chairman, Dr. C. C. Carpenter, in which reference is made to the successful passage of the company's Bill through Parliament, acknowledgment for assistance in this connexion being made to Sir William Pope, Prof. H. Louis, Dr. E. F. Armstrong, and others. In accordance with the provisions of the new Act, the sliding scale has now disappeared from the company's charter, and dividends have been fixed at 5 per cent. per annum in respect of the issued, and at 6 per cent. in respect of the unissued, ordinary stock. These rates are to hold under all circumstances, and profits earned beyond this will be divisible as to three-fourths to the gas consumers, by way of reduction in price, and as to one-fourth in equal parts to the shareholders and co-partner employees. The transvaluation of gas from an illuminating to a calorific basis—in the promotion of which the company played a leading part—is regarded as a reform of great promise, as are also certain new regulations which will conduce to more effective purification. Owing mainly to the need for more working capital entailed by the higher costs of materials and labour, the first favourable opportunity will be taken to make a substantial issue of new capital.

BRITISH GLUES AND CHEMICALS, LTD.

The statutory meeting of this company (*cf.* J., 1920, 189 R) was held in London on August 23, Mr. W. S. Corder presiding.

The chairman said that the whole of the preference share issue had been allotted, as well as 850,001 of the 1,000,000 ordinary shares, and 166,666 preference shares and 333,333 ordinary shares had been allotted to the vendors in part payment of the purchase price. Subscriptions had been paid, subject to calls in arrear, for 333,334 preference and 516,667 ordinary shares. The purchase price, amounting to £760,528, had been paid in full, the transfer of the properties from the old companies to the new company having been completed. No promotion expenses had been paid in connexion with the formation of the company. The vendor companies were in process of voluntary liquidation, and new companies had been registered to preserve the names and goodwills. The liquid assets exceeded the liabilities by over £450,000. The overseas trade of the company was rapidly increasing, and sufficient orders were on the books to keep the works going for some time; there were signs that the demand would continue to increase.

Although the company was the largest one that manufactured certain products in this country, it did not constitute a monopoly, as there was a number of competing firms. The company's fertilisers were used for food production at home, and its glues and gelatins were used in nearly every trade The company's research department was at the disposal of customers, so that their requirements could be investigated and accurately provided for.

British Pluviusin Co., Ltd., has been registered as a private company with a capital of £1,250,000 in £1 shares. An agreement is to be entered into with Explosives Trades, Ltd., and the business to be carried on will include waterproofing, manufacture of imitation leather, linoleum, tarpaulins, waterproof cloth, etc. The registered office is at 12, Newton Street, Manchester.

TRADE NOTES.

BRITISH.

Gambia in 1918.—The total value of imports, excluding specie, into Gambia in 1918 amounted to £919,426 (£697,052 in 1917), the origin of the imports compared with 1917 being as follows:—United Kingdom, 58; United States, 15·4 (7); British Colonies, 15·3 (19); and France, 7·7 (12) per cent. The exports were valued at £882,890 (£952,906 in 1917) and included:—Groundnuts, 56,489 tons (£800,319); palm kernels, 644 t. (£9800); and 85,103 hides (£51,520). The groundnut crop, which is the chief product of Gambia, was only an average one and was mainly taken (96 per cent.) by the United Kingdom. Similarly, over 96 per cent. of the hides exported went to the United Kingdom. The export of palm kernels was shared almost equally between France and its possessions and the United Kingdom. In 1918, 26 tons of piassava, worth £930, was exported, as against 15 t., worth £550, in 1917. Of the total exports, nearly 94 per cent. went to the United Kingdom.—(*Col. Rep.-Ann., May*, 1920.)

FOREIGN.

Foreign Company News.—*France.*—Large amounts of capital are being invested in the French chemical industry, which is expected to become one of the leading industries of the country. Among recent flotations is that of the "Société Alsacienne de Produits Chimiques," with a capital of 16 million francs, which will take over the Kestner works at Thann-Mulhouse (Alsace), as well as a large modern plant at La Rochelle, which formerly made war chemicals but will now be used for the manufacture of synthetic camphor, sulphates of copper and potash, and a brand of butterine. A number of companies has recently been formed in connexion with the chemical and oil industries; amongst these are:—"Société Francaise Rotoczyn" (gasoline, heavy oils, etc.), 23,000,000 fr.; "Société Pax" (essential oils and other chemical products), 1,000,000 fr.; "Société Chimique et Industrielle des Monazites" (chemicals, and the manufacture of thorium, mesathorium, cerium, etc.), 2,500,000 fr.; "Société des Hydrocarbures et Produits Industriels," 10,000,000fr.; "Société de la Silice" (pulverised silicates, and a substitute for German kieselguhr), 600,000 fr.—(*U.S. Com. Rep., June* 24, 1920.)

Italy.—A combine has been formed between the Società Montecatini of Milan, the Società Colle e Concimi of Rome, and the Unione Italiana Concimi of Milan. Of these companies the first produces sulphur in Central Italy and Sicily, and the other two manufacture artificial fertilisers, especially superphosphate. As a result of the fusion the Società Montecatini has raised its capital from 75 to 200 million lire (lira = 9½d.). The support of three large Italian banks has been assured.—(*Chem. Ind., June* 2, 1920.)

Glass Trade of Hongkong—Since the war there has been much competition in the glass trade of Hongkong, the sources of the imports during 1918 and 1919 being as follows:—*Window glass:* Japan, 80% (58); Great Britain, 5% (27); United States, 15% (7); and Belgium, 4% (1919 only); *plate glass:* Japan, 43% (nil); Great Britain 10% (40); United States, 47% (59); *glass ware:* Japan, 80% (69); Great Britain, 6% (16); United States, 3% (8); China, 3%. Japan has thus lost considerably as its product was faulty and unpopular. The total values of the imports of all kinds of glass into Hongkong in 1918 and 1919 were £118,056 and £141,248 respectively. At present Great Britain, the United States and Belgium are competing to get the better class trade.—(*U.S. Com. Rep., June* 15, 1920.)

Dye Situation in Hongkong.—The situation of the dye trade in Hongkong is very uncertain, though its volume was greater in 1919 than 1918. Before the war the trade consisted of vegetable dyes, usually products either of China or of countries with which China has long traded in such materials, and artificial dyes, chiefly aniline dyes, and artificial indigo, which mostly came from Germany. The United States and Switzerland had begun to build up a considerable trade in aniline dyes and artificial indigo when, in December, 1919, the Hongkong Government, at the request of the British Imperial Government, prohibited, save for re-export purposes, the importation of artificial dyes not of British manufacture. So far, British manufacturers have not responded to the extent required by the local market. The imports of dyeing materials in 1919 included:—Aniline dyes, £64,013; artificial indigo, £15,038; and natural indigo, £284. Of the aniline colours imported in 1919, the United States furnished 82 per cent., and Japan and Switzerland 7 and 4 per cent. respectively, whilst the United States supplied 59 per cent. of the artificial indigo, and north China the balance, mostly of American origin.—(*U.S. Com. Rep., June* 10, 1920.)

Trade of Hongkong in Oils and Oilseeds.—The trade in vegetable and essential oils as a whole showed considerable expansion, the total value exported amounting to £1,563,977 (£1,176,656 in 1918), but there was a poor market in essential oils. Exports of aniseed oil were valued at £135,763, essential oils other than aniseed and cassia oils at £35,251, coconut oil at £19,235, peanut oil at £728,610, other vegetable oils £194,616, vegetable wax £52,489. Aniseed oil, peanut oil, and tea oil were exported in greatly increased quantities. The export of cassia from Hongkong in 1919 assumed pre-war proportions, the total value being £236,445, as against £141,324 in 1918. Great Britain and the United States took approximately one-third of the export, Europe (especially France) about 14 per cent., and India about 10 per cent. Export of cassia oil decreased from a value of £86,849 in 1918 to £74,158 in 1919, of which Great Britain took 15, the United States 72, Japan 8, and India 2 per cent. During 1919 the value of the wood oil shipped from Hongkong remained stationary at about £400,000; more than half the export went to Great Britain, and the rest to Japan, Australia and China. As wood oil is now being shipped in bulk in tanks, the trade in this oil is expected to develop rapidly, especially as the use of bulk cargoes extends to China.

In 1919, exports of groundnuts amounted to 19,346 short tons, valued at £482,604, as compared with 19,346 tons, worth £1,199,582, in 1918. The supplies for the year came mainly from North China, and considerable amounts were furnished by Indo-China, the Straits Settlements, and Japan. Of the total export, Great Britain took 12·5, United States 25, and China 50 per cent. The decrease in the 1919 export was due to the fact that supplies from North China went largely to Japan.—(*U.S. Com. Rep., Apr.* 14, *June* 1, 7, 1920.)

Vegetable Oil Resources of the Shanghai District, China.—The chief plants yielding vegetable oils in China are beans, cotton seed, groundnuts, rapeseed, sesamum seed, tea seed, and woodnuts, practically all these being cultivated products. The quantities of oil, oil-seeds, and oil-cake, in piculs of 133⅓ lb., exported from Shanghai during 1918 were:—Bean oil, 5771 piculs (£14,320); cottonseed oil, 99,670 (£187,158); groundnut oil, 217,113 (£524,340); rapeseed oil, 3818 (£13,332); sesamum-seed oil, 422 (£1069); tea oil, 886 (£2328); woodnut (filbert) oil, 658 (£1944); other vegetable oils, 25,070 (£42,214); bean cake, 282 (£160); cotton seed, 75,195 (£25,837); groundnuts, hulled 781,071 (£835,533), unhulled 10,953 (£9111); groundnut cake 71,125 (£34,280); rapeseed, 243,471 (£205,592); and sesamum seed, 82,195 piculs (£83,180). The number of oil mills in China is increasing, and those in Northern China mainly treat soya bean, whilst those in central China produce the other varieties of oil mentioned. The oil mills do not work all the year round, as there is not sufficient seed available, and also the high summer temperature causes the oil to become rancid. The total capacity of the oil mills in Shanghai amounts to about 5400 piculs (321 tons) a day.—(*U.S. Com. Rep., Apr.* 26, 1920.)

Exports of Glycerin from the United States.—The export of glycerin from the United States in 1919 was 1982 short tons, valued at £238,196. The amounts taken by the chief countries of destination are given in the following table:—

Destination.	Short tons.	Perctge. of total
Argentina	119·6	6·0
Brazil	23·5	1·1
British India	28·6	1·4
Canada	59·9	3·0
Chile	49·8	2·4
China	60·1	2·5
Cuba	54·5	2·7
Japan	1229 5	11·3
Mexico	30·3	1·5
Norway	132·0	6·6
Sweden	19·5	0·9
United Kingdom	11·3	0 5

—(*U.S. Com. Rep., May* 26, 1920.)

Consumption of Chemicals on the Transvaal Mines in 1919.—The values of the chief chemicals consumed on the different mines in the Transvaal during 1919 are shown in the appended table:—

Chemicals.	Gold mines. £	Other mines. £
Carbide	110,248	3997
Cement	61,701	4554
Charcoal	457	6365
Chemicals, assay and smelting requisites	143,109	784
Cyanide	360,000	—
Disinfectants	35,221	3690
Explosives	1,299,672	113,339
Lime (white)	121,477	829
Lubricants (oils)	126,020	32,703
Greases and tallows	105,739	9448
Paint, tar, driers, etc.	23,784	2635
Mercury	48,560	—
Paraffin	23,420	2742
Petrol	22,007	3664
Soap	12,510	977
Soda	2726	226
Zinc and zinc discs	238,608	13

—(*S. Afr. Engin., May*, 1920.)

Rubber Trade in Norway.—Stocks of raw rubber were very scanty prior to the war, and difficulties of shipping rendered it necessary to shut down some factories and curtail output until conditions became easier with the conclusion of the Norwegian-American Agreement in 1918. The annual requirements are estimated at 150 tons rubber and 200 to 250 tons balata, practically all of which is purchased through the United Kingdom. Most factories at present are working on accumulated stocks. Motor tyres are in demand, but engineering troubles in Britain have enabled America to maintain the lead obtained during the war. Cycle tyres are mainly imported from Great Britain.

Goloshes are likely to be in demand owing to the high price of leather. In this line Britain has lost the high place held twenty-five years ago, owing to the export of inferior material. It is anticipated that the import duty on goloshes will be removed. —(*India-Rubber J., Aug.* 7, 1920.)

REVIEWS.

THE GRETNA RECORD.

Preliminary Studies for H.M. Factory, Gretna, and Study for an Installation of Phosgene Manufacture. *Pp. xvi.*+145. (*London: H.M. Stationery Office.* 1920.) *Price* 15*s. net.*

The work done by the Department of Explosives Supply has been generally claimed, at all events by chemists, to be second to none other accomplished during the war. Although our chemical industry, as a whole, was far from being in so moribund a condition as many of its critics would have us believe, yet we were seriously deficient in factories and plant adapted for the production of organic substances in quantity. Moreover, the war soon developed into one of nations rather than of armies, so that even the vast organisation and elaborate preparations of the Central Powers on the chemical side proved inadequate to supply the altogether unprecedented quantities of chemical munitions required by them. It is now a matter of history that the D.E.S. from its very earliest beginnings under the *ægis* of Lord Moulton had the courage to originate an ambitious and far-reaching programme involving, in particular, the principle of the construction, in the very shortest space of time, of very large Government factories solely for the production of chemical munitions. Questions of economy of construction, cost of production, and post-war applications of the plants did not come into consideration, and the sites chosen were selected without reference to their commercial suitability.

Lord Moulton selected as his "master builder" a man of outstanding personality—Kenneth Quinan. One was impressed on meeting him, to know him was to love him, and to work for him was an inspiration. Little wonder, therefore, that the team at Storey's Gate—all far too modest to wish their names recalled here—worked early and late, but always methodically and scientifically, and that the great factories grew apace until the day came when they produced their munitions "according to plan."

Naturally, in the course of this work a large amount of technical information of every variety was produced and collected by the Factories Branch of the D.E.S., and it became a favourite scheme of Quinan's to have this made accessible after the war, particularly to the younger chemists of the country. His association with the best of our professoriate, whose attributes he was wont to describe in characteristic and flowery language, and his experience in training the staff available for his factories, who came to him largely without expert knowledge of the work they had to do, possibly gave him special insight into the ideal education for a technical chemist. He often waxed enthusiastic in private conversation over his schemes for training chemists, and felt that the publication of the information accumulated at the national expense would be of the greatest value in helping both the growing generation and those already in the industry, who probably without exception were ready at all times both to help the Factories Branch and to profit by their experiences.

It is a very fortunate circumstance that the authorities have seen their way to give effect to this idea, and all concerned are to be congratulated on their very broad-minded action. The selection and preparation of the information could scarcely have been in better hands than those of Mr. William Macnab, who, apart from his intimate connexion with the Department throughout its whole existence, has had a lengthy and varied acquaintance with chemical industry and is fully in sympathy with the ideals of some of the leading teachers and industrial leaders who are striving to elevate British chemical industry into its rightful position. His preface is not the least valuable portion of the book and the considered expression of opinion in it should receive the widest possible publicity.

The first volume to be published deals with a portion of the great Gretna Factory and with the study of an installation for phosgene manufacture. The problem at Gretna was to produce 30,000 tons per annum of R.D.B. cordite involving the manufacture of the corresponding quantities of nitroglycerin and nitrocellulose which in turn required cotton waste, dynamite glycerin and the necessary acids for their nitration. Quinan's plan was to set forth the quantities of materials required in the different stages and the plant necessary for carrying out the various operations. The usual drawings were prepared, but elaborate explanatory notes or descriptions were issued with each drawing which are stated to have been of the greatest help to those erecting the plant and to those who had to run it. The book contains these drawings and explanatory notes, so that even the tyro can follow step by step the development of the factory. Its value to the student and to all other chemists and chemical engineers inexperienced in the planning of large chemical works is quite unique, and teachers with this volume at their disposal should have a model on which to base their instruction. Even the more experienced cannot fail to profit from the study of the Gretna methods and will no doubt pick up many valuable points of detail. Criticism of such a work in the ordinary sense is impossible and would certainly be unprofitable, but it is of interest to discuss some of the broader issues which arise particularly in connexion with the vexed question of the chemical engineer which at the moment is the most prominent matter in chemical circles.

Very frequently in the old days the chemist stated the requirements of the process, indicating the more obvious pitfalls due to the nature of the chemicals to be used, and the engineer designed and constructed the plant. This usually required a good deal of modification before it worked, and by the time the process was running smoothly the plant was found to contain many faults which could have been rectified by a closer understanding between engineer and chemist, who, though co-operating loyally, have as often as not failed really to understand one another's difficulties. Generally, the result was even less satisfactory when the chemist had the larger say in the design, the plant being in particular too frail to stand the usual rough usuage at the hands of the British workman.

The chemical engineer, as some of us understand his functions, should act as a connecting link between chemist and engineer. Speaking the language and, still more, in sympathy with the mentality of both, he can understand the requirements of the chemist and translate them to the engineer. Should he attempt to replace both, disaster is likely to result since the viewpoint of the two is so different as to be almost irreconcilable. His function is to be one of the team akin to the half-back in football. In addition to knowing the chemical and physical properties of substances and how to design plant, to handle them he should be possessed of a wide knowledge of every type of special plant with their advantages and defects, such as the motor enthusiast to-day seems to have about the various makes of cars. It requires experience to acquire this, but the same may be said of the motor car, about which knowledge seems to be acquired without difficulty.

The properly trained chemical engineer in the future will play a large part in staffing the works both in control of processes and in the construction department. This is not the place to discuss his training, which is being earnestly considered by several bodies; it can be emphasised, however, that the teachers of chemistry have been handicapped by insufficient knowledge of the ideal factory in the past, whereas in the future the Gretna book will certainly go far towards supplying this information. If read carefully and critically, the story of the creation of the Gretna Works gives the clear impression of thoroughly sound team work, scientific work in the best sense, every detail calmly and soberly considered, alternatives carefully weighed, calculations made and verified, the whole with a slow, relentless certainty detached from the turmoil of war and yet leading to the production of a great factory in record time, satisfactory in every detail, yielding its products as calculated and planned and playing a great part in our final victory.

As the war developed, economy in materials became as important as economy in man power, and the demand for almost every conceivable material became so great as to exhaust the productive power of the world. Then it was that the recovery of the spent acids and the prevention of all kinds of waste became so necessary. The description of the details of this branch of the work and the accompanying flow sheets are some of the most valuable portions of the Gretna record; its careful study should lead many others to overhaul processes in which waste occurs to see whether under like treatment this can be reduced.

Contrary to the public belief, profits in chemical industry are cut very fine and the success or failure of a process depends largely on the elimination or utilisation of waste both in the form of actual materials and in that of heat. The increase in the cost of raw fuel and the deterioration of its quality have a most serious consequence for chemical works and far more attention will have to be paid to avoid loss of heat in the future. The chemical engineer specially trained in thermochemistry will find a lucrative field for his investigations.

It is increasingly necessary to emphasise that the chemical engineer, valuable as he is and will be, cannot replace the chemist, particularly the organic chemist. The experience of the writer has taught him that men possessed of the true mentality of the organic chemist are becoming increasingly rare in spite of the fact that industry needs them more than any other type of chemist, and our teachers will be doing a great disservice if, in the attempt to create chemical engineers, they sacrifice the organic chemist.

The phosgene-plant studies will be particularly valuable to students as they illustrate in the fullest detail the plan adopted of contrasting two alternative methods of manufacture and the reasons for giving the preference to one of these. Quinan was a particular zealot in advocating the use of thermochemical data in studying these problems, and the problem detailed in the book forms a perfectly admirable example of what can be done by the scientific application of physico-chemical data.

The writer would have wished to have emphasised some of the lessons and warnings contained in Mr. Macnab's introduction, but as this is likely to be widely reprinted it can adequately speak for itself.

A great service has been done to chemical industry by the publication of this work, and though it may take time before the harvest is reaped from its seed, it is certain that this harvest in time will be a bounteous one.

E. F. Armstrong.

Fuel Production and Utilisation. *By* Dr. H. S. Taylor. *Industrial Chemistry Series, edited by* Dr. S. Rideal. *Pp. xvi.*+279. (*London: Baillière, Tindall and Cox.* 1920.) *Price* 10*s.* 6*d. net.*

"Fuel Production and Utilisation" will be found to be not the least useful of the valuable series of books edited by Dr. S. Rideal dealing with industrial chemistry. Although the author states somewhat diffidently that the book "is addressed more especially to the young college graduate," it will prove of great help to all engaged in solving problems relating to fuel, in that there is presented in delectable form a well-balanced and discriminated compilation of references to authorities on this most important national subject.

In spite of the author's close personal knowledge of the subject, it is inevitable that where he relies on long quotations from other publications there will be an occasional repetition of inaccuracies. In this volume there are fewer than usual, but they exist and are instanced on p. 121, where it is stated, on the authority of the *Times Engineering Supplement*, that coke-oven gas is supplied from Tansley Park to the Birmingham Gas Works, whereas it is more correct to state that the Birmingham Gas Works produces its own coke-oven gas and Tansley Park supplies coke-oven gas to the Sheffield gas undertaking.

The volume contains good sections, theoretically and practically treated, on boiler firing, coal carbonisation, gasification (water gas, blast-furnace gas, producer gas), residuals, lignite, peat, wood, and synthetic fuels. Most recent work is referred to, but there is no reference made to colloidal fuel. An excellent *résumé* of the position concerning the use of powdered fuel is given in quotations from Gadd and Coffin. Their analyses of the results so far obtained indicate well-balanced judgments on a difficult problem.

The author lays much stress on the necessity for increased effort in the direction of fuel conservation, and points out that whereas 50 per cent. of the known coal resources of the world is to be found within the United States of America, only 2·6 per cent. is present in Great Britain. In spite of this low figure, in 1913 over 34 per cent. of the output of Great Britain was employed for export, representing over 70 per cent. of the total seaborne coal trade of the world. Everyone must agree on reflection that although this is a tremendous immediate advantage, it is inevitable that it will be eventually to the lasting disadvantage of the country that is so prodigal with its natural resources.

An interesting table appears on page 25 giving the gross and net calorific values of various gases and the calorific values per cubic foot of air-gas mixture (theoretically proportioned). The figures quoted for coal and coke-oven gas are open to question because the differences between the net and gross figures do not correspond with general practice, and the calculations for calorific value per cb. ft. of air-gas and mixture are not understandable, as they appear much too low and do not agree with one's own calculations from data culled from the same table.

Low-temperature carbonisation, which is being boomed so much at the present time, is fully dealt with by quotations from Evans, but in the reviewer's opinion there is no justification for the statement that this process has recently become a commercial success, for he is convinced that the process cannot compete commercially with the high-temperature processes of the present day, and that the former can only be financially and commercially successful after all attempts to produce a "coalite" by means of low temperature conditions have been abandoned.

An interesting statement is made that the output of carbonising plants is increased by about 10 per cent. by the employment of outside producers rather than the usual type of internal hot gas producer.

The author characterises the experimental methods of the Gas Investigation Committee of the Leeds University and Institution of Gas Engineers as not being free from objection, but does not indicate in what direction his criticism would lead him. The committee, however, have given ample and sufficient reasons for the methods they have adopted, although there is no doubt that for other purposes and other objects the methods would be quite unsuitable.

The proposals of Helps for the production of low-grade gases at ridiculously low prices are lightly touched upon, but it would be dangerous if the readers of this most useful volume were to be misled by any of the fallacious claims made by the hustling progenitor of "Pleno"—who, however, is not always wrong.

The author has achieved all his objects and more. The book is opportune and rises to the occasion. It should be found on the shelves of all those who are in any way interested in the subject.

E. W. Smith.

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Die Zwischenprodukte der Teerfarbenfabrikation. *By* Dr. Otto Lange. *Pp.* 645. (*Leipzig: Otto Spamer.* 1920.) *Prices:—Germany,* 135 *mk.* (+40%), *bound* 150 *mk.* (+40%). *England and Colonies,* 80s., *bound* 90s.

A Kinetic Theory of Gases and Liquids. *By* Dr. R. D. Kleeman. *Pp.* 272. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1920.) *Price* 16*s.* 6*d.*

The Origin and Progress of the Caoutchouc or India-Rubber Manufacture in England. *By* Thomas Hancock. *Centenary Edition. Pp.* 72. *Reprinted for James Lyne Hancock, Ltd.,* 1920.

The Coal Fire. *A Research by* Margaret W. Fishenden *for the Manchester Corporation Air Pollution Advisory Board. Fuel Research Board, Department of Scientific and Industrial Research. Special Report No.* 3. *Pp.* 112. (*London: H.M. Stationery Office.* 1920.) *Price* 4*s.*

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RAIL CONVEYANCE OF CHEMICAL COMMODITIES.

(RATES AND CONDITIONS.)

J. LUKES.

The questions of transportation of goods by railway and of the costs incurred are of the utmost importance to-day to the trading community in general and to the chemical trade in particular; and the result of the unfettered power given to the Minister by the Ministry of Transport Act, 1919, has been unpleasantly revealed.

Increase of Rates.—Under the provisions of the Transport Act, Section 3 (e), the rates and charges were raised on January 15 this year by from 25 per cent. to over 100 per cent., according to class, and on July 7, 1920, a further reference was made on behalf of the Minister of Transport to the Statutory Rates Advisory Committee concerning an interim revision of rates and charges, and in connexion with this the following extracts from the Terms of Reference will be self-explanatory:—

"I am directed by the Minister of Transport to inform you that since the issue of his directions on December 20 and 23, 1919, to the railway companies of the United Kingdom to increase their charges it is estimated that the financial result of working British Railways (including Ireland) will show a deficiency as from April 1, 1920, at the rate of £54,500,000 per annum, which includes increases of £4,400,000 in salaries, and wages which came into force on July 1, under the provisions of the Sliding Scale."

"The Minister accordingly desires the Committee to consider and advise him what increases should be made in the rates, fares, tolls, dues, and charges of such companies so as to yield by the end of June, 1921, the total deficit which commenced to accrue on April 1 last."

The amount of additional money required in Great Britain is computed for sixteen months to be £66,000,000, and this sum is to be raised between the time the new rates and fares are imposed and July 31, 1921 (the date to which the period was subsequently extended). It is estimated that the sum to be collected from passenger fares in Great Britain will be £17,000,000 for the period expiring July 31, 1921, leaving £49,000,000 to be produced in Great Britain from the rates and charges for the carriage of minerals, merchandise, and live-stock by goods and passenger trains. To provide this sum in eleven months (*i.e.*, from September 1, 1920, to July 31, 1921) rates must be imposed to produce £53,500,000 in a year. An increased revenue of about £2,500,000 is required in Ireland.

The Rates Advisory Committee set up under Section 21 of the Ministry of Transport Act, 1919, has taken evidence, and its report, dated July 30, 1920, has been presented to the Minister (Command Paper 886, price 2d.). According to the evidence given before this committee, the proposals submitted by the railway companies for securing the increased revenue required were to the effect that all rates applicable prior to January 15, 1920, should be increased by over 100 per cent., returned empties by 200 per cent., small consignments by 150 per cent., and that no traffics should be excepted from these increases.

These proposals of the railway companies have been adopted in the main, except that the rates for manure in bulk, etc., to be used as agricultural manure in the United Kingdom have been increased by just over 50 per cent. (whereas higher flat rate charges are to be levied on other traffic in Class C, *i.e.*, 9d. per ton instead of 6d. per ton, as originally proposed), and the charges for returned empties are to be increased by 100 per cent. and no more.

It must be understood that the above percentage increases are upon rates which include amounts for station accommodation, services, and in many instances cartage, and that the total payable is therefore heavier than a larger percentage increase would mean on a conveyance rate only. This factor must be taken into consideration when comparisons are made with increases in other countries, where the railway authorities charge only for the services performed.

Whilst it is felt by the public generally that some measure of increased charge may be due to the respective companies for railway conveyance, terminal services, station accommodation, etc., whichever service or services may be performed for the trader, it is essential that the rates and conditions on which such increases are based should be equitable and reasonable. Unfortunately, such a position does not exist in respect of the chemical industries, and the traders concerned have contended for many years that the rates and conditions applicable to their commodities were too high, unreasonable, and, indeed, onerous; hence it may be well to define the pecular legal position in which the chemical trade finds itself.

Legal Conditions and Rates for Dangerous Goods.—The first stumbling block to the chemical manufacturer is to be found in Section 105 of the Railway Clauses Consolidation Act, 1845, which enacts that no person shall require the company to carry upon the railway any aquafortis, oil of vitriol, *or any other goods which in the judgment of the company may be of a dangerous nature.*

The second serious disability is that under Part 4 of the Railway Rates and Charges Order Confirmation Acts, 1891/1892, the railway companies are empowered to charge for dangerous goods such reasonable sum as they think fit in each case. Thus they can decide finally as to what merchandise is dangerous, charge what reasonable sum *they* think fit, carry or refuse to carry; and it follows that if they agree to accept chemical commodities for conveyance, they can stipulate the conditions under which they will accept, and specify the nature of all packages which are to be used in connexion with the conveyance over the railway.

There is no doubt that the railway companies, having been given these wide powers, have made the utmost use of their opportunities, as the term "dangerous goods" now includes practically all chemical products, and embraces articles not only of an explosive, inflammable, corrosive and poisonous nature, but also merchandise which is in any slight manner objectionable under any extreme conditions; and the extent to which they have used the power is amply demonstrated by the fact that the regulations and conditions applicable to the carriage of dangerous goods in the General Railway Classification for the year 1890 occupied 38 pages, whilst in the Classification for 1920, out of a total of 488 pages no less than 212 are taken up by the special classification for so-called dangerous goods.

This freedom in the matter of acceptation of traffic and fixing of rates and conditions (without statutory check and effective means of criticism) was conferred upon the railways years before it was realised that the chemical industry was indispensable to the national interests, and it is seriously questioned whether Germany would have outstripped this country in chemical production and initiative (in the manner she did, as was made clear by the war) had our railways not discouraged the internal movement and interchange of chemicals by levying charges which prohibited the movement of heavy raw materials, except for very

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short distances, and restricted the transit of intermediate and finished products by imposing onerous rates and conditions. It is beyond doubt that the manufacturers found it better business to export direct semi-manufactured chemical commodities to foreign countries—particularly to Germany—to be worked into the finished article there, rather than to incur the expense of a series of movements by rail in this country.

With the view of clearly illustrating the difference between rates for the conveyance of ordinary merchandise under Part 1 and the sums payable for dangerous goods under Part 4 of the Order Confirmation Acts 1891/1892, it should be understood that prescribed amounts for service terminals and station accommodation are set out in the Acts for traffic in Part I. In the case of Class 2 traffic the charges are:—

Terminal for station accommodation is 1s. 6d. per ton at each end	3	0
Loading at 8d. per ton		8
Unloading at 8d. per ton		8
Covering at 2d. per ton		2
Uncovering at 2d. per ton		2
Total	4	8

The consignor of traffic placed in the Statutory Class 2 (scheduled to Part 1 of the Order) would have some means of ascertaining what amount representing service terminals and station accommodation was included in his rate (although the railway companies endeavour to evade their responsibility to disintegrate rates claimed or charged, even upon receipt of a formal request addressed to the secretary of the company). On the other hand, the consignor of a commodity which the railway companies have classified as dangerous and have indicated in their special classification that the figure shown against Class 2 in the Rate Books may be taken as the reasonable sum they think fit to charge, has no means of ascertaining what portion of the sum represents terminals and accommodation, no details being set out in the Acts under Part 4, as in the case of Part 1. The result is that the rates on Part 1 traffic, which apply at railway company's risk and include full service and station terminals, provision of railway rolling stock, collection at sending point and delivery at destination by road cart, are equally applied at owner's risk as "reasonable sums" to chemical merchandise in Part 4 of the Provisional Orders, even when such merchandise passes from private siding to private siding in tank wagons provided by the traders, giving concentrated loads of from 8 tons to 20 tons per truck.

This is a serious hindrance to chemical manufacturers who have provided their own private sidings, and the railway companies go so far as to state that it is not usual to make any siding allowances from the sums they prescribe for dangerous goods, even when relieved by the private-siding owner of load- and unloading services, the provision of station premises and rolling stock.

Contract Conditions.—In addition to the levying of unreasonable rates or charges, the carriers enforce special contract conditions in connexion with chemical traffics; they require indemnities against third-party risks under certain circumstances, and (with a few exceptions) the merchandise is conveyed only at the risk of the trader. The consignor is bound to subscribe to consignment notes which contain, in addition to the indemnity referred to, conditions placing the sole risk upon himself and relieving the railway company of any loss of or injury or delay to the said goods, and undertaking that the goods will be removed at destination within four hours (in the case of tank wagons, six hours) —in default to pay 5s. per ton per hour—and if not removed within twelve hours agreeing to the railway company selling the goods in such a manner and at such time as it thinks best. This means that the charge for standage of a 20-ton tank wagon of petrol would be £5 per hour.

Rolling Stock.— During recent years some thousands of railway tank wagons have been built by private traders and placed upon the railways; it is contended that no adequate provision has been made by the railway companies in their classification for liquids conveyed in such vehicles, and that in these cases the unreasonableness of the rates or sums charged is most pronounced, particularly the charge which is made, presumably by way of insurance, in consequence of any slight risk which may be left to the railway companies to bear, through the alleged dangerous nature of the liquid conveyed.

Premiums for Risk.—It is surely a business proposition to assume that a small premium would cover insurance for the limited measure of risk, since explosives, inflammable, corrosive and poisonous liquids, properly packed in accordance with the Home Office and railway companies' specifications, are not far removed from ordinary merchandise, and petrol and other inflammable liquids sent in specially manufactured steel drums or in specially constructed owner's tank wagons could not be fired unless the drums or tanks were faulty, in which case the railway companies would be relieved of all responsibility by the conditions of contract; and it is ludicrous to suggest that a poisonous liquid is dangerous in a railway tank wagon. At the same time the premiums demanded by the carriers for the risks which do not in practice exist are enormous, as illustrated by the following extract from the General Railway Classification:—

Oils, not dangerous, in owners' tank wagons, 8-ton loads	Class C
Petrol or benzol, in specially constructed owners' tank wagons, 8-ton loads ...	Class 2

The following table shows the rates levied, prior to September 1 last, between large centres in respect of goods in the classes mentioned:—

	Class C. Per ton. s. d.	Class 2. Per ton. s. d.	Difference. Per ton. s. d.
Liverpool and London	30 3	55 6	25 3
Leeds and Glasgow	36 11	62 1	25 2
Bristol and Birmingham	16 3	30 4	14 1
Cardiff and Sheffield	33 3	65 5	32 2

The differences between the two rates show that the carriers require unreasonably heavy sums for insurance, and the rates themselves indicate what the charge would be for the carriage of 20 tons in a railway tank wagon.

Comparisons with Germany and America.—It would not be quite fair to complete this article without some definite reference to charges made in Germany, as compared with charges (pre-war) here; and the following comparisons will show the position so far as benzol, toluol, and naphtha, in owners' tank wagons, Inflammable Liquids Class "A," flashing below 73° F., are concerned:—

	50 Miles. Per ton. s. d.	90 Miles. Per ton. s. d.	130 Miles. Per ton. s. d.
Germany	7 0	10 0	14 0
England	15 0	21 8	26 0

In America, the Inter-State Commerce Commission, with the assistance of the Bureau of Explosives, controls the classification, rating and conditions under which dangerous goods are conveyed, and evidence recently given before the Rates Advisory Committee illustrates the unreasonable manner in which the question of danger is dealt with in this country. It appears that in America, inflammable liquids, flashing over 80° F., are not considered as dangerous liquids, whereas in this country in a recent case before the Railway and Canal Commission Court [Midland Railway and Others v. Brotherton & Co., Ltd., and Wm. Butler & Co. (Bristol), Ltd. (*cf.* J., 1920, 187 R)], it was declared that the railway companies did not accept 150° F. as the dividing line between danger and safety, and their contention was upheld by the Court.

Dangerous or Non-Dangerous.—In arriving at a decision as to whether the commodity is dangerous or otherwise, the English railway companies are guided by a body of chemists who, generally speaking, have no works' experience of chemical processes and products; they do not appear to consider whether the merchandise is safe in the package in which it is conveyed, but what might happen in case of a train accident or an accident to a container. In the case of leakage of liquids not inflammable under normal daily temperature, the companies point out that there *may* be danger provided the rays of the sun during the hottest day in summer were to fall upon the leakage, and provided that a man should at that psychological moment drop a match or a lighted lamp on the liquid which had so escaped. (It, of course, stands to reason that unless the match or light were dropped at the correct time the leakage may have evaporated quickly in the rays of the sun).

Assistance for Key Industry.—It is the firm opinion of a number of large chemical manufacturers that no real attention or assistance has been given to this key industry so far as the carriers are concerned, and it seems that the fact of extortionate charges having been paid in the past is sufficient guarantee for their continuance in the future—quite overlooking the consideration that the consequent cramping of trade and the driving of by-products and semi-manufactured commodities abroad are against the best interests of the country, and will not assist us in meeting the demand for high explosives, should another war break out.

Revision of Railway Rates.—Particulars of the difficulties and the serious position in which the chemical manufacturer is placed have been given in evidence before the Statutory Rates Advisory Committee in connexion with the hearing respecting the general revision of railway rates and charges. Trade witnesses have supported proposals that an impartial Business Tribunal, easy of access and inexpensive, should be appointed to have the power of classifying merchandise of every description, including dangerous goods, and of deciding the rates, charges, and conditions to be applied; and it has been particularly pointed out that the railway companies should be permitted to charge only for the services they actually perform, and for the accommodation which is provided and used. It is hoped that in the national interests the Committee will make such a recommendation to the Minister of Transport as will accord the chemical manufacturers and traders of this country some right to be consulted in connexion with the conveyance of their merchandise and the cost; and that more reasonable and equitable terms will be obtained in the future, so that British chemical manufacturers may enjoy a reasonable chance in competing with traders in other countries where the conditions are more favourable in regard to railway transport.

Patent Office Library. — On and after October 1, 1920, the hours of opening will be from 10 a.m. to 9 p.m. (in lieu of 8 p.m. as hitherto), except on Christmas Eve and Easter Eve, when the closing hour will be 4 p.m.

LIQUID OXYGEN EXPLOSIVES.

J. THORBURN.

Liquid oxygen explosives, named "Oxyliquit," were first introduced in 1897 by Linde, whose process for the commercial liquefaction of air, developed two years previously, rendered such explosives possible. In free competition with ordinary explosives they made no progress, but during the war their use rapidly spread in German industry, where they enjoyed a virtual monopoly because ordinary explosives, or the raw materials therefor, were reserved for military purposes. Under the name "Sprengluft" they were extensively used by the Germans in the iron, potash, and non-fiery coal mines, and for tunnelling and demolitions both civil and military.

Liquid oxygen for explosives should contain at least 85 per cent. of oxygen, and usually contains 85—90 per cent., the remainder consisting principally of nitrogen. Its boiling point is −183° C.; consequently, in order to minimise loss by evaporation in transit, it is produced as near as possible to the site of the blasting operations. The liquefaction plant is generally of the Linde, Claude, or Heylandt type. The liquid oxygen is either stored in a large vacuum-jacketed reservoir until required, or run directly from the plant into the transport vessels. These are vacuum-jacketed, spherical flasks of brass or steel with a capacity usually of 15—25 litres, constructed on the principle of the Dewar flask. As in this, the inner walls of the vacuum jacket are silvered or polished, and the vacuum is improved by placing a quantity of highly absorptive charcoal in the jacket to absorb residual air and the small quantity of air which gradually leaks through the pores of the metal. This is an application of Dewar's discovery of the high absorptivity of charcoal for air near the boiling point of the latter, the vacuum being almost perfect so long as the vessel contains liquid oxygen. The normal loss of oxygen by evaporation from these vessels when new is under 60 grams per hour. To keep them efficient they are tested monthly, and when the loss from them exceeds 400 grams per hour they are returned to the manufacturers to have their jackets re-evacuated. The neck of the vessel is long and narrow, and when upright the inner flask hangs freely within the outer flask and touches it only along the line of suspension near the mouth. On tilting the vessel to pour out its contents the body of the inner flask touches the outer at two points. The resulting admission of heat increases the rate of evaporation of the liquid oxygen, and thereby produces sufficient pressure in the flask to expel the liquid contents quickly and steadily. For distribution to the workings, the liquid oxygen is transferred to five-litre vessels of similar construction.

The explosive is prepared by saturating an absorptive combustible, such as soot, lampblack or cork-meal, with liquid oxygen. This may be done in the borehole as in the Baldus-Kowastch process, but saturation is often incomplete by this method, with the result that on firing the shot the explosion is only partial, and the remainder of the charge may be thrown out burning. It has been found better to prepare the explosive outside the borehole as in the "Marsit" process. The absorbent is filled into porous cylindrical envelopes, usually of linen, paper or cardboard, to form cartridges of convenient length and several millimetres less in diameter than the borehole. A small quantity of liquid oxygen is poured from a five-litre flask into an "immersion" vessel, which is usually a vacuum-jacketed cylinder of the proper size made of glass, porcelain or metal, but galvanised sheet iron vessels insulated with slag wool or the like are sometimes used. The requisite number of absorbent cartridges are placed vertically in the vessel, and cause rapid evaporation of its contents, the vapour from which cools them thoroughly. After this preliminary cooling, which saves oxygen and occupies only a few minutes, the vessel is filled up with liquid oxygen, and when the immersion has lasted ten to thirty minutes, the exact time depending on the porosity of the absorbent and envelopes used, saturation of the cartridges is complete. They are lifted out by means of wooden tongs and pushed with a wooden rod along an iron gutter into the borehole, which must be quite straight and clean. The detonator is inserted in the last cartridge of the charge and the hole is tamped with porous material, to allow the evaporated oxygen to escape. The shot is then fired. When clay is used for tamping, a ventilation channel is formed in it by rotating a thin brass rod in the borehole during tamping. From the moment of their removal from the immersion vessel, the cartridges rapidly lose oyygen and with it their explosive power. At the instant of firing, sufficient oxygen should be present to prevent the formation of carbon monoxide. The interval between saturation and firing should therefore be as short as possible and, consequently, there is time to prepare only two or three shots for each blast. This constitutes a serious drawback to the procedure just described, which cannot be avoided if ignition is effected by means of an ordinary fuse. If, however, electrical ignition is employed, time may be saved by completing the firing arrangements while the saturation of the cartridges is in progress. In applying this method, the detonator is fixed in a short cylindrical wooden block which is pushed to the bottom of the borehole, the detonator projecting slightly from the block and pointing towards the mouth of the hole. The firing cable is then connected to the detonator wires and the electrical continuity of the firing circuit tested. Not till then are the cartridges transferred from the immersion vessel to the borehole. It only remains to insert the tamping and fire the shot. By this procedure the loss by evaporation is minimised, hurried working is rendered unnecessary, the risk of misfires, due to faulty connexions, is diminished, a greater explosive effect is obtained from the same quantity of liquid oxygen, and a larger number of shots can be fired simultaneously. Where conditions permit, a further increase in the possible number of simultaneous shots is effected by the practice, sometimes followed in potash mines, of using a wooden plug as tamping or doing without tamping.

For exploding charges of liquid oxygen explosives, fuse alone may often be used, but as a much greater explosive effect is obtained with detonators, these are generally employed. They may be fired by means of ordinary fuse or electrically. When fuse is used, a greater length is required than with ordinary explosives as a precaution against accelerated burning, caused by the fuse cover igniting and burning more rapidly than the core in the highly oxygenated atmosphere of the borehole. The difficulties with fuse have led to the adoption of electrical firing. Ordinary detonators may be used if they are made so that the liquid oxygen cannot enter them, and if they are protected from direct cooling, *e.g.*, by inserting them in small wooden tubes, or if they are allowed to remain only a relatively short time in contact with the explosive.

A special detonator much larger than the ordinary detonators has been devised, consisting of a perforated iron or cardboard tube containing an absorbent such as cork-meal mixed with an oil. This detonator is explosive only when saturated with liquid oxygen. It is inserted in one of the cartridges constituting a charge, before they are immersed, and is ignited by an ordinary electric igniter.

For firing a series of shots successively, a method which has proved satisfactory consists in inserting a piece of fuse between the detonator and the electric igniter of each charge, the length of the fuse being four cm. for the first and two cm. longer for each successive shot. When the igniters are fired simultaneously the shots follow at regular short intervals. As a precaution against premature ignitions due to sparking, the junction between igniter and fuse is enclosed in a cylindrical wooden block five cm. long. Alternatively, the fuse with igniter is sometimes coiled up in sand in a cardboard cylinder from which only the end of the detonator and the wires of the igniter protrude.

Liquefaction plant and accessories for the preparation and use of liquid oxygen explosives are supplied by the Sprengluft G.m.b.H., Berlin, and other firms.

Liquid oxygen explosives are stronger than black powder and can be used instead of dynamite. Their cost depends on their efficiency which in turn depends very much on local and personal factors, including the attitude and skill of the workers. They are unsuitable for use in wet boreholes, shaft-sinking, in quarries where the stone is required in large blocks, and in fiery mines.

It is perhaps too early to forecast the future of liquid oxygen explosives, but it is unlikely that, under normal conditions, they will replace ordinary explosives to any appreciable extent. Since the war their importance has diminished owing to the renewed possibility of obtaining ordinary explosives. The existence of the necessary plant in Germany might be expected to favour the preference of liquid oxygen explosives there, but ordinary explosives have already displaced them in some districts. In Alsace Lorraine, on the other hand, the situation is still obscure, owing to the influence of the French Government tax on explosives.

MEETINGS OF OTHER SOCIETIES.

THE INSTITUTE OF METALS.

The Autumn Meeting of the Institute of Metals was held on September 15 and 16 at Barrow-in-Furness under the presidency of Sir George Goodwin, and was very well attended. The number of papers presented was so large that several of them had to be taken as read, and the discussion of others curtailed, although it is hoped that many written contributions to the discussions will be received later. On the practical side, Mr. H. B. Weeks, who also acted as local hon. secretary, communicated an account of the practice in brass-foundry work at Messrs. Vickers' works, as a preliminary to the visit which the members were enabled to make to the foundry later in the day. Messrs. T. G. Bamford and W. E. Ballard gave an account of experiments to determine the influence of dissolved gases on brass of high grade, and showed that the temperature of pouring is the determining factor in influencing the quality of the casting, and not the maximum temperature to which the metal has been exposed. Pouring at a temperature within 40° C. of the liquidus will usually render the casting porous. The authors described their experimental methods for collecting and analysing the gas contents of a brass. Mr. R. T. Rolfe discussed the influence of arsenic and antimony on the properties of Admiralty gun metal, reaching the conclusion that both elements are deleterious, and that large quantities cause unsoundness as well as brittleness. Commander G. B. Allen described the experiences of the Navy in regard to condensers, especially under war conditions, and called attention to the importance of erosion by sandy particles in bringing about deterioration of the tubes at the inlet ends. Varnishing or coating the tubes would probably have a good effect if the practical difficulty of forming a uniform film could be overcome. In the discussion on this paper, Dr. Bengough stated that erosion plays a less important part in shore plants, and that the initiation of corrosion had not been traced to the presence of spills or similar defects. He also suggested a modification in the method of inserting the tubes into the ferrules in order to lessen the possibility of the accumulation of air bubbles.

On the more strictly scientific side, the principal paper was that by Prof. H. C. H. Carpenter and Miss C. F. Elam, on crystal growth and recrystallisation in metals. This included a very extensive series of observations, partly on aluminium, and partly on an alloy of tin containing 1·5 per cent. of antimony. This alloy has the convenient property of marking each stage of grain growth by a raised boundary on a polished surface, so that each successive stage may be watched, and the results photographed without confusion. The authors distinguish sharply between the growth of crystals by gradual movement of their boundaries and recrystallisation, which implies complete re-orientation from new centres. They conclude that plastic deformation is necessary for both, and that the higher the temperature of heating, the less is the amount of previous deformation which is required. Large crystals do not necessarily grow at the expense of small. The matter is a controversial one, and the authors, while showing the inadequacy of existing explanations, are not yet prepared to offer a complete hypothesis of their own. Dr. W. Rosenhain criticised the conclusions of the paper, and maintained the adequacy of his own explanation. The subject was vigorously discussed, and Dr. F. C. Thompson showed slides to prove that in certain alloys general disintegration of a crystal took place before the appearance of new crystals. It was generally agreed that a further knowledge of the intimate structure of crystals would be required before a complete account of the process could be given. Mr. F. Johnson described the appearance of narrow twins, resembling Neumann lamellæ, in cold-worked beta brass, and Mr. J. H. S. Dickenson gave an account of the intercrystalline fracture of some brasses when brought into contact with metals or alloys of low melting point while in a state of tension. A good piece of thermal analysis work was contributed by Mr. D. Hanson and Miss M. L. V. Gayler on the alloys of magnesium and aluminium. The system proved to be a difficult one, owing to the very small crystallisation-interval in the most important part of the series, but the existence of two compounds has been clearly proved. Two papers were taken as read, a confirmation by Miss Bingham of the existence of three allotropic modifications of zinc, and an account of the constitution of alloys with a tin basis containing copper and antimony by Dr. O. F. Hudson and Mr. J. H. Darley.

The visits comprised the very extensive engineering and shipbuilding works of Messrs. Vickers, including the airship-construction department, the iron and steel works of the Barrow Hæmatite Co., and the Barrow Paper Mills. On the last afternoon the members travelled by train to Lakeside and made a steamer tour of Lake Windermere.

The Spring Meeting, 1921, will be held on March 9 and 10, in London, and the May Lecture will be delivered by Prof. Thomas Turner on "Casting of Metals."

SOCIETY OF DYERS AND COLOURISTS.

The first meeting of the Session 1920—1921 of the Midlands Section of the Society was held in the University College, Nottingham, on September 24, when a lecture on "The Examination of Hydrocarbon Oils" was given by Mr. L. Guy Radcliffe (Manchester).

The well-known physical tests usually applied to mineral oils were briefly referred to, emphasis being laid on the correlation of the various tests and the interpretations of the numerical data obtained therefrom. The distinction between viscosity and oiliness was discussed, mention being made of the influence of free fatty acids on the efficiency of lubrication. The Michell viscometer was shown and described especially as a means for the rapid determination of viscosity in workshops. Following remarks on the determination of flash point, the difficulty of obtaining concordant results as to loss in weight experienced on heating oils in air was mentioned, and the opinion expressed that at present there was not a really satisfactory apparatus available for this purpose. In connexion with fuel oils, the apparatus used for determining the temperature of spontaneous ignition was described and certain important generalisations were cited. In dealing with the stability of mineral oils, special attention was given to the ease with which such oils undergo oxidation with the formation of solid precipitates and the production of acidity; the conditions favourable to such changes were detailed and some account given of the nature of the deleterious products. The lecture concluded with a brief description of some machines used for determining the friction-reducing values of oils when applied to bearings.

NEWS AND NOTES.

CANADA.

Copper and Nickel in Quebec.—It is reported that lodes of copper and nickel ore extending from 100—140 ft. have been discovered in the Lac du Bonnet mining district. The Dominion Government has sent a survey party to make a report on the whole field.—(*Official.*)

Antimony Development in New Brunswick.—An expenditure of $750,000 in the development of the antimony mines at Lake George, near Fredericton, N.B., has been forecasted by the president of the North American Antimony and Smelting Co., Ltd. It is expected that shipments of the ore will be commenced early in the autumn.—(*Bd. of Trade J., Aug.* 5, 1920.)

Discovery of Arsenic in British Columbia.—A large deposit of metallic arsenic is reported to have been found on Alder Island belonging to the Queen Charlotte group. Hand-picked specimens show from 18 to 24 per cent. arsenic. This is the first known occurrence of arsenic in British Columbia, although it has been obtained for some years as a by-product from the arseno-pyritic ores of the Hedley Gold Mining Co.—(*J. Ind. and Eng. Chem., Aug.*, 1920.)

The Fertiliser Industry.—The number of companies in Canada making commercial fertilisers was 12 in 1917, and 15 in 1918, exclusive of slaughtering and meat-packing plants producing fertilisers as by-products. The assets and working capital of these 15 companies were $3,064,111 in 1918, or about 10 per cent. more than in 1917; 412 persons were employed, and the total salaries and wages paid amounted to $370,091. Large quantities of fertilisers are produced by the beet-sugar industry and the chemical industry, whilst thousands of tons of ammonium sulphate are produced in coke-oven plants and exported, mainly to the West Indies and Southern States, as a fertiliser for sugar-cane and cotton crops. Cyanamide has been produced on a large scale in Canada in recent years and the consumption is increasing, but the bulk of the output is exported. Potash is made from wood ashes on a small scale. The total value of the output of the Canadian fertiliser industry in 1918 was $2,558,007 ($2,295,075 in 1917), and included 27,985 tons of "complete" fertilisers, worth $1,238,064; 10,934 t. of "ammoniated" fertilisers, worth $481,947; and 27,384 t. of basic slag, worth $239,816. The total value of the materials used in the year was $1,573,582.—(*U.S. Com. Rep., July* 10, 1920.)

Electric Reduction of Iron Ores.—Although the iron ores of Ontario are known to be of considerable extent, yet owing to their high sulphur content, and the fact that they are usually siderite or magnetite, successful operation has never been attained except in one or two cases. The scarcity of coal in Ontario has been a factor restricting domestic production, but there is abundant water-power. An electric smelting method has been developed by Mr. J. W. Moffatt, of Toronto, which makes use of both a reduction furnace and an electric furnace working in combination. The carbon monoxide given off during the reduction is utilised to supply heat for the reaction, so that, theoretically, no fuel beyond that needed for reduction is required. In actual practice, however, a small amount of heat must be added. The ore is crushed and fed into the reducing furnace and carbon added. The sulphur is burnt off before reduction is allowed to take place, and then the metallic iron is conveyed in an air-tight conveyor to the electric furnace, where it is melted down and refined. Master patents for the process and the furnaces have been taken out in Canada, the United States and other countries. It is expected that arrangements will shortly be made for the erection of a plant. A process for the electric reduction of Ontario ores has also been invented by Prof. A. Stansfield, of McGill University, Montreal; patents have been applied for, and arrangements for large-scale working are being considered.

AUSTRALIA.

Tasmanian Industries.—As Tasmania is constantly suffering from either actual or threatened shortage of coal, considerable interest is now being taken in the country's own resources. Tests of coal mined at Preolinna gave very good results in regard to yields of gas and coke, and it is stated that this field contains some 50 million tons of coal, which include the best steam coal, gas coal, and Torbanite shale.

Messrs. Hoskins, ironmasters of New South Wales, are working towards the establishment of an iron industry in Tasmania, and are stated to have acquired the leases of areas on the west coast containing deposits of magnetite and hæmatite. The Government is investigating the question of utilising and developing the waters around Strahan for use as a harbour.

The Emu Bay Railway Company of Tasmania, which owns the railway line to Mount Bischoff, has decided to enlarge its engineering workshop at Burnie and to undertake general engineering work for the public.

Active operations have begun in connexion with the establishment of woollen mills at Launceston; and Messrs. Cadbury & Co., chocolate manufacturers, propose to erect a factory at Claremont, near Hobart.

According to the latest returns, the population of Tasmania was 218,121 on March 31 last, a gain of 1370 in twelve months.—(*Official.*)

FRANCE.

Industrial Notes.—*Metallurgy.*—Work in the factories is progressing steadily in spite of the continued lull in business owing to the holiday season. In Meurthe and Moselle the devastated works are being actively reconstructed on the most modern lines, and in Lorraine the blast furnaces at Ottange, Redange, and Uckange will soon be in working order. Speaking generally, there has been a marked improvement in the supplies of raw material and fuel during the last few weeks, and prices remain firm.

Coal.—The output from the Sarre region is increasing every month, and the supply of American coal, which is coming in at the rate of 335,000 tons monthly, is expected soon to reach 500,000 t. The French production has been 2,143,000 t. of coal and 159,000 t. of coke, which represents an increase of 50 per cent. over the average production from January to May. The supply of German coal for August reached the figure agreed to at the Spa Conference, viz., 1,640,000 t. The actual deliveries totalled 1,646,186 t., made up as follows (the figures in brackets represent the quantities agreed to): Ruhr district, 1,457,988 t. (1,458,000); Aix-la-Chapelle, 66,268 t. (64,000); Cologne basin, 121,430 t. (120,000).

The Chemical Industry.—A company termed "La Société des Cristalleries de Nancy" has been formed to manufacture perfume bottles, which were formerly imported. As the production of natural and synthetic perfumes is making great headway, the new company should find a ready market for its products. Prices in the perfumery market have reached such abnormal heights that former big buyers, like America, are holding back. The policy of high prices is deprecated by many as being certain to lead to the establishment of large perfume factories in foreign countries.

Cotton and Wool.—In the past France has imported practically all her requirements in these commodities, but recent experience has shown the necessity for developing the potential resources of the French colonial empire. In 1913, imports of cotton amounted to 329,537 t., to which total the U.S.A. contributed 78 per cent., Egypt 8, India 7, and Great Britain 2 per cent. So far the attempts to cultivate cotton in Indo-China, the French Sudan, New Caledonia, and Madagascar have been very sporadic. In regard to wool, 96 per cent. of the supplies of which is imported, attempts to produce it have been made in Upper Senegal, Nigeria, and more particularly in Morocco, whence 30,000 t. is expected to be delivered in 1926.

Copra Production in Cochin-China.—Cochin-China is the largest producer and exporter of copra in Indo-China, the average export being about 7160 tons a year, destined almost exclusively to France. The coconut palm is cultivated in most of the villages of Cochin-China, and plantations of 3600 and 3200 hectares (hectare = 2·47 acres) exist in the provinces of Mytho and Bentre, whilst there are smaller plantations in the provinces of Vinh-Long and Gocong. During the war the few shipments resulted in decreased production, and, by 1917, the exports only reached 2000 tons. The oil factory, established near Saigon, in 1917, can treat 2000 tons of copra a year, and its production will shortly be increased. About 1000 hectares of new plantations will reach their full output in five or six years, and will yield some 1500 or 1600 tons. It is estimated that within the next twenty years Cochin-China could produce sufficient copra to supply the greater part of the needs of France. The industry offers a wide field to both planters and capitalists.—(*Bd. of Trade J., May* 13, 1920.)

Phosphate Deposits in Morocco.—The French Chamber of Deputies has sanctioned the raising of a loan of 744,140,000 francs by the Moroccan Government for the purpose of exploiting the rich beds of phosphates discovered in the district of El Boroudj.—(*Rev. d. Prod. Chim., Aug.* 31, 1920.)

Liquidation of the Alsatian Potash Mines.—On July 31 the French Chamber of Deputies sanctioned the appropriation of 76 million francs for the purchase and management by the State of the potash mines in Alsace, and one million francs for preliminary working expenses. As a consequence, the official liquidator of the mines, who is chairman of the Société Commerciale des Potasses d'Alsace, has decided to reduce the amount of potash salts allocated for export during the last four months of this year, and to render available for French agriculture 22,000 tons of potash (K_2O) in excess of the amount originally provided for.—(*Rev. d. Prod. Chim., Aug.* 31, 1920.)

UNITED STATES.

The Future of the Use of Oxygen-enriched Air in Metallurgy.—The possibility of applying oxygen to various standard metallurgical operations, which depends to a large extent on a relatively cheap supply, was discussed by Dr. F. G. Cottrell in a paper before the American Iron and Steel Institute. The two modern processes in general application for the production of oxygen are from water by electrolysis, and from air by liquefaction and distillation. The horse-power in power consumption required for the first process works out at 6000 h.p. hrs. per ton, and for the second 60 h.p. hrs. per ton, ⅛ ton of hydrogen and 3½ tons of nitrogen being produced as by-products in the two processes. These values are theoretical limits based on 100 per cent. efficiency, but as both processes involve reversible actions losses must be allowed for. The actual efficiency of the electrolytic process is 80 to 85 per cent. All available data point to the liquefaction process as being the most suitable for obtaining a cheap supply. Patents for centrifugal separation have been taken out, but none of them seems to overcome the many difficulties encountered. A plant erected in Alabama during the war for the fixation of nitrogen would, if operated for oxygen, yield an output equal to the present United States production of 130 tons per day, one-quarter of which is produced by electrolysis, and the remainder by liquefaction.

At present 95 per cent. of the above output is used in torches and for cutting and welding operations. With an increased supply at a cheaper cost, oxygen could be applied with advantage to increasing the calorific intensity of the blast in blast furnaces, thereby effecting economy in fuel, to supplying a strongly reducing atmosphere in the open-hearth furnace using a smaller gas volume, to allowing the use of low silicon iron in the Bessemer convertor, and in general to many metallurgical operations involving volatilisation processes.—(*Chem. and Met. Eng., July* 14, 1920.)

GENERAL.

Reported Discovery of New Potash Deposits in Spain.—Potash mines containing carnallite and sylvine embedded in rocksalt have been discovered near Suria and Cardona, in the Province of Barcelona. Provisional estimates fix the quantity of carnallite at 2,550,000 metric tons and that of sylvine at 1,150,000 t.—(*Z. angew. Chem., Sept.* 3, 1920.)

Discovery of Iron Ore in Iceland.—Prospecting near Oenundarfjorden has disclosed an occurrence of exceptionally good iron ore with 70 per cent. of metal. The discovery has aroused considerable interest in Sweden, where a company has been formed to exploit it. The mineral potentialities of Iceland have hitherto received but very little attention.—(*Z. angew. Chem., Aug.* 17, 1920.)

Reported Discovery of Copper Ore in Finland.—Two mining companies, the Finland Copper Co. and the Salla Mining Co., have purchased some large deposits of copper ore which have been discovered in Kuolajarvi Parish in the Oulanka River valley in northern Finland. Some claims are said to be very rich in copper. There are also rich veins and probably extensive deposits of sulphide ore in the same locality.—(*U.S. Com. Rep., July* 21, 1920.)

Phosphate and Manganese Ores in the Society Islands.—The only mineral mined in the Society Islands is phosphate, which is produced and exported by a single company, the Compagnie Française des Phosphates (capital 11 million francs). This company, which owns all the mineral rights for the Island of Makatea, 120 miles north of Tahiti, produced from 80,000—90,000 metric tons of 80 per cent. phosphate a year before the war, and about 40,000 t. in 1919. Before the war the phosphate was chiefly exported to San Francisco, France, and Honolulu, but it is now shipped mainly to New Zealand. The great difficulty is the lack of suitable labour, but as the French Government has enacted a decree providing for the regulation and importation of foreign labour, the production will probably increase rapidly.

One island in the Society group is known to contain manganese deposits, the commercial possibilities of which are now being investigated on behalf of the owner of the mineral rights.—(*U.S. Com. Rep., July* 13, 1920.)

The Mineral Resources of Abyssinia.—Important deposits of coal, iron, oil, sulphur, gold, silver, copper, and potash are reported to occur in Abyssinia, but, with the exception of potash, none is worked on a commercial scale. The potash deposits, situated close to the Erythrean frontier, and about 46 miles from the Red Sea, have been worked since 1915 by an Italian company, the Società Mineraria Coloniale of Asmara, Erythrea; they are estimated to contain a million metric tons (90% K_2O), but the annual output has never reached 4000 t. Iron ore is widely distributed, and some rich deposits are known, but are exploited only to a small extent by the natives. Coal deposits also exist in several localities, and certain of them are reported to be worth working to supply fuel for the Sudan and Abyssinia. A certain amount of salt is quarried by the natives in the lowland desert plains between the Abyssinian Plateau and the Red Sea, north of the Straits of Bab-el-Mandeb. Copper and nickel deposits and clays suitable for aluminium extraction are reported from Walego province, and indications of oil and sulphur from Shoa province; asbestos is also stated to occur. The Abyssinian Development Syndicate, Ltd., a British company, is now negotiating for concessions for the exploitation of Abyssinian minerals.—(*U.S. Com. Rep., June* 10, 1920.)

Resources of Portugal.—One of the chief resources of Portugal is cork, of which over 85,000 metric tons is produced each year from 475,000 hectares of cork oaks. This output is greater than the production of all other countries combined (82,000 m.t.), and much of the trade is in British hands (*cf.* J., 1920, 221 R). The production of olive oil is about 580,000 hectolitres and is only exceeded by that of Italy and Spain. There are over 5200 mills and 16,300 presses in the country. Some 4 million kg. of rosin are produced annually, about 750,000 kg. being consumed by local industries. Many of the mines are in British and other foreigner's hands, but recently Portuguese companies with large capital have been showing interest in the mining industry. In 1915 there were 26 coal mines, with a total production of 150,000 t. The relative importance of the metals produced in Portugal corresponds to the following sequence:—Wolfram (annual output 2500 t.), iron, copper, manganese, antimony, lead, tin, uranium, and gold. There are also deposits of clay, slate, lime, asphalt, gypsum, etc. Among Portuguese industries may be mentioned pottery, sugar refining, and the manufacture of soap, oil, cattle food, and cocoa. The linen industry is centred at Braga, the thread being imported from Riga, Belgium, and Italy; it is half-bleached in Portugal and finished in England.—(*Bd. of Trade J., June* 3, 1920.)

Zinc Smelting in Norway.—The electrolytic zinc smelter, which will shortly be started at Glamfjord, is the first of its kind in Norway, and will, it is anticipated, have the effect of stimulating the development of new mines and of increasing the production from old workings. The Norwegian production of zinc ore during 1916 and 1917 was, respectively, 121 and 296 short tons of sulphides, containing 22—31 per cent. of zinc.—(*U.S. Com. Rep., July* 12, 1920.)

The Danish Margarine Industry.—Prior to the cessation of manufacture in 1918 there were about 50 margarine factories in Denmark, but since production was resumed in 1919 the number has increased to 58. The total output in 1919 was 39,600 metric tons, compared with 1200 t. in 1918, 33,200 t. in 1917, 56,500 t. in 1916, and an average of 42,700 t. for the period 1911–15. Exports in 1919 were 1500 t., and imports 300 t. The *per capita* consumption in Denmark was about 33·0 lb. in 1912–14, 41·8 in 1915–16, 24·2 in 1917, and 27·9 in 1919; in 1918 margarine was not on sale. By far the greater proportion of margarine is prepared from vegetable oils and fats, and these are continuing to supplant animal fats in the manufacture. (*Z. angew. Chem., June* 29, 1920.)

Artificial Silk Manufacture in Poland.—It is stated that the artificial silk factory at Tomaszow, established some years before the war, will shortly start work again. Great obstacles have been met with in restarting the factory owing to the shortage of the raw materials required, viz., cotton, ethyl alcohol, ether, and sulphuric and nitric acids. The pre-war daily output was 1500 kg., and it is now proposed to start producing about 500 kg. a day.—(*U.S. Com. Rep., July* 28, 1920.)

The Artificial Silk Industry in Italy.—It is announced that the Società di Navigazione Italo-Americana, which recently increased its capital and is extending the scope of its activities, will shortly construct several new plants for the manufacture of artificial silk, which will probably be located at Turin, Naples, Orbassano and Bra, and it is expected that at least 10,000 workers will be employed. The S.N.I.A. Co., through the controlling interest which it holds in the "Cines Seta Artificiale" Co., the "Viscosa" Co. of Pavia, and the "Società Italiana della Viscosa" of Turin, already holds the dominating interest in the Italian artificial silk industry.—(*U.S. Com. Rep., July* 26, 1920.)

"Cellulose" Alcohol in Switzerland.—A society has been formed in Geneva with the object of establishing a cellulose-alcohol industry in Switzerland. Experiments are now being undertaken on the production of alcohol from sawdust cellulose, those by Terrisse having shown good results. It is thought that the price of such alcohol would be much lower than that from sugar-beets or than that of synthetic alcohol, but it should not exceed 25 centimes per kg., otherwise it could not compete with petrol, which now costs 1·10 fr. per kg.—(*Z. angew. Chem., June* 15, 1920.)

The Glass Industry in the Saar Region.—The Glassworks Vopelius and Wentzelschen, in Sulzbach, the biggest undertaking of its kind, has resumed operations. The number of employees at present engaged is 9000.—(*Z. angew. Chem., Aug.* 17, 1920.)

Iron and Steel in Chile.—The Commercial Secretary to H.M. Legation at Santiago states that the Altos Hornos Iron and Steel Smelting Works, Valdivia, erected by a French company in 1910, at a cost of over 14 million pesos (peso=1s. 6d.), will shortly recommence operations by undertaking a series of experimental tests. The work will be under the supervision of a Government Commission. —(*Bd. of Trade J., Sept.* 2, 1920.)

Sugar-beet Cultivation in Chile.—The sugar refinery in Penco has been conducting experiments with a view to growing sugar beet for the manufacture of sugar. About 3 tons of roots was worked up, and it is claimed that the refined sugar obtained from them was of a higher quality than that produced from Peruvian raw sugar. Its composition is given by the following analysis:—Polarisation, 99·30%; water, 0·12%; glucose, 0·16%; ash, 0·05%; organic matter, 0·37%. Provided that at least 60,000 acres of land is available for cultivation, this refinery is prepared to undertake the manufacture of beet sugar on a large scale.—(*Deuts. Zuckerind, May* 7, 1920.)

A New Swiss Association of Chemists.—A representative association of chemists, called the "Schweizerischer Chemiker - Verband," was founded on July 4 in Berne, to work for the improvement of the status of Swiss chemists. The details of its programme include the establishment of an employment bureau and of a journal, pensions and insurance, and legal protection (*e.g.*, for inventions).—(*Chem.-Zeit., July* 17, 1920.)

Chemical Industry in Germany.—The Berlin Chamber of Commerce, in its report for 1920, states that the chemical industry was more deranged by the war than any other, and points to the manufactures of explosives and nitrates as examples of the way in which whole branches of the industry were transformed and adapted to the use of new raw materials. Increases in wages and in cost of materials have resulted in ever-increasing works costs, and no relief is to be expected until the rate of exchange and inflated values become normal again. Government control of sulphuric acid and other important chemicals has been very rigid, but has not resulted in any great increase in production. Hydrochloric acid was freed from control in March, 1919, and some good export business was done in this line. Ammonia and ammonia products have been in great demand, but the raw materials have been very scarce; in the case of sulphate the control price was too low to make the manufacture profitable. In the dyestuff industry export was resumed to Belgium and Italy immediately peace was signed; business with France is increasing, but England and America are holding off. Doubt is expressed as to the possibility of recovering trade with America, as the latter has made such strides with its own dye industry. In other foreign markets Germany hopes to regain its former position. The shortage of materials and labour troubles have made it impossible to fill the orders that are on hand. The pigment and dye industries have formed combines for regulating prices and allocating available raw materials. Foreign sales have been made at higher prices in order to neutralise the low rate of exchange. The paint and varnish trades have been unable to meet demands. Restriction on linseed oil is still retained, also the prohibition of imported benzine. The drug industry has suffered from a general strike as well as from the all-round shortage of materials. Many of the smaller works have been shut down; outside interests obtained control of the small supplies available, and profiteering was rife. It is noteworthy that most of the big chemical firms have made large profits in spite of small outputs, owing to the high prices ruling.—(*Bd. of Trade J., Sept.* 9, 1920.)

A report on the condition of the German chemical industry as in July last is given in the issue of "Die Chemische Industrie" for September 8. The tale is a very doleful one. There is a general scarcity of demand; everywhere there is complaint of the lack of coal and raw material; hours of work have been curtailed in some factories, and prospects generally are much worse. The retrogression in the pharmaceutical and photographic branches is especially marked, and only in the case of the artificial fertiliser industry is any slight improvement recorded.

Fuller's Earth (1913—1919) forms the subject of a pamphlet (price 6d.) recently issued by the Imperial Mineral Resources Bureau. England and the United States are the chief producers, the output for the two countries being respectively 31,609 tons and 34,459 tons in 1913, and 23,290 tons and 75,418 tons in 1918. The 1919 production of the United Kingdom was 24,785 tons, of which 20,821 tons was produced from the Surrey deposits in the Reigate district and the remainder in Gloucester and Somerset. Australia and India both produce a few hundred tons per annum. The American supplies are found mainly at Quincy, Florida, and these furnish all the earth required for the refining of mineral oils throughout the States, whilst the Arkansas deposits are used wholly for edible oils.

The chief use of fuller's earth at the present time is for the decolorisation and clarification of oils. It is used also as a carrier for certain pigments, as a filler for paper, as an ingredient of some soaps, and it is also serviceable in detecting colouring matters in certain food products. It appears to be generally conceded that, whilst the U.S. product is quite suitable for the refining of mineral oils, it is inferior to the English for the refining of edible oils and fats (*cf.* J., 1919, 456 R).

In an interesting appendix there is a reference to communications from Dr. E. F. Armstrong and Dr. J. W. Evans to the Bureau pointing out that the nature and properties of fuller's earth require investigation. Little or nothing appears to be known of any relationship that may exist between the chemical or mineral composition of the earth and its peculiar physical properties, and it seems desirable that this possible relationship should be investigated.

Fuller's earth contains both amorphous and crystalline matter. The amorphous material, it is stated, is probably closely similar to ordinary rock clay, consisting essentially of a hydrated silicate of aluminium with incompletely decomposed mineral matter containing alkalis and other bases. The crystalline components probably include various mineral substances such as free silica and silicates and some of the heavier detrital minerals such as zircon. The colour may be due to disseminated silicate of iron of the same type as glauconite. Dr. A. H. Cox, who has studied this subject recently on the petrological side, is quoted as stating that when examined microscopically, fuller's earth presents certain features that at once distinguish it from ordinary detrital clays, and he is of the opinion that it represents a true precipitate.

If the difficult and many-sided problems connected with fuller's earth could be solved, the results would undoubtedly be of economic importance. They undoubtedly deserve attention as the object of a purely scientific research involving the co-operation of the chemist, the physicist, and the petrologist.

Revision of the Atomic Weight of Scandium.—The Report of the International Committee on Atomic Weights for 1920—1921, signed by Prof. F. W. Clarke, Sir T. E. Thorpe, and M. G. Urbain, recommends no alterations in the accepted values of the atomic weights except in the case of that of scandium, which should now be changed from 44·1 to 45·1.

COMPANY NEWS.

CALICO PRINTERS' ASSOCIATION, LTD.

In his address to the 21st and 20th (adjourned) general meetings at Manchester on September 15, Mr. Lennox B. Lee, the chairman, said that the shortage of colours during the past year had not been less acute than during the critical years of the war, and the colour users had only maintained production by importing from Switzerland, America, and Germany. The amalgamation of the two chief colour makers, "a step taken under Government pressure," was not to the advantage of either the colour-making or colour-consuming trades, for any scheme which aimed at setting up a monopoly must disorganise the working mechanism and *esprit de corps* of the associated firms, increase overhead working costs, stifle healthy rivalry, and provide opportunity for price inflation. Despite difficulties, there had been some progress in dye production, but it did not follow from this that an early or complete independence was near at hand, and the need for continuing importation was as insistent as ever. In discussing the four alternative policies that have been suggested, viz., (1) free imports, (2) a tariff, (3) subsidy, and (4) licensing, Mr. Lee stated that (1) was declared by the Government to be inadmissible, (2) did not command general approval, but that (3) commended itself as both safe and equitable. As the Government had declined this policy, the directors had suggested that, following the course adopted for promoting cotton-growing in the Empire, the dye-consumer might voluntarily place himself under an assessment, based on the colour he uses, to form a fund under State control out of which a drawback could be accorded to home dye-manufacturers; but this proposal had met with no support. The policy of licensing (4) had been tried and found cumbersome and inequitable. As, however, the Government had expressed its intention to re-introduce legislation based on the Imports and Exports Regulation Bill, the following safeguards must be regarded as essential:—(a) The licensing committee must consist of practical men with technical knowledge, who should be appointed, and in any case approved, by the colour users, whose representatives must be in a majority. (b) The colour-consuming trades must be consulted as to the machinery to be employed in carrying out the licensing system, and the system chosen must be approved by them. (c) The onus of proof as to the suitability of a British colour to meet trade demands must lie on the colour maker alone, and the evidence must satisfy a technical committee enjoying the confidence of the colour users. Failing such proof, free and prompt importation should be granted. (d) The licensing system should be definitely limited in respect of duration, and be renewable only by fresh legislation. The whole history of the colour movement had been biased by the steady, persistent pressure put on the authorities by the colour-making interests, and the Government had proved an easy and, perhaps, not unwilling instrument. The carrying out of the policy adopted was left in the hands of a succession of high officials, constantly coached by the colour-making interests. It was worthy of note that the Government and the advocates of protection had restricted their argument concerning national security to colour-making works, but plant for producing heavy and fine chemicals was at least as important as that in the dye factories. This limitation of the claim for special protection emphasised the necessity of not allowing the argument of public safety to be used as a "stalking horse" for the promotion of sectional interests.

The net profits of the Association for the two years ended June, 1920, amounted to £1,216,960 (issued share capital £5,026,840, debentures

£3,200,000), and the dividends paid or payable are 5 per cent. on the preference shares, and 5 and 10 per cent. on the ordinary shares for 1919 and 1920, respectively. Balances at credit of depreciation and reserve accounts total £2,398,694; and the carry forward is £336,781, which compares with £73,041 brought in.

AMERICAN CYANAMID CO.

The report for the fiscal year ended June 30, 1920, states that the cyanamide plant at Niagara Falls was working at full capacity throughout the year, and that the eight old carbide furnaces were successfully replaced in May last by two new and improved furnaces. The manufacture of "Ammo-phos" at Warners, New Jersey, the plant for which has worked well but somewhat below capacity, can now be regulated to produce, within certain limits, fertiliser containing specific contents of both ammonia and phosphoric acid; production during the past six months has been confined to a new grade of material containing about 20 per cent. each of ammonia and available phosphoric acid. Work at the phosphate mines at Brewster, Florida, was seriously curtailed for six months owing to labour troubles, but during the past half-year normal output has been attained and even exceeded. Demand for the company's products has outstripped supply, and some 7 million dollars' worth of the current year's output has been contracted for at profitable prices. The company has purchased a half interest in the Owl Fumigating Corporation, which was formed to produce liquid hydrocyanic acid from the company's cyanide. The Corporation has erected a new plant at Azusa, California, in the centre of the citrus fruit industry, where the output will be used for fumigating citrus trees. The entire process has been patented. The company's cyanide finds extensive use in the gold and silver mining districts of the United States, Mexico, and Canada.

Gross sales in 1919–20 amounted to nearly 8½ million dollars, the gross profit upon which was over 2 millions and the net profit \$1,716,360. The net income, after payment of all taxes, etc., was \$1,525,877. Issued capital stands at \$14,588,500, of which \$7,994,200 represents 6 per cent. cumulative preference stock and the rest common stock.

LEVER BROTHERS, LTD.

It is reported that the West African interests of Lever Bros., Ltd., including the business of the Niger Co., and those of the African and Eastern Trade Corporation are to be brought under one management. The Corporation, it is stated, will issue 4 million new ordinary shares in exchange for an equal number of 20 per cent. "A" preferred ordinary shares in Lever Bros., Ltd.

NITRATE COMPANIES IN 1919.

A review of the performances of the chief English nitrate-producing companies is rendered difficult by the circumstance that the financial year of some of them does not synchronise with the calendar year. As the year 1919 was notoriously a very bad one for the Chilean nitrate industry, it follows that reports for 1918–19 necessarily make a better showing than those which cover the whole period of 1919. After the conclusion of the armistice in 1918, the fortunes of the companies took a decidedly unfavourable turn; the demand for nitrate for explosives manufacture ceased, the British Government prohibited the companies from dealing until its own large stocks had been disposed of, many of the *oficinas* were closed down, and shipping facilities became very restricted. It was not until the Nitrate Producers' Association was formed early in 1919 with the object of centralising sales that any amelioration set in. The price of nitrate gradually rose from 9s. per quintal of 101·4 lb. in September, 1919, to 17s. in February last. Although costs of production have also risen, the selling price to-day leaves a good average profit.

The eight chief companies whose financial year is not co-terminous with the calendar year paid an average dividend of 9·8 per cent. on the combined share capital of £1,996,800 (shares and debentures, £2,535,780), as against 15·1 per cent. for the previous twelve months; their debenture debts were reduced by £35,652, and reserve funds increased by nearly £75,000 to £609,017. Their total output of nitrate was 3,705,483 quintals (7,678,896 q.), and the average net profit per quintal was probably 29d. (22d.).

The production of the principal companies whose outputs cover the calendar year 1919 amounted to 4,565,395 quintals (11,435,053 q. in 1918), but as the profits obtained were in many cases derived from the sale of nitrate held over from 1918, it is not possible to deduce a figure approaching accuracy for the average profit per quintal. The dividends paid by the companies averaged 8·3 per cent., against 14·5 per cent. for 1918. Eight of the 14 companies drew upon their carry-forward to enable them to pay their dividend, and the aggregate carry-forward of £574,460 was £219,441 lower than a year previously. The total share and debenture capital of these 14 companies—£4,327,500—is considered extremely small in comparison with their capacity. The total share capital of the 22 companies is £5,885,750, upon which £521,705 was distributed in dividends, equal to about 8·9 per cent., compared with £868,490 and 14·9 per cent., respectively, for the previous completed year. The following is a statistical summary of the performances of these 22 companies:—

Companies.	Production, Quintals.	Inc. or Dec. %	Trading Profits. £	Inc. or Dec. %	Net Profits. £	Dividends. %	Inc. or Dec. %
Lagunas Synd., 1918-19	498,797	—46	41,431	— 51	33,354	nil	—
Liverpool	1,286,500 *	—26	167,575	— 6	84,354	140	—
London	390,000 *	—51	42,591	— 23	7382	5	—10
Pan de Azucar	192,082	—72.6	22,766	— 73	15,462	10	—20
Santa Catalina	134,895	—67	22,441	— 38	19,676	20	—10
Santiago	231,500	—54	45,080	+ 40	42,032	7½	+ 7½
New Tamarugal	294,549	—76	24,051	— 72	18,813	nil	—15
Rosario	677,160	—53	82,116	— 48	39,487	10	— 5
Aguas Blancas, 1919 ..	187,000	—74	† 13,935	—124	†18,121	nil	—10
Alianza	1,186,191	—41	78,803	— 83	70,904	10	—30
Angela	239,613	—36	7485	— 85	† 1490	10	—20
Anglo-Chilean	1,555,350	—32	157,967	— 7	77,685	15	—
Barrenechea	37,000 *	—90	23,008	— 14	20,056	15	+ 5
Lagunas Nitrate	54,000 *	—89	26,417	— 35	14,244	2	—
Lautaro	753,000 *	—62	101,223	— 63	23,222	16	— 2
New Paccha	59,000	—89	† 15,678	—153	†21,073	5	— 5
Salar del Carmen	231,000	—66	26,323	— 68	9183	5	—15
San Lorenzo	105,000 *	—65	3516	— 85	†11,040	nil	—25
San Patricio	—	—	3877	— 64	2513	nil	—
Santa Rita	45,000 *	—90	8212	— 34	5308	5	—
San Sebastian	6000	—98	† 24,963	—296	†30,980	nil	—
Tarapaca	107,000	—84	† 1895	—102	† 6463	nil	—10

* Estimated. † Loss.

—(*So. Amer. J.*, *Apr.* 3, *Sept.* 4, 1920.)

PERSONALIA.

Prof. E. Rutherford has been elected a member of the Academy of Sciences, Amsterdam.

Prof. A. K. Dambergis, professor of pharmaceutical chemistry in the University of Athens, died in June last, aged 62.

Mr. W. S. Curphy, Chief Inspector of Alkali, etc. Works since 1910, has retired, and has been succeeded by Dr. T. Lewis Bailey.

Prof. V. J. Harding, a graduate of Manchester University, has been appointed professor of chemical pathology in the University of Toronto.

Mr. J. D. Fry, lecturer in physics at the University of Bristol, has been appointed to the staff of the Research Association of British Rubber and Tyre Manufacturers.

The sum of 1½ million marks has been bequeathed to the University of Frankfort by the New York banker James Speyer, provided that the State also makes a certain contribution.

We regret to announce the death early this year of Sir J. M. MacCullum, M.P., of the firm of Isdale and MacCullum, soap manufacturers, of Paisley, and an original member of this Society.

Dr. P. V. Pauli, one of the pioneers of the German "heavy" chemical industry, died on August 20, aged 84. The deceased spent several years in this country in the early 'sixties, working with the Union Alkali Works, Ltd., Evans and MacBride, and the Sulphate of Copper Company. In 1880 he joined the firm of Meister, Lucius and Brüning, was elected to the board of management, and remained at the head of that undertaking until he retired in 1900.

Prof. W. H. Ellis, whose death occurred recently at Lake Joseph, Muskoka, Canada, served as chairman of the Canadian Section of this Society in 1906—1908 and as an ordinary member of Council in 1908—1910. Born at Bakewell, Derbyshire, in 1845, he graduated at the University of Toronto in arts and in medicine, where he later became professor of applied chemistry and dean of the faculty of applied science. He was public analyst for Toronto for many years and a recognised authority on toxicology.

The death of Sir William Mather, on September 18, in his eighty-third year, removes a successful and influential worker for the cause of scientific and technical education. In addition to serving the interests of the Manchester University, the Gordon College, Khartoum, and a number of other educational institutions, he filled the office of president of the British Science Guild and of the Textile Institute. He introduced the eight-hour day into the works of Messrs. Mather and Platt, of which firm he was chairman, and represented three Parliamentary Divisions in Lancashire within the period 1885—1904.

Mr. Henry Bassett, who joined this Society in 1884 and whose death took place on August 30, at the age of 83, was one of the few remaining pupils of Hofmann at the Royal College of Chemistry. After serving many years as assistant to Mr. F. A. Manning, he took up consulting work in London in 1894, devoting his attention more particularly to non-ferrous alloys and to the testing of anthracene. He was the author of many communications to the Chemical Society, including a paper in 1864 on ethyl orthocarbonate, and he carried out a number of investigations on the corrosion of alloys, etc., in connexion with his work as consulting chemist.

REPORTS.

Report on the Work of the [Egyptian] Government Analytical Laboratory and Assay Office during the Period 1913—1919. *By* A. Lucas. *Ministry of Finance, Egypt. Pp.* 57. *Cairo: Government Publications Office.* 1920. *Price* P.T.10.

This report of the work of the Egyptian Government Laboratory is the first to be published since 1912; during the period covered by it the work has been extended and reorganised under the Ministry of Finance.

Inspection of Materials.—Samples consisting chiefly of building materials, oils, paints, spirits, paper, textiles, and waters were submitted for examination by almost every Government Department. Wherever possible, specifications have been drafted relating to materials tendered to the Government, and contractors are being urged to realise the importance of submitting genuine samples of adequate size. Many samples of alcoholic liquors were taken in pursuance of the military proclamations intended to stop the sale of liquor made from plain spirits and of various artificial essences and extracts of chemical origin. Alcohol is largely used in Egypt for household purposes, and samples were taken for determination of the strength; more attention should be given to the conditions of sale of all forms of alcohol. Tobacco and cigarettes were occasionally found to be adulterated with foreign leaves, particularly banana leaf. An increasing volume of chemico-legal work is being undertaken for the Ministry of Justice in connexion with the examination of documents, counterfeit coins, dust and dirt found in connexion with crime, clothes and fabrics, firearms, bombs and bullets. In one case of 168 documents, examined in connexion with a claim for land worth £16,000,000, 163 were found to be forged. In regard to the revision of a specification for kerosene, a minimum flash point of 100° F. was adopted; the proportion of samples flashing at 100° F. or over increased from 2·1 per cent. in 1913 to 65·2 per cent. in 1919. Much confidential work was done for the Intelligence Department of the Army during the war, and the Laboratory made 1000 chemical igniters for flares and 100 incendiary bombs for a special purpose.

Advisory Work.—Advice was given upon the storage and handling of inflammable goods at Suez Basin, Port Said, at a proposed petroleum store near Cairo, and elsewhere. The occurrence of cotton fires on railways was also investigated, and recommendations made regarding smoking regulations and protection against sparks. The denaturing of alcohol and the use of arsenic in Egypt were also subjects of inquiry. Over 3000 tons of sulphuric acid was imported in 1919, and the manufacture of this acid locally from imported raw materials is recommended. As a result of laboratory investigations, the Government cement factory, having a capacity of 50,000 tons per annum, has been started in the Sudan; it is intended to use a mixture of locally made charcoal and imported coke as a fuel.

Research Work.—A comprehensive examination of Egyptian crude petroleums has been undertaken; it has been shown that a fuel oil suitable for internal combustion engines can be made by distilling, under conditions which ensure a moderate degree of cracking, the black residue (mazut) which results from the distillation of Hurghada crude oil. The distillation of the crude oil is difficult because of the admixture of salt water, but it has been found that the emulsion can be broken up by the application of high-tension electric current in suitably constructed apparatus. A new volumetric process for assaying gold by means of mercurous nitrate has been devised. Ortho-tolidine may be used as an indicator. (*Cf.* J., 1919, 269A.) An investigation of a case of corrosion of concrete by sewage showed that it was caused by the penetration of gaseous sulphur compounds which were afterwards oxidised. This may be prevented by artificial ventilation and by applying a protective coating to the concrete above the water line.

The Assay Office.—The Assay Law of 1916, under which the hall-marking of gold and silver was made compulsory, considerably increased the work of the Assay Office, which has been reorganised and partly centralised. The report gives a description of many old marks of assayers that are now obsolete and of the new standard hall-marks. Minor amendments of the law and a more efficient inspection system are still required to protect the public against fraud.

REPORT FOR THE YEAR 1919 ON THE CONDITIONS AND PROSPECTS OF BRITISH TRADE WITH CHINA. *By* H. H. FOX, *Commercial Counsellor at Shanghai, with the assistance of* C. A. W. ROSE AND H. J. BRETT, *Commercial Secretaries at Peking and Hongkong, respectively.* (*London: H.M. Stationery Office.* 1920.) [*Cmd.* 853. 9*d.*]

Although China's industrial development—in the modern sense—is of comparatively recent date, rapid progress has been made, and there is every indication that the country will become one of the leading industrial nations. Almost every form of raw material known to commerce is produced in China, labour is plentiful and cheap, and labour troubles are unknown; but lack of communications, unscientific treatment of raw materials, and inefficient native management of factories seem to indicate that foreign co-operation is still essential. The future of the country depends very largely upon the rapid extension of internal communications, and more especially of railways. The war had no great effect upon China; the loss of some channels of trade was amply compensated for by increased business with Japan and America, and good advantage was taken of the world demand for foodstuffs and raw materials. The country lost indirectly by the absence of European guidance in the development of trade and resources, but gained indirectly by the realisation of the general backwardness of the Chinese people.

Mineral Wealth.—Recent investigations by experts indicate that former estimates of the mineral wealth of China were much exaggerated, and that there are few large deposits, at least within the areas at present accessible. It is probable that China's potentialities depend on the development of her industrial and agricultural rather than of her mineral resources. Modern mining methods are practically confined to coal and iron, and even the deposits of iron ore do not appear large when compared with deposits worked in other countries. The output of coal in 1919 was about 23 million tons, of which about 13 millions was produced by modern methods. Iron ore is most abundant in the Yangtse Valley, where the Han Yeh Ping mines produced 600,000 tons in 1919; the ore from this source is smelted at Hanyang and the resulting pig iron is exported mainly to Japan. Much iron ore is known to exist in Hupeh, Shantung, Shansi, and other Provinces. Copper and tin are found extensively in the province of Yunnan, the present output of tin amounting to about 5 per cent. of the world's production. The tin industry is entirely in Chinese hands. Large amounts of antimony are produced, 272,989 piculs of regulus and crude being exported in 1918. Gold, wolframite, silver, mercury, asbestos, lead, zinc, nickel, mica, and molybdenum also occur in considerable quantities. Attempts to develop the production of petroleum have met with little or no success.

Foreign Trade.—The total value of China's foreign trade in 1919 was 1,277,807,092 Haikuan taels (Hk. tael=6s. 4d. in 1919; 2s. 8¾d. in 1914), divided about equally between imports and exports. The percentage distribution of trade in 1919 (and in 1913) was as follows:—British Empire (including Hongkong) 38·30 (48·00), United Kingdom 9·50 (11·40), Japan 37·10 (19·70), U.S.A. 16·50 (7·60), other countries 11·10 (24·70).

Imports.—With a population of at least 350 millions, China's imports of foreign goods in 1919 averaged about 12s. 6d. per head, so that there is obviously much room for great expansion. British trade lost much during the war, and now the lack of supplies and in many cases the high prices of United Kingdom goods are hindering recovery in this market. However, British goods have a high reputation for quality in China, and there is no doubt but that they will secure their full share of the trade.

The values in millions of taels of some of the chief items imported in 1919 are appended. (3½ million taels=approx. £1,000,000).

Metals and minerals, 56·61; cement, 1·61; chemical products (except soda, match-making materials, medicines), 1·60; coal, 12·52; coal-tar dyes, 3·04; artificial indigo, 1·31; vegetable indigo, 0·63; other dyes, paints and paint oil, 3·05; glass and glassware, 2·68; glue, 0·60; match-making materials not paraffin wax), 1·73; medicines (including cocaine and morphia), 5·47; oil, kerosene, 46·27; oil, lubricating, 2·17; perfumery, etc., 1·72; soap and materials for making, 3·33; soda, 3·11; wax, paraffin, 1·26; cotton goods, 209·79.

Dyes.—There has been a striking recovery in the import trade of artificial indigo and of coal-tar dyes, but the figures for 1919 are still far below those for 1913. The consumption of synthetic indigo in 1913 amounted to 17,000 tons, and the subsequent decline is due partly to increased cultivation of natural indigo and partly to greater economy in use. The pre-war price of synthetic indigo was 40 taels per picul (nearly 2s. per lb.), and it is now 120—140 taels for the same strength (6s.—6s. 8d. per lb.) This dye is now imported mainly from Switzerland; small amounts have been obtained from America, and larger supplies are expected; isolated shipments have been received from France; and latterly over 6,000 piculs of German indigo (probably from old stocks accumulated at Dutch ports) have arrived in Japanese ships. Small shipments of British indigo, of very good quality, have arrived at frequent intervals, but there is need for greatly increased supplies. The leading position in regard to coal-tar dyes is held by America (Switzerland and Japan coming next), whose dye-wares are satisfactory as to quality but slow and uncertain in delivery, and, in certain lines, inadequate in amount.

The Swiss products are also satisfactory and insufficient in quantity The British coal-tar dyes have been well received, but the quantities available are hopelessly inadequate; in certain lines British prices are considerably higher than American. It is imperative that British manufacturers should take immediate advantage of the present shortage of German dyes, for German manufacturers are already beginning to recover their hold upon this market.

Exports.—The chief features of the export trade in 1919 were the enormous demand for oil-seeds and oils, and the persistent inquiry for egg products, particularly for liquid yolk; there has been much speculation in the latter. The demand for albumin also increased considerably, and the quality of this product has been much improved owing to the refusal of the United States to admit any dried egg product containing more than 0·001 per cent. of zinc oxide. The export trade in silk was very profitable, but it is noteworthy that Japan has easily outdistanced China in this business; exports from Yokohama rose from 14,837 to 217,181 bales during the last 50 years, whereas those from Shanghai increased only from 45,887 to 80,532 bales. The following are among the articles exported in 1919, the values being given in millions of taels:—

Commodity.	Value.	Commodity.	Value.
Antimony, regulus ..	0.54	Groundnuts, shell ..	0.52
Pig iron	8.17	" kernels ..	5.32
Iron ore	2.40	Indigo, liquid	0.86
Tin, slabs	8.43	Vegetable oils (including groundnut oil 13.94, and wood oil 7.96) ..	46.27
Beancake	44.17	Essential oils	1.17
Camphor	1.59	Pottery, earthenware ..	0.75
Coal	7.25	Sesamum seed	15.57
Egg, albumin and yolk ..	19.82	Skins and hides	22.19
Fibres, hemp, jute, ramie	4.22		

Suggestions are made for developing British trade in China, and valuable appendices are given dealing with finance, labour conditions, co-operative enterprises, and British trade with Hongkong, etc.

Report on the Commercial, Industrial, and Financial Situation in Japan, 1914 to 1919. *By* H. Thorne, *Commercial Secretary to H.M. Embassy, Tokyo. Pp.* 75. *London: H.M. Stationery Office.* 1920. [*Cmd.* 912. 9*d.*]

The geographical position of Japan during the war enabled her to escape from many of its harmful consequences, to take advantage of the great commercial and industrial possibilities offered, and to exchange her position as a debtor nation to one of the few creditor nations of the world. Unfortunately, many manufacturers, anxious to make large profits rapidly, placed inferior goods on denuded markets, a course of action which has had baneful consequences since the armistice. Further, the abundance of wealth led to the promotion of a disproportionate number of companies, paying 60, 70, and even 100 per cent., at the expense of provision for future development. These conditions have resulted in financial depression, but the dangers have been seen and will most probably be averted.

Natural Resources.—The natural wealth of Japan is not great, and most of her industries depend on foreign supplies of raw materials. There is an abundance of raw silk, camphor and sugar are supplied by Formosa, and copper by the main island. Although abundant, coal is expensive, and the question of future supplies is engaging attention. The rich deposits in Formosa are being worked, but the output from this source will not suffice to meet the ever-growing demand. Gold, tungsten, and graphite are found chiefly in Korea; sulphur is very widely distributed, but only the high-grade deposits are worked. The output of the chief minerals and metals for 1918 is given below in long tons, except where otherwise stated:—

Mineral Output of Japan in 1918.

Material.	Output. Tons.	Material.	Output. Tons.
Copper	88,729	Iron sulphide ore ..	1,525
Lead	10,492	Chromite ore ..	104
Tin	165	Manganese ore ..	821
Antimony ..	385	Sulphur	64,675
Zinc	22,497	Arsenic	14
Pig iron	176,521	Arsenic ores ..	12
Steel	18,048	Graphite	1,061
Molybdenum ..	1	Coal	27,580,954
	oz.		galls.
Silver	6,596,618	Petroleum	85,060,783

Labour.—In spite of great advances in cost, labour in Japan is considerably cheaper than labour in the west, but it is less efficient (the ratio is stated to be from 2:3 to 1:2); working hours are being reduced and labour-saving devices are little used. Hence it is open to doubt whether the actual cost of production of competitive goods is lower in Japan than in England, and, in any case, it is submitted that the difference in favour of Japan is not sufficient to warrant apprehension. The population of Japan proper was 56,851,300 at the end of 1918, and it is increasing at the rate of about 800,000 per annum.

Imports.—The imports in 1914 and 1919 were valued at 595,735,725 yen and 2,173,459,880 yen, respectively, those for the latter year including the following:—

Imports into Japan during 1919.

Commodity.		Amount.	Value. Yen.
Lead, ingot, slab	kin	59,705,900	10,896,800
Tin, ingot, slab	"	5,023,900	6,953,600
Nickel, ingot, slab	"	2,845,300	4,139,200
Leather	"	1,917,300	5,388,200
Coal-tar dyes	"	2,094,200	10,720,900
Paper pulp	"	68,175,900	10,687,200
Hides and skins	"	25,715,400	15,460,000
Sodium nitrate, crude	"	109,510,000	13,838,000
Sugar	piculs	4,548,000	58,183,600
Ammonium sulphate, crude ..	"	1,687,200	27,435,000
Oil cake	"	24,592,800	135,188,700
Coal	tons	699,700	18,588,200
Ores	"	—	20,902,700
Kerosene oil	galls.	37,359,100	21,675,600

kin = 1.32 lb. picul = 132.27 lb. yen = 2s. 0½d.

Over 50 per cent. of the imports consisted of raw materials (including foodstuffs) and manufactured goods represented only about 12 per cent. of the total.

Before the war Japan was practically dependent on Germany for dyestuff supplies, and the subsequent partial stoppage of German shipments caused serious inconvenience, the imports falling from about 6½ million kin in 1913 to 222,000 kin in 1917 and 357,616 kin in 1918 (36,061 kin in 1919). However, the Government established the Japan Dyestuffs Manufacturing Co., Ltd. (Nippon Senryo Seizo Kabushiki Kwaisha) to obviate this difficulty. In September, 1919, this company was selling the following dyestuffs:—Five sulphur colours, 11 direct, 5 basic, 6 acid, 2 acid mordants and 1 oxide. It is stated that within a few years Japan will be able to supply her own requirements in dystuffs, with the exception of special products, such as vat colours, and certain complex direct cotton colours. The production of coal tar is said to be sufficient for the purpose. During the past two years considerable quantities of American dyes have entered the country, but it is generally reported that they are not giving complete satisfaction. During 1918 the United States supplied 72·3 per cent. of the total import, and in 1919, 74·6 per cent. The importation of Swiss dyes shows signs of recovery. Now that an agency of the British Dyestuffs Corporation has been established in Japan, British dyes should be properly represented on this market, and the present is a most opportune time for their appearance in large quantities. A Bill has been introduced into the Diet providing for the increased protection of the local industry, and an *ad valorem* import duty of 33 per cent. is contemplated.

During the war Japan became self-supporting in regard to most of the heavy chemicals required for industrial use, and has become a competitor on foreign markets in many of them. Among the chemicals most extensively manufactured and exported are.—Potassium bichromate, chlorate, permanganate, carbonate, nitrate, sulphate and ferrocyanide; bleaching powder; acetic, nitric, hydrochloric and sulphuric acids sulphate of iron; copper sulphate; magnesium carbonate; sodium peroxide; barium salts; naphthalene, etc. Other chemicals manufactured, but not exported, are caustic soda (60 per cent.), glycerin, salicylic acid, yellow phosphorus, formaldehyde, aniline salts, acetate of lime, and sulphate of ammonia. The manufacture of carbolic acid is still in its infancy.

Importance is attached to the registering of trade marks in Japan, and it is pointed out that in cases where big or complicated businesses are handled, the best course is to act through established British firms in Japan if direct representation is not available, rather than through native houses.

Exports.—During the war Japan supplied the Allies with large quantities of copper, antimony, graphite, fish oils, starches, cotton waste, chemicals, etc.; and the following goods were exported in increased quantities: Sugar, paper, coal, iron and steel manufactures, porcelain, glassware, enamel ware, cement, matches, etc. Of the above articles it is thought that the trade in glassware and matches is most likely to be retained, particularly in India, Java, China, and South America.

The total exports in 1919 were valued at 2,098,872,617 yen (591,101,461 yen in 1914), and among the separate items were:—

Exports from Japan in 1919.

Material.	Weight. kin.	Value. yen.
Coal	2,000,700	37,723,600
Fish and whale oil ..	10,070,300	3,042,900
Sulphur	47,780,600	2,035,500
Camphor	2,031,300	7,883,900
Celluloid	1,000,000	2,216,000
Copper, ingots and slabs ..	32,406,300	19,647,200
Zinc, ingots and slabs ..	9,471,900	2,935,800
Pottery	—	22,629,800
Glass and manufactures of	—	19,680,700
Sugar, refined	109,500,600	21,627,300
Matches (gross)	41,550,600	32,968,300
Silk, raw	28,622,400	623,618,500

Report on the Trade of Australia for the Year 1919. *By* S. W. B. McGregor, *H.M. Senior Trade Commissioner in Australia. Pp.* 59. *H.M. Stationery Office*, 1920. [*Cmd.* 960. 6*d.*]

The heavy expenditure of public money for war purposes in Australia is now coming to an end, and though the financial position and conditions generally are such as to give cause for some anxiety as to the future, against these can be set the comparatively undeveloped state of the country, which leaves room for ample work for generations to come. The imports in 1913 and 1918–19 were valued at £79,749,653 and £86,116,434, respectively, the proportions furnished by the chief countries of origin being United Kingdom, 51·82 and 36·42; United States, 13·68 and 28·63; and Japan, 1·19 and 8·64 per cent. If the totals are based on the competitive imports, *i.e.*, excluding those not manufactured in the United Kingdom, the proportions become:—United Kingdom, 63·2 and 46·61; United States, 11·8 and 29·38; and Japan, 11·08 (1918–19 only) per cent.. The values of some of the chief imports in 1918–19, together with the percentage furnished by the United Kingdom in each case, were:—Ores and metals, £705,387 (42·9); earthenware, cement, china and glass, £1,467,886 (26·4); leather and manufactures of, £684,510 (29·0); indiarubber and manufactures of, £1,173,045 (25·4); ammunition and explosives, £732,300 (43·2); chemicals, £3,871,353 (39·5); paints and varnishes, £553,554 (33·6); oils, fats and waxes, £273,846 (6·5). British manufacturers are advised to improve their commercial organisation, taking great care in the choice of local agents and overseas representatives; it is alleged that they lack enterprise and are indifferent to the special needs of Australian trade. As local manufactures are increasing, fuller advantage should be taken of the Trade Commissioner Service, and it is suggested that the feeling of Australians towards British manufacturers and traders might be improved by propaganda, either national or carried out by trade associations, with the object of showing the dominant part played by the United Kingdom in the trade and commerce of the world in the past, and the similar position it may occupy in the future. Strenuous efforts are being made by various American organisations to capture Australian trade, but American methods have in many cases not given satisfaction, and, in addition, trade in this direction is being restricted by the adverse exchange. It is stated that Japan will probably lose the bulk of its trade with Australia as the trading methods employed and the quality of the goods supplied have continued to be unsatisfactory.

The value of the mineral output in 1918 was £26,155,649 (£25,590,839 in 1918), and included:—Gold, £5,408,157; silver and lead, £6,104,977; copper, £4,464,787; tin, £1,432,294; coal, £6,123,747; various, £2,621,687. The policy of treating all metallic ores within the Commonwealth so that the resultant metals can be marketed in the refined state, has been continued, and several new works have been established for this purpose. Industry has been much hindered by labour unrest.

As regards agricultural produce, the yield of cane sugar in 1917–18 was 327,589 tons (193,037 t. in 1916–17), but the beet-sugar industry has made little progress; only 14,487 t. of sugar-beet was produced in 1917–18.

The local production of manufactured goods in Australia continues to develop, and will probably have the effect of changing the character of the British goods imported rather than bringing about a decrease in their value. Under normal conditions there is every prospect of a gradually increasing value of imports into Australia from the United Kingdom. Although a number of British manufacturers is known to be seriously considering the establishment of branch factories in Australia, little has been done as yet. (*Cf.* J., 1919, 420 R; 1920, 12, 38, 116, 167, 202, 218 and 236 R.)

Report of the Government Chemist upon the Work of the Government Laboratory for the Year ended March 31, 1920. *With Appendices. Pp.* 18. *London: H.M. Stationery Office.* [*Cmd.* 881. 3*d.*]

Full of interesting matter, the Report deals with the chemical work done wholly, or in part, for 23 Government departments and other public bodies in Great Britain and Ireland.

Some 368,898 samples were examined during the year representing an increase of nearly 80,000 on the preceding year, and the principal increase was due to goods liable to customs duty such as wines, sugar, tea, and cocoa preparations.

The figures indicate a further revival in trade after the return to peace conditions as against last year, but the revival is masked somewhat by further large decreases in samples from the War Departments. Of beer, 25,489 samples were examined and 323 of materials used in brewing for duty charge, whilst 8,890 samples drawn from 7,938 fermenting vessels by local officers of Customs and Excise were examined as a check on assessment of beer duty. Sour beer, which was mostly destroyed later, furnished 770 samples, a considerable increase (81) on last year's figure. No evidence was obtained of dilution of beer.

Of so-called non-alcoholic beers, herb beers, etc., 212 samples were examined and all contained alcohol (from 2—5% of proof spirit, and one as much as 9·6%).

Of beer exported on drawback, 15,352 samples were analysed, compared with 8425 in the previous year, showing a return to pre-war conditions; but only 133 samples of imported beer were examined as compared with 10,000 samples for the year ended March 31, 1914. Very little foreign beer is imported at present.

Of 969 samples of beer and brewing materials tested for arsenic, five only were found to contain more than the limits laid down by the Royal Commission on Arsenical Poisoning, viz., one hundredth of a grain of arsenious oxide per pound of solids or per gallon of liquid. All the 282 samples of malt and sugar tested were satisfactory, and of 619 samples of beer and wort three only exceeded the limits for arsenic. Imported cider and perry furnished 44 samples, 20 of which were classed as Spirit Preparations, and all the seven home-produced samples "did not consist solely of fermented apple juice." Duty was remitted on seven ciders too sour to be saleable.

Of table waters, 20 samples of mineral and spa waters, 333 of cordials, syrups, fruit juices, and essences, and 102 of non-alcoholic wines were examined under the Finance Acts, 1916.

Of spirits, 955 samples of fermented wash, 19 of fusel oil, 29 of grog, 16 of illicitly distilled spirits, 1,359 of compounded spirits for export and 18,125 of spiritous preparations for export, 25,007 of imported spirits and spiritous preparations were examined; 864 samples of wood naphtha and mineral naphtha and 65 of petroleum ether and other denaturing substances, 32 samples of pure alcohol and 20 of specially denatured alcohol. The care taken in the control of duty-free spirits and the large volume of work entailed are indicated.

In the assessment of wine duties 143,544 samples were tested. The great bulk of the revenue from sugar is derived from refined sugar, but the imported goods, and goods for drawback or exportation containing sugar include such a great variety of articles containing, besides sugar, glucose, molasses, saccharin, etc., that standard rates of duty for such articles have been fixed wherever practicable, samples only being taken in case of doubt. Some 36,441 such samples were examined as compared with 23,777 last year.

Some hundreds of samples of glucose were also examined.

Saccharin carries a heavy duty, being about 500 times sweeter than sugar, and it has to be searched for in all preparations likely to contain it. Its manufacture in this country was resumed in 1917, and 253 samples were examined in the year under review.

Of tobacco, 10,234 samples for home consumption and 13,797 for drawback on export were examined; and many thousands of offal tobacco for manufacture of nicotine, sheep dips, etc.

Tea is examined at the port of entry by inspectors, and doubtful samples are sent to the laboratory; the quantity imported was 500,000,000 lb., as compared with 370,000,000 lb. in 1914, and 16,562 samples were examined, 40 per cent. being condemned on account of accidental foreign matter; coffee, cocoa, matches, etc. were also examined.

Hydrometers and other graduated vessels were tested, 2,591 such tests being made.

It is interesting to note that of the 1000 or more samples of milk and milk products examined for the Ministry of Agriculture and Fisheries none contained preservatives, and there was no evidence of the presence of foreign fat in any of the samples of imported butter. Substantial work was done for the War Department, 4,322 samples of all descriptions of food being examined.

Many interesting investigations were made, as for instance, that for potash production for the Board of Trade, the examination of road drainage for toxic constituents from tar for the Joint Committees of the Ministries of Fisheries and Transport, the extraction of radium of luminous dials, compass cards, etc., for the Ministry of Munitions, and the disposal of waste from the flax factories for the Office of Works, London.

A few interesting details are given of cases in which the Government Chemist acted as referee under the Sale of Food and Drugs Acts and Fertilisers and Feeding Stuffs Act.

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for September 9 and 16.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
British India ..	Metals, paints, dyes, paper, glass	338
"	Cement-making machinery ..	339
"	Earthenware, glassware	363
" ..	Iron, steel, metals	364
British W. Indies	Glass	345
"	Glass, china	376
Canada	Patent medicines	341
"	Glass, china, pottery	366
New Zealand ..	Linseed oil, matches	371
South Africa ..	Galvanised iron, fencing wire ..	374
" ..	Earthenware, crockery, china ..	375
Belgium ..	Spirits	348
"	Pig iron	377
Dantzig	Sanitary porcelain	349
Denmark ..	Paper	378
" ..	Soda ash, calcined Glauber's salt	379
" ..	Asbestos	380
France	Raw materials for the manufacture of perfumery	383
Germany ..	Oils for soap manufacture ..	384
Italy	Cellulose, caustic soda, sodium sulphide	386
Spain	Nitrates, sulphates, superphosphates	353
Switzerland ..	Pigments, varnish	354
Turkey	Paper, chemicals	388
United States ..	China, glass, pottery, drug sundries	391
Brazil	Cement	392
Mexico	Chemicals, white lead, paint ..	397

TARIFF. CUSTOMS. EXCISE.

United Kingdom.—The revised regulations governing the preferential rates of customs duties on goods consigned from and grown, produced, or manufactured in the British Empire are set out in the issue for September 9. Among the goods to be considered as manufactured articles are refined sugar, glucose, syrup, molasses, and saccharin.

Argentina.—The excise taxes on alcoholic beverages, alcohol, and matches have been amended.

Australia.—Recent customs decisions affect aluminium sheet for use in the manufacture of motor-car running boards, brass tubing $\frac{3}{16}$ in. and under in diameter, and clear ruby mica.

Austria.—Modifications of export restrictions affect certain kinds of paper, candles, and soap.

Bolivia.—A copy of the new tariff may be seen at the Department.

Brazil.—The import duties on certain kinds of colours, inks, varnishes, and cement have been reduced by 20 per cent. as from September 1.

Costa Rica.—Recent tariff modifications affect condensed milk, lard, perfumery, and certain kinds of glassware and earthenware.

Finland.—Export licences are no longer required for, *inter alia*, bark (with some exceptions), pig iron, asbestos, mica, tar water, and pitch oil.

The conditions affecting import and currency licences are given in the issue of September 9.

French Cameroons.—The customs *régime* of French Equatorial Africa is to apply to the French Cameroons.

Germany.—Certain maize products capable of being used as cattle foods may be imported without licence as from September 1.

Coconut fibres, agave, and similar fibres may only be imported only under licence.

The taxes on imported beer, wines, spirits, vinegar, acetic acid, ethers, and matches are set out in the issue for September 16.

Certain minerals and stones have been removed from the "Export Free List."

Italy.—Beta-naphthol, shoemaker's glue, and medicated olive oil may be exported without licence, but licences are required for galvanised, coppered, and tinned iron wire and plates.

Japan.—Mineral oils with a density exceeding 0·904 at 15° C., to be used directly as fuel, may be imported duty free.

The amended rates of import duty affect ivory nuts, alcoholic beverages, salt, olive oil, animal fats, vegetable tallow or wax, licorice, ipecacuanha root, cassia and cinnamon bark, cinchona bark, coca, jaborandi and patchouli leaves, gentian root, rhubarb, extract of nux vomica, ergot of rye, cloves, bromine, picric acid, salicylic and acetyl-salicylic acids, salicylate of soda, sodio-theobromine, hydrobromic acid, bromides, alcohol, antifebrin, aniline hydrochloride, coal-tar derivatives (with some exceptions), coal-tar dyes, artificial indigo, pitch, asphalt, asbestos, minerals, ores, platinum metals, and certain metal wastes.

Luxembourg.—Among the articles that may be exported without licence are alcoholic beverages, asbestos, tanning bark, cork, rosin, asphalt, cement, candles, polishes, wax, white lead, emery, graphite, lubricating oils, lithopone, incandescent mantles, mastic, red lead, ochre, plaster, sand, lime, pharmaceutical products, celluloid, cardboard, and coal tar.

Norway.—The import is prohibited of, *inter alia*, perfumes, perfumed soap, and chocolate.

Portugal.—The export restrictions have recently been modified. Export licences are required for lard, olive oil, sugar, charcoal, phosphorus matches, and certain hides and skins. Export surtaxes have been amended on turpentine, whale oil, oils and oilseeds, wood pulp, chicory root, resins, and "sucata de cupro-nicquel."

Lard, olive oil, margarine, and edible vegetable fats may be imported duty free as from September 6.

Rhodesia.—Recent customs decisions affect black Badminton dye, fat liquor, fustic and hematine crystals, novolineum and solignum (wood preservatives).

Spain.—The reduced rate of import duty on sugar is applicable until December 31.

Sweden.—Export prohibitions have been withdrawn from carbon bisulphide and certain hides and skins.

United States.—Recent customs decisions affect hydrogenated fish oils, crushed limestone, and ferrosilicon.

GOVERNMENT ORDERS AND NOTICES.

Prohibited Exports.—The Board of Trade (Licensing Section) has notified the removal of the following from the list of prohibited exports:—Linseed; ergot of rye, and the liquid extract of ergot; tea.

TRADE NOTES.

BRITISH.

The Gold Coast in 1918.—The total value of the imports into the Gold Coast during 1919 was £2,919,915 (£3,219,099 in 1917) and included:—Coal, 10,663 tons (£55,332); earthenware, £10,302; gunpowder, 54 t. (£8428); petroleum oil, 893,606 galls. (£74,048); salt, 6633 t. (£53,840); soap, 1950 t. (£88,691); perfumery, £24,658. The increases in value of the salt and soap imported were mainly due to enhanced prices. The United Kingdom supplied 73 per cent. of the value of the imports, and the United States 21 per cent. The total value of the exports was £2,641,927, and included:—Cocoa, 66,343 tons (£1,796,985); kola nuts, 5913 t. (£262,144); copra, 99 t. (£2722); auriferous by-products, 37,501 lb. (worth £22,316 in 1917); palm kernels, 8933 t. (£152,921); palm oil, 670,867 galls (£83,689); rubber, 621 t. (£57,006); specie (£146,305 in 1917). The United Kingdom took 47 per cent. (65 in 1917) of the imports, the United States 37, and France 3 per cent. The exports of palm kernels and oil showed large increases, partly owing to the fact that freight was not available for cocoa, so that the natives paid more attention to palm products, because these commanded higher prices and were privileged as regards shipping. For these reasons the production of cocoa fell by 27 per cent. The prohibition of the importation of rubber into the United Kingdom led to a decrease in the export of this article, and, though the United States took an increased amount, this did not compensate for the loss in the United Kingdom market. Cocoa, the chief product of the colony, suffered greatly because it was not placed on the priority list during the war, but it is now recovering, and the Gold Coast will soon recover its position as the greatest cocoa-producing country in the world. As regards the mineral wealth, in addition to gold mining, the large manganese deposits on the Dagwin extension concessions were worked throughout the year, and 30,292 tons was shipped.—(*Col. Rep.-Ann., No.* 1029. *March*, 1920.)

FOREIGN.

The Nitrate Situation.—Reports forwarded by H.M. Commercial Secretary at Santiago to the Department of Overseas Trade, and by H.M. Consul at Antofagasta, state that no large sales of nitrate have been made since the early part of this year. The total production for the first six months of 1920 was 26,158,367 quintals (quintal=101·44 lb.) or 1,184,600 long tons; exports, which were distributed about equally between England and the United States, amounted to 33,173,982 q. or 1,502,400 t.; and stocks at June 30 were calculated at about 970,000 t., of which 830,000 t. belonged to members of the Nitrate Association and the remainder chiefly to Americans and Germans. Production and exports for the past three years were as follows:—

	1917-18. Qtls.	1918-19. Qtls.	1919-20. Qtls.
Production..	64,773,489	50,707,926	42,551,779
Export ..	63,325,382	39,007,083	47,904,232

In pre-war days the total exports amounted to 45—50 million q. The sales to date made by the Association for delivery from July 1920 to April 1921, amount to 1,343,000 t., at an average price of 16s. 5d. per quintal. Although the demand for nitrate continues brisk, transport and labour difficulties are causing the Association to consider the limitation of further forward sales. Fuel has become very scarce. Coal is unobtainable from the United Kingdom and difficult to procure from the

States; Australian coal is not economical for use in *oficinas*, and cannot be depended upon; owing to continued strikes Chilean coal is not available, and it is also uneconomical; oil fuel is becoming increasingly scarce. The Commercial Secretary is informed that several British nitrate *oficinas* have one year's production awaiting rail transport. Owing to these difficulties, future production is not expected to exceed present output. The average cost on board is reported to be 12s. per quintal (maximum), and it appears that large profits are being and will be made. New factories are to be erected in the course of a year at Los Dones. The various national interests in the industry are approximately as follows: Chilean, 36%; British, 34%; German, 18%; Yugo-Slav, 10%; and American, 2%.

Trade of the United States in 1919.—The total value of the imports into the United States in 1919 was £780,800,000, and that of the exports £1,550,000. The distribution of the trade between the chief countries is given in the appended table in millions of pounds sterling (on the basis of \$5 to the £):—

	Imports from. £	Exports to £
United Kingdom	61·8	451·8
Canada	98·9	140·5
Australia	9·6	18·9
New Zealand	4·3	5.6
British India	28·0	13·5
British Africa	13·2	11·8
Argentina	39·8	30·7
Belgium	1·5	73·6
Brazil	46·7	22·6
Egypt	7·9	3·0
Straits Settlements	29·2	2·4
China	30·9	21·1
Cuba	83·7	53·4
France	24·8	191·9
Germany	2·1	18·3
Italy	11·8	87·3
Japan	82·0	72·9

Some details concerning the trade in chemicals and allied products are given below:—

	Imports. £	Exports £
Cement	0·014	1·5
Chemicals	13·9	23·7
Coal and coke	1·1	25·1
Colours, dyes, paint, varnish	0·93	8·5
Dyewoods, tanning bark, etc.	0·46	0·01
Earthenware, chinaware, etc.	1·4	0·6
Fertilisers	6·3	4·2
Glass	0·26	5·0
Gunpowder and explosives	1·3	2·3
Matches	0·25	0·12
Metals, unwrought	33·1	45·3
Oils, mineral	6·3	68·7
Oils, vegetable	24·6	19·7
Ores and concentrates	10·1	1·2
Perfumery, essential oils, etc.	2·4	1·9
Resins, gums and wax	7·0	4·2
Salt	0·065	0·28
Soaps, candles, etc.	0·083	4·6
Starch	0·049	3·1
Sulphur	0·44	1·3
Wood pulp	7·4	6 0

—(*U.S. Com. Rep., June* 24, 1920.)

The Cement Market in Spain.—Spanish manufacturers control the local cement market, as price is the chief factor and quality is of little account. During the war imports of cement from Belgium and England ceased, and the domestic cement industry was able to develop unhampered by competition. Cement is chiefly produced at Barcelona and Bilbao, and the leading Spanish company is the "Compañia General de Asfaltos y Portland 'Asland'," with a capital of 14 million pesetas (peseta=9½d.). This company is at present not working at more than 50 per cent. of the capacity of its three plants, but in 1919 it produced 86,134 metric tons of cement, or about 40 per cent. of the Spanish output. It is evident therefore that home demands can be supplied without recourse to importation.—(*U.S. Com. Rep., July* 21, 1920.)

Allotments of Formosan Camphor.—H.M. Consul at Tamsui reports that the allotments of camphor for the September quarter are:—United Kingdom, 900 piculs; U.S.A., 2475 piculs; France, 365 piculs (picul=132.3 lb.). It is believed that the Monopoly Bureau will in future cease to supply crude camphor to foreign refiners and will sell them fixed amounts of refined camphor through the Japan Refined Camphor Co. at 10 per cent. below market price.—(*Bd. of Trade J., Sept.* 2, 1920.)

REVIEW.

CHEMICAL FERTILISERS AND PARASITICIDES. *By* S. HOARE COLLINS. *Industrial Chemistry Series, edited by* DR. S. RIDEAL. *pp. xii.*+273. (*London: Ballière, Tindall and Cox.* 1920.) *Price* 10*s.* 6*d. net.*

This is a book which should take the place of many text books, and at the same time be read by the man who wants special information on matters not contained in the ordinary treatise. Mr. Collins has a great experience as an agricultural chemist and as a teacher, and his book will appeal to many for whom some of the treatises on artificial manures, their manufacture and uses, are of too scientific a character. To the agricultural student this book will be welcome, as it will give him a fresh aspect from which to regard the subject, and will bring to him a knowledge of industrial processes which yield by-products of value to the agriculturist and also offer him the most up-to-date information as to the progress science is making in bringing in atmospheric and other sources of fertilising elements of prime importance to the production of farm crops. Increased production is the order of the day, and one of the chief factors of increased production is the right use of fertilisers. The successful farmer has been described as the man who does the right thing at the right time, and, it may be added, who uses the right material, whether variety of crop, food, manure, labour, or implement, for the purpose for which it is best suited under the conditions which obtain on the particular farm. A century ago artificial manures were dubbed "stinking chemicals" by the same farming community which at an earlier date condemned turnips as "vegetables only fitted for a gentleman's garden," but knowledge has advanced far since then, and there are few, if any, farmers to-day who could do without these formerly despised adjuncts to their business.

Part I. of this volume deals briefly with the need for fertilisers and with the effects on plant growth of nitrogen, potash, and phosphates; Part II. with the sources of fertilisers and with some of the methods of dealing with the raw materials. On page 40 the statement of the composition of kainit is rightly stated, but on p. 168 the composition given may prove misleading. The chapter on fuel by-products will, it is hoped, have to be rewritten in a few years when our present methods of wasting coal have been abandoned. Section VI., dealing with the utilisation of atmospheric nitrogen, is of great interest and, taken with Part III., Section I., is a comprehensive review of existing methods. The provision of a cheap source of power is, of course, essential to the economic production of nitrates from the atmosphere, but there is no reason why in England, as in Germany and Denmark, the development of the industry should not be considerably expedited. A fair chemical knowledge is required to follow the author in his descriptions of the manufacture of the inorganic and organic nitrogenous fertilisers (the last heading including calcium cyanamide), but the ordinary reader can gain a good insight into these manufactures even if he has to skip the purely chemical paragraphs. There is no doubt that the student will gain a far better appreciation of the nature and use of fertilisers if he has an acquaintance with the methods of manufacture, and the writer does not remember reading a treatise on artificial manures where so much attention is paid to the manufacturing processes and the underlying principles. The chapter on valuation of fertilisers should be studied by every buyer of artificials who wishes to gain a knowledge of their values and uses from sources other than the statements of those whose business it is to sell these commodities, and the farmer can gain much useful information in a small space by reading Sections II. and III. of Part IV. The section devoted to insecticides and fungicides is necessarily somewhat sketchy, but enough information is given to inform the farmer or fruit grower as to the functions of the various preparations.

A very comprehensive reference bibliography is given at the end of each section so that any particular aspect of the subject can be thoroughly explored by the reader who requires wider and more detailed information. Mr. Collins' book bears the impress of a writer of wide experience and reading, of a knowledge not only of the requirements of the agriculturist but of how they can best be satisfied, and of the commercial means taken to satisfy them. It can thus be recommended to everyone connected with the industry of farming who wishes to stimulate increased production by the utilisation of every means which mechanical or chemical science can afford.

M. J. R. Dunstan.

OBITUARY.

ALFRED EVANS FLETCHER.

By the death of Alfred E. Fletcher in his 94th year, technology has lost an active worker who was closely associated over an exceptionally long period with the progress and control of chemical industries. Although it is now nearly 30 years since he retired from the position of Chief Inspector under the Alkali, etc. Works Regulation Act, his successful labours in this capacity contributed in a large measure both towards the development of the important work of this Department, and also towards its recognition and appreciation by chemical manufacturers.

Fletcher was trained originally as an engineer, but subsequently turned his attention towards chemistry, in which subject he received his training at University College, London. In 1863 he was appointed as assistant to the late Dr. Angus Smith, the first Chief Inspector under the Alkali Act, whom he subsequently succeeded in 1884. His official duties brought before him the need for improved methods of analytical control, and it was in this connexion that he devised his well-known aspirator for the rapid extraction and analysis of flue gases and his anemometer, both of which instruments have proved of outstanding value and application. Among other scientific work he was closely associated with the Scottish Office in the administration of the Rivers Pollution Act, and took an active part in the earliest attempts to mitigate atmospheric pollution from coal smoke.

Despite his advanced years Fletcher retained much interest in the progress of science and technology after his retirement, and remained associated with this Society, of which he was an original member, until a few years ago.

PUBLICATIONS RECEIVED.

A Treatise on Chemistry. *By the* Right Hon. Sir H. E. Roscoe *and* C. Schorlemmer. Vol. I.—The Non-Metallic Elements. *Fifth edition, completely revised by* Dr. J. C. Cain, *with* 226 *illustrations. Pp.* 968. (*London: Macmillan and Co., Ltd.* 1920.) *Price* 30*s*.

The Manufacture of Sugar from the Cane and Beet. *By* T. H. P. Heriot. *Monographs on Industrial Chemistry, edited by* Sir E. Thorpe. *Pp.* 426. (*London: Longmans, Green and Co.* 1920.) *Price* 24*s*.

Margarine. *By* W. Clayton. *Monographs on Industrial Chemistry, edited by* Sir E. Thorpe. *Pp.* 187. (*London: Longmans, Green and Co.* 1920.) *Price* 14*s*.

The Chemical Analysis of Steel-works' Materials. *By* F. Ibbotson. *Pp.* 296. (*London: Longmans, Green and Co.* 1920.) *Price* 21*s*.

Organic Chemistry. *By* Dr. A. Killen Macbeth. *Pp.* 235. (*London: Longmans, Green and Co.* 1920.) *Price* 6*s*. 6*d*.

Catalysis. *By* E. Jobling. *Text-books of Chemical Research and Engineering, edited by* W. P. Dreaper. *Pp.* vii+144. (*London: J. and A. Churchill.* 1920.) *Price* 7*s*. 6*d*.

Ceramic Industries Pocket Book. *By* A. B. Searle. *Pp.* 267. (*London: Sir Isaac Pitman and Sons, Ltd.* 1920.) *Price* 8*s*. 6*d*.

Modern Explosives. *By* S. I. Levy. *Pp.* 109. (*London: Sir Isaac Pitman and Sons, Ltd.* 1920.) *Price* 3*s*.

Report of the Committee of the Privy Council for Scientific and Industrial Research. 1919–20. *Pp.* 120. (*London: H.M. Stationery Office.* 1920.) [*Cmd.* 905.] *Price* 1*s*.

Special Reports on the Mineral Resources of Great Britain. Vol. XVI. Refractory Materials, Etc. Petrography and Chemistry. *By* H. H. Thomas, A. F. Hallimond, and E. G. Bradley. *Memoirs of the Geological Survey.* (*London: H. M. Stationery Office.* 1920.) *Price* 5*s*.

Experimental Researches and Reports. *Published by the Department of Glass Technology, the University, Sheffield.* Vol. II. 1918–19.

Report on Compulsory Adoption of the Metric System in the United Kingdom. *By the* Metric Committee of the Conjoint Board of Scientific Studies. *Price* 1*s*.

Reading List on Molasses. *Compiled by* Clarence J. West. *Bibliographic Series. No.* 5. (*Cambridge, Mass.: Arthur D. Little, Inc.* 1920.)

Monographias do Servico Geologico e Mineralogico do Brasil. *Vol. I.* 1913. *Vol. II.* 1919.

Boletim do Ministerio da Agricultura, Industria e Commercio do Brasil. *Year VII., January—April,* 1918; *January—June,* 1919. (*Rio de Janeiro: Servico de Informacoes.*)

The Department of Industrial and Scientific Research has published Vol. I. of Von Rohr's "Theory of Optical Instruments," translated by R. Kanthack. (Price £2 5s.) This and other publications of the Department are obtainable at H.M. Stationery Office, Imperial House, Kingsway, London, W.C. 2; 28, Abingdon Street, S.W. 1; 37, Peter Street, Manchester; 1, St. Andrew's Crescent, Cardiff; 23, Forth Street, Edinburgh; and from E. Ponsonby, Ltd., 116, Grafton Street, Dublin.

THE ROLE OF ANTIMONY IN TROPICAL MEDICINE.

R. G. FARGHER.

It is perhaps not generally realised that of the 14 million square miles of territory which constitute the British Empire something like one half lies within the tropics. In these tropical areas, often densely populated with peoples of primitive habits and with little regard for hygiene, it is not surprising that disease should be rife. Though much is being done to introduce preventive and sanitary measures, progress in this direction, which must be coincident with the education and co-operation of the peoples themselves, is of necessity slow, and for many years to come the methods of dealing with tropical diseases will probably be curative rather than preventive. Special interest attaches, therefore, to studies in chemotherapy such as that presented by the use of antimony derivatives in certain diseases of parasitic origin.

The suggestion that antimony might be employed usefully in medicine has generally been attributed to the hypothetical Basil Valentine. Certain it is that the author of "Triumphwagen des Antimonii" was the advocate of treatment as heroic as any that modern medicine has to offer, so the inference that he recommended antimony for internal use requires but little justification. The attitude of his contemporaries was distinctly antagonistic, and so strong was the opinion that the poisonous properties of the metalloid were incompatible with its internal use that it is recorded that all graduates in medicine at Heidelberg were required to register an oath never to employ it. Nevertheless, under the influence of his teaching, it came to be looked upon as a universal panacea, and towards the end of the 17th century more than a hundred preparations of the metal were in more or less common use.

Tartar emetic, examined first by the Dutch physician Mynsicht and afterwards more accurately by Glauber, had already been employed in medicine by the ingenious medium of drinking wine which had been allowed to stand in an antimony goblet. Its use in the treatment of trypanosomiasis was first proposed by Nicolle and Mesnil, but to the English workers, Plimmer and Thomson, attaches the credit of the earliest work. Employing potassium and sodium antimonyl tartrates they were impressed by the wonderful sterilising effect of subcutaneous injections in experimental rats heavily infected with trypanosomes. Their results seemed to Manson to be of sufficient promise to warrant trial on human subjects, but the extreme local reaction precluded their effective employment. The check was of short duration, as the discovery of the intravenous route, first announced in 1909 by Broden and Rodhain, and claimed independently by Leboeuf, quickly led, in the hands of Martin and Barré, to the basis of the present most effective mode of combating sleeping sickness—the combined use of atoxyl intramuscularly and tartar emetic intravenously. The exaggerated claims made for this combination are to be regretted, as experience has shown that though success may be anticipated when treatment is commenced in the early or trypanosome fever stage of the disease, it is more rarely attained in the later or sleeping sickness stage, a conclusion of particular importance when it is remembered that the early symptoms are less pronounced in the coloured than in the white races, and that it is to the former that the disease presents so terrible a menace.

In other tropical diseases greater success has attended the presentation of antimony. Thus, in external and internal leishmaniasis the results of numerous observers, commencing with Machado and Vianna in Brazil, leave little doubt as to its specificity. In bilharziasis, only too prevalent amongst the Egyptian fellaheen, specific action has been proved, and Christopherson concludes that as the shell of the bilharzia ovum is permeable to tartar emetic, sterilisation resulting, the action is also prophylactic. Good results have been obtained in the treament of granuloma, filariasis, guinea worm, papilloma, yaws, relapsing fever and cerebro-spinal fever. Rogers has claimed the utility of tartar emetic in malaria, but he is practically unsupported by other workers, and the conclusion may be drawn, with Greig, that in this case antimony is only appreciably efficacious when toxic doses are presented, the drug acting rather as a general protoplasmic poison than as a specific for the malarial parasite.

The foregoing brief summary will suffice to indicate the therapeutic importance antimony has assumed during the past decade. The number of its derivatives which has reached the stage of clinical trial, however, is extremely limited, and is restricted to the variation of tartar emetic by the replacement of potassium by sodium, lithium, or ammonium; Martindale's preparation of antimonious oxide; Ranken's finely-divided metallic antimony; and one or two relatively unimportant "colloidal" preparations.

The reason is not far to seek. Until recently, the simple organic compounds of antimony which, from analogy with arsenic, might have attracted attention, were only obtainable by cumbrous methods and, even when prepared, were not, chemically speaking, inviting. Thus, the sodium method is complicated by the greater tendency of antimony, as compared with arsenic, to pass from the tervalent to the quinquivalent condition, and is of limited application. It consists essentially in the interaction of an aromatic halogen compound with antimony trichloride in presence of sodium. The Grignard reaction, in essence the combination of an aryl magnesium halide with an antimony trihalide, gives rise again mainly to the triarylstibine or its dihalogen derivatives, and the conversion of these into the presumably more promising monoarylstibinic acid derivatives involves several stages and problematical yields.

The extension of the Bart reaction to the preparation of aromatic antimonials is, at all events in laboratory practice, of greater promise, as diazotised amines readily couple with sodium antimonite in alkaline solution, with or without the presence of a catalyst such as copper powder, with replacement of the diazonium group by the stibinic acid residue. Covered by several patents by the German firm of von Heyden, there appears to be some claim for independent discovery by English workers. A number of derivatives of phenylstibinic acid prepared in this way has been tried experimentally in trypanosome-infected animals by Lange, Uhlenhuth, Mulger, and others, the results indicating that the conclusions arrived at from the study of the organic arsenicals as to the influence of substituents in the benzene nucleus cannot be applied to the antimony derivatives, which therefore present a new problem in chemotherapy. This view has been supported, for example, by the comparative inefficacy of the antimony analogues of atoxyl and salvarsan, and naturally, though no doubt illogically, the more precarious tenure of antimony in the organic nucleus has been suggested as the cause. Little evidence is available as to the relative stability of the two groups, but the assumption of lesser stability probably implies that the same detoxicating effect cannot be expected from the organic combination of antimony as has been achieved in the case of arsenic. Of the componnds so far examined, sodium *p*-acetylaminophenylstibinate (stibacetin) appears the most promising, and of it alone are clinical results available, Caronia stating that it is efficacious in the form of leishmaniasis encountered in the Mediterranean area, whilst results of English workers indicate a possible value in trypanosomiasis.

In general, therefore, study of the literature of the aromatic antimonials reveals many difficulties in the way of their successful employment in medicine. With few exceptions non-crystalline, yielding non-crystalline metallic salts of dubious composition, their preparation and purification present problems as difficult as any encountered in the more complex arsenicals, and though antimony, as at present administered "in large doses over prolonged periods produces fatty changes in the liver and kidneys which may seriously damage the resisting powers of the patient and even cause death" (Low), supersession by the true organic antimonials will necessitate the demonstration of more considerable advantages than have yet been claimed.

Nevertheless, it would be idle to suggest that their further examination may not yield results of importance, and though in expert hands the use of tartar emetic is now happily free from many of the difficulties and dangers which confronted earlier workers, more favourable means of presenting antimony undoubtedly remain one of the pressing problems of tropical medicine. The solution is not merely of humanitarian and scientific interest; from a purely utilitarian standpoint it possesses a very real economic importance.

THE COAL FIRE.

With the object of diminishing the smoke nuisance in Manchester, a committee of the corporation, in a spirit of far-sighted and eminently practical inquiry which might well commend itself to other municipalities, appointed some few years ago an "air pollution advisory board" to inquire into the efficiency of domestic fire-places. The executive was composed of factory managers, local men of science, city councillors, and others. Under their auspices and that of the Fuel Research Board, Dr. Margaret Fishenden, late Beyer Fellow of the University of Manchester, was appointed to undertake the research which has been in part financed by the Department of Scientific and Industrial Research. The results are embodied in a very full report on "The Coal Fire," which has been published for the Fuel Research Board by H.M. Stationery Office.[1] In view of the facts that of the 190 million tons of coal which are consumed in the United Kingdom annually rather more than 40 millions, or about one-fifth, is burnt on the domestic hearth,[2] and that the domestic chimney is responsible for much the largest proportion of soot of a peculiarly tarry and adhesive nature, any improvement which would lead either to the more economic use of coal by increasing its heating efficiency, or to diminished emission of smoke, would be of untold advantage to the community. The report is therefore of peculiar value, as up to the present no very trustworthy information on the subject has been forthcoming.

The method employed has been substantially that used in the Leeds tests in the investigation of gas fires.[3]

The radiant efficiency was estimated by the percentage of B.Th.U. in the fuel used in radiation in the following way:—

An imaginary hemisphere, of which the radiating surface is the centre, is mapped into areas by lines of latitude and longitude 20° apart, so that in all there are 81 areas, which naturally vary in dimensions, being largest at the equator and decreasing towards the poles The amount of radiation falling on the central area is estimated by means of a radiometer, the total amount calculated in B.Th.U. being determined from the lighting of the fire until its extinction. The radiation falling on the other surfaces of the hemisphere was determined by comparing the readings of a thermopile placed in the centre of each area and adjusted on a pivoted metal "line of latitude." It was found unnecessary to go through the whole series in each experiment, as "the distribution factor," as it is termed, varies very little for the same grate. This factor is the sum of the relative values of the thermopile readings corrected for the different areas, taking the central area as unity, and was found to be 32·5 in the first grate investigated. The "radiant efficiency" for this grate is given by the expression:—

$$\frac{R \times 32{\cdot}5}{C} \times 100.$$

in which R is the total heat absorbed by the radiometer from start to finish expressed in B.Th.U., and C is the calorific value of the fuel in B.Th.U. Thus, the expression represents the percentage of B.Th.U. utilised in radiation.

A variety of grates was examined in this way with varying rate of air-current regulated by a damper, and with coal of different qualities and in different states of aggregation, patent fuel preparations, anthracite, coke carbonised at high and low temperatures, and briquettes.

In addition to these determinations, measurements were made of heat absorbed by the air passing up the chimney from different kinds of fuel, and of the effect of restricting the draught. The heating of the air of the room under different conditions of draught was also estimated. Without discussing these observations in detail we may give briefly the author's summary.

There was little alteration in the radiant efficiency of coal; it varied from 19·5 to 24 per cent., burnt in different types of grate, which showed no advantage in favour of the modern grate (crushed coal—slack—lowered the efficiency from 24 to 20 per cent.), nor was the radiant efficiency affected by the rate of combustion. With other kinds of fuel, however, a notable increase was observed, anthracite giving 27, coke 28·5, the low-temperature coke 34 and 31, as compared with coal at 24. Briquettes, on the other hand, gave 19 per cent. efficiency. Although the total radiation showed a comparatively small range of variation, the design of the grate affected its distribution, a vertical radiating surface having an advantage for the occupant over a horizontal one. Subject to considerable variation, the average value of the air flow was 19·000 cb. ft. per hour, the temperature of the flue at the ceiling level being 105° F., as compared with 53° F. for that of the entrant air.

The author estimates that in the case of a coal fire burning with a full draught giving 22 per cent. radiation, about 52 per cent. of the heat of combustion is lost in passing up the flue, so that the heat absorbed by the brickwork would not amount to more than 20 per cent. For an outer flue this is mainly wasted. With restricted draught, on the other hand, the flue loss could be reduced to about 13 per cent. The difference of 39 per cent. is ascribed by the author to heat dissipated by conduction through the flue walls owing to the lowered rate of air flow. The importance of building flues on inner walls becomes obvious, as well as the advantage of restricting the draught, which thereby diminishes the flow of cold

[1] The Coal Fire. A Research, by M. W. Fishenden, D.Sc. London, H.M. Stationery Office, 1920. Price, 4s. net.
[2] Journal of the Royal Society of Arts, 1917, p. 136.
[3] Reports of the Gas Heating Research Committee of the Leeds University, 1909 and 1910.

air through the room and lowers the rate of combustion. The author also draws attention to the radical importance of a grate being as little recessed as possible, so that no obstacle should screen off the radiation. In conclusion, Dr. Fishenden refers to the relative cost of coal, gas, and electricity. Taking the heating efficiency of coal (including heating of air, walls, and brickwork) as at least 30 per cent. the modern gas fire at 60 per cent. and the electric heater at 100 per cent., and assuming coal to cost 45s. per ton, gas 4s. 6d. per 1000 cb. ft., and electric power at 1d. per unit, the cost of a coal fire for continuous heating is only about one-third that of a good gas fire, and one-fifth that of an electric fire of equal heating capacity.

CANADIAN OPPORTUNITIES IN INDUSTRIAL CHEMISTRY.

In addressing the third Annual Convention of Canadian Chemists on the above subject, Mr. S. J. Cook, chemist-in-charge of the Chemical and Mining Division, Dominion Bureau of Statistics, instanced two general methods of ascertaining where practical industrial opportunities exist, viz., by studying lists of imports, and by examination of chemical plant with a view to determining where economies could be effected. In connexion with the former he gave the following list of the more important chemical imports into Canada during the twelve months ended March 31, 1920:—

	Value.
Acids	\$1,054,345
Drugs, medicinal and pharmaceutical preparations	4,325,160
Dyeing and tanning materials	5,626,110
Explosives	556,836
Cellulose products	2,489,189
Fertilisers	1,200,233
Paints, pigments and varnishes	4,121,681
Soaps, perfumes and cosmetics	2,634,118
Inorganic chemicals	6,666,785
All other drugs, dyes and chemicals	6,883,926
Total	\$35,558,383

Dealing with more specific problems, Mr. Cook referred to the ineconomy occurring at cyanamide plants, where the oxygen isolated from the air is not utilised, and then to the great loss of sulphur, amounting now to over 300,000 tons yearly, which is allowed to escape in the roasting of the nickel-copper ore in the Sudbury district. During the period 1915–19 inclusive, Canada imported sulphur to the value of \$6,349,467, and sulphuric acid worth \$353,656. Freight rates for transport of sulphur dioxide in tank cars from Sudbury are prohibitive, but it is worth considering whether the liquefied gas could not be transported by a pipeline to the lake shore and there used in the sulphite-pulp plants, or made into acid for shipment in tank steamers. A million tons of pulp wood will yield over a million tons of mechanical pulp, but only half that quantity of sulphite pulp. Analyses of sulphite liquors from Canadian mills show that they contain as high a percentage of sugar as those produced in Europe. They should yield at least 1 per cent. of alcohol by volume, but they are still being run into the rivers and streams.

In the history of the American Chemical Society only three papers have been contributed on Cellulose. Canada has a Forests Products Laboratory, but no chemists are employed. No attempt has been made in Canada to manufacture artificial silk from wood pulp. The wheat straw of the prairies is regularly burnt; some day it will be used for paper manufacture at Saskatchewan. Canada is making progress in the field of hydro-electric development; some 12 per cent. of the available water-power has been developed, but the potentialities remain enormous.

The four stages of a country's development have been specified as follows:—(1) Capital must be imported, (2) raw materials are exported, (3) finished products are exported, (4) capital is exported for developing new countries. Canada is hovering between (2) and (3), and the next advance must be made in the direction of diminishing the exportation of materials in the raw state. To effect this the training of Canadian chemists must be made more intensive, and all branches of the industry must co-operate in a whole-hearted manner.

NEWS FROM THE SECTIONS.

MANCHESTER.

The 1920–21 session was opened on October 1 by a lecture on "The Structure of the Molecule in Crystalline Solids," by Prof. W. L. Bragg, of Manchester University. The chairman, Mr. John Allan, presided, and over 200 members attended.

It has become more and more difficult to define the dividing line between physics and chemistry as the extent of our knowledge has increased. Both sciences have a common goal, for if we can arrive at the structure of the individual atoms we can explain their physical and chemical properties, and it is in the advance towards this end that the two sciences converge.

The physical conception of the atom is that of a number of negatively charged electrons grouped around an excessively small positively charged nucleus, the number of electrons being such that the positive and negative charges neutralise each other. The number of the electrons is found to increase steadily in passing from one element to the next in the series of known elements. Hydrogen has one electron, helium two, lithium three, and so on, the most complex element, uranium, having ninety-two electrons around its nucleus. Certain physical properties show a regular progression with the number of the electrons, and have led to the idea of the "atomic number" as a fundamental constant, a number which expresses the position of the element in the series. The concept of atomic number conjoined with the periodic nature of the chemical properties of the elements leads to the inference that the electrons are arranged in a series of spherical shells around the nucleus. The end of each period marks the completion of a shell, the next electron added in passing to the first element of a new period marks the commencement of a new shell. It is the outermost incomplete shell which is believed to determine the chemical properties of the elements; those which have corresponding numbers of electrons in their outer shells have similar chemical properties, and occur in the same vertical column in the periodic table. Those atoms which have complete outer shells possess great stability and have no tendency to combine with other atoms; they form the group of elements known as the inert gases. The chemical affinities of other elements represent the tendency of the outer shells to revert to a more stable form.

In this attempt to realise greater stability, the atoms group themselves together into the molecules of a chemical compound. By a study of crystalline structure we can examine the manner in which this is done in the case of solid bodies. The structures of a number of the simpler crystalline forms have been determined, and the arrangement and the distances apart of the atoms in the molecule have been deduced. These relations throw some light on the nature of the inter-atomic forces. Two classes of chemical combinations, already indicated in many other ways, are clearly distinguished. In the first class the atoms take up a more stable configuration by parting with, or taking up, electrons until their outer shells have the same number of electrons as the inert gases. In doing this they necessarily acquire a positive or negative charge; they become "ions," and the solid body is held together by the attraction of the oppositely charged ions. In other cases an atom acquires the requisite number of electrons for stability by holding a certain number of electrons in common with another atom, and the forces which now act as a link are of the same nature as those which bind the individual electrons to either atom. The crystalline structures reveal the existence of these two types of atomic linking. In the first class of compounds the forces holding the atoms together can be calculated in terms of the charges on the ions and their distances apart, and these forces are in numerical agreement with the known chemical energy of combination. The forces which come into play when atoms share electrons cannot be calculated so simply; it is, however, hoped that from the chemical energy we may be able to calculate the forces holding the electrons of the atom in place, and so arrive at a clearer conception of the atomic structure.

BRISTOL AND SOUTH WALES.

The third session of this Section was opened on October 7 at the University, Bristol, Mr. E. Walls, the chairman, presiding. Prof. A. M. Tyndall gave an address on "The Chemical Elements: Fresh Light on an Old Problem," in which he treated mainly of the work of Thomson, Rutherford, Aston, and others, on the structure of matter.

MEETINGS OF OTHER SOCIETIES.

THE IRON AND STEEL INSTITUTE.

The Autumn Meeting of the Iron and Steel Institute was held in Cardiff on September 21—24. A large number of papers had been submitted for this meeting, but only six were read. The first paper, by Mr. Walter Dixon, described the development of the electrical equipment at the works of the Ebbw Vale Steel, Iron, and Coal Co., Ltd. This installation represents the development of the electrical industry in its relation to the iron, steel, and coal trades during the last twenty years. The paper describes the power stations, the methods of distribution and transmission, and the uses of electricity in the works. The members of the Institute had, a day or two later, an opportunity of visiting the works and inspecting the installation.

A paper by Dr. W. Rosenhain and Mr. D. Hanson described a number of cases of failure of mild steel in which fracture had taken place by separation of the ferrite crystals from one another, and not, as is more usual, by rupture of the crystals themselves. They pointed out a number of features common to all these cases, notably that they had all occurred when the metal was subjected to "internal stress" at a slightly elevated temperature. They consider that these cases are similar to those which are well known in non-ferrous alloys, especially alpha-brass, where the phenomenon is known as "season cracking." They pointed out the danger which might arise in the case of such articles as steam boilers, where the necessary conditions for this type of failure might occur. A paper by Mr. and Mrs. D. Hanson described an investigation into the constitution of the alloys of iron and nickel. The authors had confined themselves to the study of the changes which take place in the solid state in these alloys, and had given special attention to (1) the effect of nickel on the critical points of iron, and (2) the verification of Osmond's hypothesis of the nickel-iron alloys. This hypothesis postulated the existence of a stable reversible equilibrium which was only obtained under certain favourable conditions of cooling through the critical temperature range; with the rates of cooling ordinarily obtained the alloys remained in a meta-stable state. By adopting special precautions the authors were able to verify Osmond's hypothesis, and to prove the reversibility of the transformation. They have also determined the equilibrium diagram. Messrs. A. Hutchinson and E. Bury described the rough cleaning of blast-furnace gas at Skinningrove by the Lodge electrostatic process, which, apparently, differs but very slightly from the Cottrell process. The plant, which has only been working for about four months, shows every sign of being quite successful, though the cost compared with other methods cannot yet be finally indicated. A reduction of the dust content from 5 or 6 grams per cubic metre to 0·8 to 1·1 grams has been obtained with comparatively small loss of the original sensible heat, and with a low expenditure of power. The authors predict that the process will prove of great commercial value, not only for the purpose indicated, but for many chemical processes. It is of interest to notice that this phenomenon, which was but a short time ago considered as a matter of purely scientific interest, is now finding extended application (*cf.* J., 1918, 389 R). A paper by Mr. W. W. Hollings dealt with the variations in the heat supplied to the blast furnace, and their effects on the fuel consumption. As a result of a theoretical discussion of the factors concerned, the author concluded that for countries with a low average absolute moisture, such as England, it does not pay to instal dry-blast; that the crushing of the materials of the charge to a uniform size may be expected to result in a considerable economy of the fuel required per ton of pig iron, and that the process of blowing with oxygen-enriched air is not likely to result in any appreciable saving for a small percentage increase in the oxygen content. A paper by Mr. C. G. Carlisle described the manufacture and quality of "electric steel."

During the four days that the Institute was present in Cardiff a number of works and objects of interest in the district was inspected. Special mention may be made of the Margam Works of Messrs. Baldwins, Ltd., at Port Talbot, where the visitors were shown one of the most complete and modern equipments, including blast furnaces, coke ovens, steel furnaces and rolling mills.

PERSONALIA.

Dr. J. G. Gray has been appointed to the new Cargill chair of applied physics in the University of Glasgow.

Prof. A. B. Macallum, professor of biochemistry in the University of Toronto, has been elected to the new chair of biochemistry in the McGill University, Montreal.

Mr. L. G. Killby has been appointed secretary to the Empire Cotton Growing Committee. Mr. Killby took First-class Honours in Chemistry at Oxford University, served in France as a chemist in the field, and is now superintendent of the department of technology in the City and Guilds of London Institute.

Dr. J. Newton Friend has been appointed head of the chemistry department of the Municipal Technical School, Birmingham, in succession to Dr. T. Slater Price.

Dr. E. K. Rideal, who has been "visiting" professor of chemistry in the University of Illinois during the past year, has been elected to a fellowship at Trinity Hall, Cambridge.

Mr. T. D. Owen, a leading Welsh metallurgist, has given £10,000 to the University College of North Wales for the establishment of a chair of electrical engineering and hydro-electrics.

The sum of £2000 has been given by Mr. W. J. Matheson, of New York, towards the foundation of a bursary or bursaries for students taking Honours in chemistry at United College, St. Andrews.

The chair of aeronautical science at the R.A.F. Cadet College, Cranwell, has been filled by the appointment of Dr. O. S. Sinnatt, lecturer in mechanical engineering at King's College, London.

Mr. John Gray has resigned the vice-chairmanship of Lever Brothers, Ltd., and assumed the chairmanship of the two associated companies, William Gossage and Sons, Ltd., and John Knight, Ltd. The chairman and directors of the first-named company entertained Mr. and Mrs. Gray at dinner on September 23, and presented Mr. Gray with a gift of silver in recognition of his services.

Prof. F. Knoop, of Freiburg, has been elected to the chair of physiological chemistry in the University of Leipzig, and Dr. H. Matthes to the ordinary professorship of pharmacy in the University of Königsberg. Dr. F. Ehrlich and Dr. J. Meyer have been appointed ordinary professors of biochemistry and chemistry, respectively, at the University of Breslau, and Drs. E. Ebler and K. Mannich ordinary professors of inorganic and analytical, and pharmaceutical chemistry, respectively, at Frankfort University.

Dr. H. N. Morse, professor of inorganic and analytical chemistry at John Hopkins University, U.S.A., died recently in his 72nd year.

Prof. Italo Giglioli, professor of agricultural chemistry in the University of Pisa, and formerly chief of the Bureau of Agricultural Intelligence of the International Institute of Agriculture, Rome, died on October 1.

The death is announced of F. P. E. de Lalande, whose name is connected with the development of the technical use of hydrosulphites, and who is stated to have been the first to prepare purpurin by the oxidation of alizarin with manganese dioxide and sulphuric acid.

We record with regret the death at New York of Mr. R. W. Moore on July 31 at the age of 58. Mr. Moore joined this Society in 1899, and from 1898 to 1910 was head chemist to the United States' Customs Service, after which he was engaged in industrial practice.

Mr. D. H. Nagel, who died on September 27 at the age of 57, was trained at Aberdeen University, and after serving as assistant to Prof. H. B. Dixon and Sir John Conroy at Manchester, proceeded to Oxford, where he devoted himself to the teaching of chemistry and to administrative work. As head of the laboratory shared by Trinity and Balliol Colleges for nearly 20 years, he was responsible for the training of a large number of Oxford students, mainly in physical chemistry, and his wide experience of the natural sciences joined with a tactful and sympathetic temperament made him an invaluable member and chairman of the Board of Faculty of Natural Science and of many other academic bodies with which he was associated.

NEWS AND NOTES.

UNITED STATES.

Rubber from Candleweed.—A plant in Arizona is producing a ton of crude rubber per day from the *ocotillo*, or candleweed, which grows wild in great abundance in that part of the country. One ton of the weed yields 200 lb. of gum and 90 lb. of a marketable tarry substance. The gum is said to lend itself well to vulcanisation and to be suited for the various uses to which rubber is put.

Selenium Oxychloride.—The Committee of the National Research Council interested in finding commercial uses for selenium and tellurium has reported that Prof. V. Lenher, of the University of Wisconsin, has found selium oxychloride to be an excellent solvent for organic substances. At present more than twenty research workers are investigating the possibility of large-scalo manufacture and studying its physical and chemical properties.

Evaporation Losses of Crude Petroleum. — The Bureau of Mines reports that the evaporation of crude oil during the few days when it is stored at or near the wells before being taken by the pipe-line causes an aggregate loss per year of about 122,100,000 gallons of gasoline in the American mid-continental field alone This represents about 3 per cent. of the total gasoline production in the United States from all fields and from all sources, and no doubt constitutes one of the largest single losses to which the oil is subjected.

Denatured Alcohol.—Hitherto the so-called No. 1 formula in which wood alcohol is used has been the favoured one for denaturing ethyl alcohol. At the present time there is an unusual demand for formaldehyde for use in treating grain for smut, and the diversion of large quantities of wood alcohol to the manufacture of formaldehyde has led to the suspension of the old denaturing formula. The formula which will probably be favoured in the immediate future provides for the use of benzol, nitrobenzene, and steam-distilled pine oil. The Treasury Department has recently published Regulation No. 61, in which various approved formulæ are given.

Evaporation Research Laboratory.—The University of Michigan has instituted for the investigation of evaporation a laboratory equipped with vertical, horizontal, semi-film evaporators, and miscellaneous equipment. The work to be conducted falls into two classes, the first being purely theoretical investigations into the principles of evaporator design, and the second the solution of concrete problems, such as the development of a particular process or the evaporation of particular solutions. As an example of the latter may be mentioned the production of high-grade table salt from dilute brine carrying larger amounts of calcium and magnesium chloride than is considered practical in ordinary salt manufacture. It is intended to carry out on a semi-commercial scale tests of processes which have been proved in the laboratory.

Briquetting of Oklahoma Coals.—Experiments have recently been completed at the University of Oklahoma on the briquetting of Oklahoma coals to render them satisfactory as a domestic and industrial fuel. An asphalt binder with penetration 20 and melting point 160° F. was employed, and both washed and unwashed coal were made up into briquettes after a series of experiments with various pressures, other binders, and a consideration of other variables. It was found that washing increased the calorific value from 10,543 to 12,570 B.Th.U., *i.e.*, about 20 per cent. Temperature and moisture were also varied throughout the tests, the moisture content ranging from 3 to 10 per cent. As a result of the work it was shown beyond doubt that the Oklahoma soft coal can be successfully briquetted to form a clean domestic fuel that will stand rough usage and which will doubtless be satisfactory in industrial use.

American Chemical Society.—At the 60th general meeting, held in Chicago on September 7—11 last, it was resolved to raise the annual subscription of members from $10 to $15 (about £4 5s. at current rate of exchange). The subscription for students and graduates will be $10, but only $6 for those who wish to receive only one of the three publications issued by the Society.

Aeroplane Propellers.—Recent tests with propellers made of sheets of duck coated with "bakelite" (the condensation product of phenol and formaldehyde) showed that the material possessed a number of useful properties, including uniformity of texture, absence of warping, elasticity, moisture-proof, oil-proof, freedom from checking and splitting, and uniformity of all propellers made from the same mould. The propellers were made by pressing together five or six coated sheets to form a board, which was then shaped with a saw and finally moulded under pressure at 350° F.

Strontium in 1918.—The chief use of strontium compounds in the United States prior to the war was in the manufacture of red fire in pyrotechnics, but during the war they were employed in night signals for military, naval, and transport purposes. Whereas 2000 short tons of crude was sufficient to meet the annual requirements before the war, it is estimated that about 4000 tons was used in 1918.

Prior to 1915 the home deposits of ore had only been mined in a few places and in very small quantities. No ore at all was mined in 1915, but 250 short tons was mined in 1916 and no less than 4305 tons in 1917. The 1918 production of ore was only 400 tons of strontianite, which commanded a price of about $50 per ton. The manufacture of strontium salts, on the other hand, was greatly increased, the manufacturing plants evidently using stocks of both foreign and domestic crude ore purchased in previous years. The production of strontium nitrate, carbonate, chloride, and oxalate in 1916 was 2,006,000 lb.; in 1917, 2,499,676 lb.; and in 1918, 4,927,000 lb.—(*U.S. Geol. Surv., Mar.* 30, 1920.)

Asbestos in 1918.—The asbestos mined and sold in the United States in 1918 amounted to 802 short tons, valued at $121,687, which is about 48 per cent. of the quantity and 24 per cent. of the value of the product marketed in 1917. Not being classed as a war mineral, the production was hampered by scarcity of labour and restraints of trade.

The United States is the world's largest manufacturer of objects made of asbestos. The total imports of unmanufactured asbestos in 1918 amounted to 137,700 short tons, of which nearly 98 per cent. came from Canada and the remaining 2 per cent. came chiefly from South Africa. The imports from Canada constituted about 95 per cent. of the total asbestos mined and sold in Canada in 1918, which amounted to 141,462 short tons. The total output for South Africa during 1918 amounted to 12,248 short tons.

It is interesting to note that Canada has furnished for many years the larger part of the world's supply of asbestos. It is wholly chrysotile asbestos. Russia has for many years ranked next to Canada in the production of asbestos from similar deposits, but has lately lost its rank to South Africa, where asbestos occurs in greater variety, viz., chrysotile, crocidolite, and amosite. Considerable deposits of asbestos have been reported and to some extent worked in Australia, Italy, Mongolia, New Zealand, Tasmania, the Philippine Islands, Cyprus, India, and Japan, but in general these countries supply but a small part of the asbestos of the world. (*U.S. Geol. Surv., Mar.* 20, 1920.)

FRANCE.

Industrial Notes.—*Metallurgy.*—In the first six months of 1920, 1,973,400 metric tons of iron ore was exported, Germany taking 673,026 t., Belgium 604,129 t., and Great Britain and other countries 696,258 t. Prices show a great increase; the Briey ore, for example, is now selling at 25 francs a ton, compared with 5—6 fr. in 1913. Of the 148 blast furnaces in eastern France, 67 are in operation with a daily yield of 10,858 t.; in the Longwy and Nancy districts the output is 4948 t., or about 52 per cent. of that on July 1, 1914.

Coal.—Thanks to the due arrival of the promised supplies from Germany, the coal situation is showing a great improvement, and much credit is due to the railway companies for having transported more than half the German consignments with promptitude and efficiency. There will be no control of the distribution of imported American coal except as regards such quantities which have been earmarked to make good the deficiency arising from the diminished importation from England.

Chemical Industry.—The market for chemical products is showing a slight improvement, and there are some indications of renewed activity. Production, however, is still below the mark, particularly in regard to dyewares. Great activity is apparent in the manufacture of cellulose acetate and of various other organic products. "La Société Anonyme des Procédés Biochimiques Pierre Mazé" (23, Rue du Pont-Neuf, Paris) has been formed, with a capital of 1½ million francs, to produce lactic acid by fermentation, which will be sold by "La Société Française des Laboratoires de Produits Organiques" (1, Rue Grétry, Paris), with a capital of 500,000 fr. The ceramic industry is also making good progress, and two new companies, "La Compagnie Française des Produits Céramiques" and "La Société Anonyme de la Céramique Française" (capital 2,500,000 fr.) have recently been established.

Petroleum.—A course of lectures on petroleum will be held in the University of Strasbourg, which will extend over twelve months and be conducted in conjunction with an optional course of practical training at Pechelbronn.

Sugar.—The price of sugar in Paris has risen from 3·45 fr. to 5·57—6·00 fr. per kg. since its sale has been decontrolled. The consumption in France is estimated at 750,000 t., and as the combined production of France and colonies will be about 520,000 t., and 100,000 t. will have to be exported to the non-producing areas of the Empire, it follows that some 330,000 t. will have to be imported. There should be no difficulty in obtaining this amount from non-European sources, though perhaps some will be obtainable from Czecho-Slovakia, where there is an estimated surplus of 400,000 t.

Resources of Senegal.—Some of the natural resources and products of Senegal are being exploited to a certain extent. The only minerals that are regularly worked are gold and salt; the former occurs in the Falémé valley, and the output is valued at some 600,000 fr.; the latter is obtained from salt lakes in Lower Senegal, and as the output is insufficient to meet the local demand, a certain amount of salt has been extracted from sea-water. About 700 tons of the titanium ore, ilmenite, was extracted from the sands on the Rufisque coast.

The chief crop and source of wealth in the country is groundnuts, the production of which amounted to 234,884 metric tons in 1918 and 222,523 tons in 1919, the 1920 crop being estimated at

275,000 t. In 1918 the exports included 2032 t. of hides and 1607 t. of palm kernels from Kazamanza. The production of kapok, gum, and rubber could be greatly increased. Large areas are covered with a species of palm tree and with baobobs; the fruit of the former could be used as imitation ivory, whilst the fibres and bark of the latter could be utilised for the production of cellulose pulp and alcohol, respectively.—(*Rev. Prod. Chim., June* 30, 1920.)

AUSTRALIA.

The Oil Agreement Act, 1920.—In order to create and develop a mineral oil refining industry in Australia, an agreement has been made between the Commonwealth Government and the Anglo-Persian Oil Co. by which the latter has arranged to erect a refinery in Australia and to supply the Commonwealth with 200,000 tons of crude oil per annum until oil is found in Australia or other territories of the Commonwealth. The distribution of capital between the refinery company and the Government is so arranged that the latter will always have a majority in number and value of shares. No action affecting the constitution or independence of the company or the disposal of refined products is to be taken without the Government's consent. The Government agrees to prevent unfair import competition, to refund customs duties paid by the company on crude mineral oil refined in Australia, and to introduce legislation for the imposition of customs duties on crude mineral oil whenever necessary to stop unfair competition. The Commonwealth has the option of purchasing the whole of the oil company's interests in the refinery company at the end of 15 years from the completion of the first refinery, or within one month of the oil company being liquidated.

Boring operations in Papua are to be placed in charge of the company, and financed out of the sum of £100,000 to be contributed by the Imperial and Commonwealth Governments.—(*Bd. of Trade J., Sept.* 16, 1920.)

Mineral Production of New South Wales in 1919.—According to the Annual Report of the Department of Mines of New South Wales, the value of the mineral production for 1919 was £9,882,366 (the lowest since 1911), as against £14,419,352 for 1918, the highest recorded in the history of the State. Over 90 per cent. of the decrease was due to the suspended production of silver, lead, and zinc at the Broken Hill mines. The production of coal was 8,631,554 t., *i.e.*, 431,622 t. less than in 1918. It is stated that the output per person employed is rather more than double that for Great Britain, largely owing to thicker seams. The coal trade of the State has good prospects in view of the world shortage. The quantity of coke produced was 424,773 t., as against 608,492 t. in the previous year. It is evident that the small coal is being turned to better account and not wasted or used for road-making. The Western District was the only producer of oil shale during the past year, the output being 25,453 t.

The output of silver, lead, and zinc, including ore and concentrates not smelted in the State, was:—Silver, 1,232,710 oz. fine; lead, 11,497 t.; silver-lead concentrates, 64,243 t.; carbonate ore, 13,746 t.; zinc concentrates, 72,294 t. Copper was produced to the value of £139,296 (£696,580 in 1918), the decrease being due mainly to the collapse of the market and the shipping strike. The output of tin was valued at £416,623, compared with £548,876 in 1918.

The production of other minerals in 1919 included:—Antimony, 86.75 t. (metal content); bismuth metal and concentrates, 19·5 t. (31 t. in 1918); gold, 65,839 oz. fine (87,445 oz. in 1918); platinum, 213·25 oz. (chiefly from the Fifield Division); molybdenite, 65·8 t.; scheelite, 80 t.; wolfram, 135 t. The whole of the alunite produced—2485 t.—was obtained by the Australian Alum Co. in the Bullahdelah Division.

SOUTH AFRICA.

Industrial Progress.—In his presidential address to the Annual Convention of the South African Federated Chamber of Industries, Mr. G. E. Saunders stated that the value of the industrial output of the Union in 1918 showed an increase of £20,000,000 compared with that in 1915–16, and the annual total must now be considerably over £61,000,000. These figures did not include the output of the mines, which was valued at £48,000,000. One of the most important industries in the country was sugar, and the new season's crop, estimated at 170,000 tons, afforded evidence of remarkable progress. The leather industry had also developed greatly, and leather had been exported to the United Kingdom market, where it was reported to be equal to the best Australian leather. Developments had taken place in the textile industry, and attention was being paid to the commercial utilisation of wild jute (*Hibiscus cannabinus*), which grew wild in many parts of the Union. About 250,000 acres was under wattle in Natal. Among new industries which had recently been established in the country were aluminium, argol and cream of tartar, ammonia, asbestos-cement, patent fuel, dextrin, gluten, lanolin, mica goods, rubber, tartaric acid, and these would probably be supplemented in the near future by white lead, acetic acid, dyes, and paper pulp.—(*S. African J. Ind., July*, 1920.)

CANADA.

Mineral Output of British Columbia in 1919.—According to the Annual Report of the Minister of Mines (Columbia) for 1919, the mineral prodution of the province, valued at $33,296,313, showed a decrease of about 20 per cent. over 1919, but this decline is without significance since the 1919 production was almost a record one, and the even larger productions of the years 1916–17–18 were due to the war. Generally, the outlook for 1920 is most reassuring. The opening of new camps in the Portland Canal district has been the outstanding event of the past few months, and there is no doubt that this district will be subjected to extensive prospecting and development this year. The lead produced in 1919 amounted to 29,475,968 lb., valued at $1,526,855, compared with 14,423,693 lb., worth $1,401,252, in 1918. The output of copper was 42,459,339 lb., worth $7,939,896, which was 19,024,415 lb. lower than in 1918, and 47 per cent. less in value. The zinc production was 56,737,651 lb., compared with 41,772,916 lb. in 1918; its value, $3,540,429, represented an increase of about 22 per cent. over that for 1918. The only output of platinum reported during 1919 was about $1500 worth from the Similkameen District. About 600 tons of manganese ore, containing over 50 per cent. manganese and less than 20 per cent. silica, was shipped from the Cowichan District, and about 100 tons of high-grade ore from Kaslo. About 5000 tons of fluorspar was produced in the Grand Forks Division and 120 tons of magnesium sulphate in the Osoyoos Division. Seven hundred and fifty tons of this mineral was shipped from deposits near Clinton, and 140 tons from near Basque. Deposits of hydromagnesite in the Clinton Division, which are reported to be large and of great purity, have attracted considerable attention during the past year. A production of arsenic valued at $21,000 was made by the Nickel Plate Mine during 1919. The gross production of coal in 1919 was 2,408,948 long tons, of which 141,407 tons was made into coke.

GENERAL.

University of Cambridge.—The recent extensions to the metallurgical department, which have been made with the generous assistance of the Goldsmiths' Company, were formally opened on October 5 by Mr. R. M. Tabor, Prime Warden of the Company. The new laboratories, which will be under the direction of Mr. C. T. Heycock, the University reader in metallurgy, include rooms for analytical and general metallurgy, gold and silver assaying, pyrometric and metallographic research, and a balance-room.

University of Birmingham.—The Council and Senate of the University are appealing for £500,000 in order to make extensions to meet the ever-increasing number of students, particularly in the faculty of applied science. The Chemistry Department has been removed from Mason College to a site at Bournbrook, where army huts have been erected to serve as temporary laboratories, etc.

Speaking at Birmingham on October 8, Mr. Austen Chamberlain said that the Government proposed to increase the grant in aid of university education from £1,000,000 to £1,500,000 for a term of years.

Research in Malleable Cast Iron.—The British Grey and Malleable Cast Iron Research Association was formally established at a meeting held in Birmingham on September 30, and a provisional council was appointed with Mr. T. Vickers (Lincoln's Inn, Birmingham) as secretary. In explaining the objects of the Association, Sir Frank Heath referred to the success of research institutions in the United States, and said it was claimed that malleable castings could be made there with a tensile strength 50 per cent. greater than was possible in this country. If true, that was a serious matter.

Ammonium Sulphate as a Weed Killer.—Experiments in Worcestershire have led to the conclusion that under certain circumstances a solution of sulphate of ammonia can be used with advantage as a weed killer. Three strengths of solution were used, *viz.*, 1 cwt., 1½ cwt., and 2 cwt., respectively, in 60 galls. of water per acre, and in the case of the corn buttercup (*Ranunculus arvensis*) the strongest solution killed 75 and crippled 20 per cent., the medium solution killed 50 and crippled 20 per cent., whilst the weakest solution had little effect save as a fertiliser. The solution made in this way from commercial sulphate of ammonia will also kill the weed known as spurrey (*Spergula arvensis*), but it is pointed out that the remedy should only be used on weeds in cereal crops and in fine weather.—(*Official*.)

Magnesite (1913—1919). (*Imperial Mineral Resources Bureau, pp.* 42. *price* 1s. 3d.).—The world's supplies of magnesite before the war were drawn chiefly from Austria-Hungary and Greece. The exports of the former were of refractory or sintered magnesia (obtained by calcining at high temperatures), and those from Greece of raw magnesite and lightly-calcined or caustic magnesia for use in the manufacture of oxychloride cement. During the war the loss of exports from the enemy countries was compensated for by a remarkable increase in the American and Canadian production.

In 1918 the production of the United States amounted to 210,168 metric tons, but fell to 147,005 tons in 1919; the Canadian production showed an even greater decline from 46,489 tons to 9020 tons.

The British Empire production rose from about 4½ per cent. of the world's output to about 15 per cent. in 1918. The imports into the United Kingdom of magnesite for 1917 and 1918 are given by the Ministry of Munitions as equivalent to 95,045 tons valued at £73,943 and 43,672 tons valued at £21,024, respectively.

Apart from the use of magnesia as a refractory and as a cement, large amounts of caustic magnesia have been made into magnesium bisulphite for use in the manufacture of paper from wood pulp. Magnesite also has a use in the manufacture of carbon dioxide. The early efforts of British magnesia-brick manufacturers to substitute Grecian for Austrian sinter during the war were unsuccessful, but towards the close they were confident that they would be able to produce bricks from Grecian sinter that would defy the competition of bricks made from the Austrian product. Arrangements have been made for the supply of Grecian magnesite to manufacturers in Great Britain, and it is expected that British manufacturers will take advantage of the experience gained during the war.

The kilns used in Greece for calcining the raw magnesite are large gas-fired shaft kilns. Various improvements have been introduced in recent years, such as Morgan gas generators, pressure and exhaust fans, and Steiger kilns. Experiments made with rotary kilns of the Fellner and Ziegler type did not meet with great success. The latest type of sintering kiln requires about 4·6 cwts. of coal per ton of sinter produced, the old type of bottle kiln requiring 6 to 7 cwts. per ton.

Much useful information is given concerning the minerals of economic importance and the properties and analyses of calcined and raw magnesite.

Hydro-electric Developments in Switzerland.—There is a tendency in Switzerland towards increasing the number of artificial lakes in order to secure a reserve of water power to meet the increasing demand for cheaper electric power. The Swiss Hydro-Economic Union estimates the total energy output of Swiss power stations at about 1·2 to 1·3 milliard kw. hrs., or about 300 kw. hrs. per inhabitant per year; it has recently published a general scheme of exploitation involving an annual production of 2 to 3 milliard kw. hrs. A new power station, with an output of 50,000 h.p. was completed near Alten-Goesgen in 1917; the power station of Eglisau, with an output of 30,000 horse-power, is on the point of completion, and a station at Mühlberg on the Aare, having an output of 32,000 horse-power, will be finished this autumn. Power stations are also under construction at Ritom, Barberine and Am Steg, and further development of already existing hydro-electric establishments are contemplated at Oberhasle, Rossens, La Plaine, and near Wildegg. The more satisfactory distribution and utilisation of available supplies are being considered by a number of societies, of which the two principal have headquarters at Lausanne and Berne respectively. The power of the Swiss water resources still available is estimated at about 20 milliard kw. hrs. per annum, which would be amply sufficient for the entire electrification of the country. Up to the end of 1918 twenty-seven concessions for export of electric current had been granted. The exported energy amounted to about 132,000 h.p., the countries supplied being Germany, Italy, and France.—(*Bd. of Trade J., Sept.* 9, 1920.)

The Italian Paper Industry.—The Italian paper industry owes its development to the use of water power. Most of the mills are situated in the three northern provinces, and of 133 mills existent in 1914, 25 can produce their own pulp, 10 manufacture pulp or cardboard, and 11 produce exclusively high-class papers. Before the war nearly 80 per cent. of the wood pulp used was imported from Germany and Austria. The entrance of Italy into the war closed this source of supply, and with the difficulties of sea transportation almost insuperable, Italian paper mills found themselves in a serious position. Imports of paper stock fell from 97,648 metric tons in 1914 to 30,563 t. in 1917.

Attention has naturally turned to increasing home production. Straw has been more extensively used, whilst poplar trees, which grow rapidly and give a good pulp, have been planted in large numbers. Even so, it is only by continual imports that a sufficient supply can be obtained. In 1917 the Italian Government assumed control of the paper industry to ensure an adequate supply of newsprint paper. Manufacturers were compelled to produce a specified quantity of newsprint per month at a definite maximum price, and a charge was made on every ton of paper produced other than newsprint. The revenue from the latter was utilised in reducing the price of newsprint. These war-time restrictions are still in force, and the shortage of paper continues very pronounced. The specialities of the Italian paper industry are cigarette paper, hand-made and imitation hand-made paper, and straw wrappings.—(*U.S. Com. Rep., July* 23, 1920.)

Reorganisation of Chemical Societies in Germany.—The "Emil Fischer Society" was founded on June 15 last for the encouragement of chemical research. It is taking the place of the "Verein zur Förderung Chemischer Forschung," a society founded prior to the war, and which, in conjunction with the "Kaiser Wilhelm-Gesellschaft zur Förderung der Wissenschaften," organised the formation of the "Kaiser Wilhelm Institut für Chemie," which has been unable to continue owing to lack of funds.

On June 16 another new organisation, the "Adolph Baeyer Society" was founded with the object of securing the continuance of the publications of the German Chemical Society, which include: (1) The "Berichte"; (2) Chemisches Zentralblatt; (3) General Index to Berichte and Zentralblatt; (4) "Beilstein"; (5) Supplementary volumes to "Beilstein"; (6) the "Lexicon of Inorganic Compounds"; and (7) the "Literatur-Register" of Organic Chemistry. The cost of preparing and issuing these publications, which are held to constitute the very foundation of chemical science and industry, is now exceedingly heavy, and the raising of adequate capital to ensure their future is considered imperative. Although valuable contributions have been intimated, and many existing societies have joined the Adolph Baeyer Society, a great deal still remains to be done.

The technical-scientific section of the Union of German Ceramic Trades (Verband keramischer Gewerbe in Deutschland), which was founded in 1913, has now been changed into the German Ceramic Society (Deutsche Keramische Gesellschaft). A special feature of the policy of the new society will be to foster close co-operation between scientific and State institutions and all branches of the ceramic industry. The Government Porcelain Factory in Berlin and the corresponding Experimental Station at Charlottenburg have definitely promised support, and other institutions will undoubtedly follow their lead.

It has recently been decided to establish a research institute for the German cement industry.—(*Z. angew. Chem., Aug.* 27, 1920.)

Swedish Sulphite Cellulose Industry.—The production, which had fallen from 771,302 metric tons in 1916 to 476,307 t. in 1918, has now risen to 581,167 t., which represents 69 per cent. of the normal. The demand for sulphite cellulose, especially on the part of British paper manufacturers, is good. The increased demand may be partly accounted for by the total absence of the Canadian supply, which is being wholly absorbed by the United States market.—(*Z. angew. Chem., Sept.* 3. 1920.)

The Mineral Resources of Armenia.—The mining industry of Russian Armenia is represented by 22 companies, working deposits of copper ore, rock salt, and iron pyrites. The average annual production from 1911 to 1913 was 154,900 metric tons of copper ore from 13 mines, 10,000 t. of iron pyrites (4 mines), 25,400 t. of rock salt (5 mines), and 6614 t. of metallic copper was produced by 7 smelters. The output of rock salt and iron pyrites represented the whole production of Transcaucasia and the production of copper amounted to 20 per cent. of the total for Russia. Among other minerals that occur in Armenia are lead and silver, gold, zinc, molybdenum, antimony, cobalt, manganese, chromium, arsenic, and coal; there are six oil wells, six salt springs, and deposits of barytes, phosphates, asbestos, etc.—(*U.S. Com. Rep., July* 8, 1920.)

Motor Alcohol in Hawaii.—Progress is being made in Hawaii in the production of alcohol from molasses and the waste of pineapple canneries. The amount of waste molasses produced there in a year is about 135,000 tons, a quantity which, it is stated, would yield some nine million gallons of motor fuel when treated by the new Foster process. A company has been formed to take over the patent rights of the latter, and it is hoped that sufficient power alcohol will be produced on the island to render unnecessary the importation of gasoline.—(*U.S. Com. Rep., July* 2, 1920.)

New Sugar Industry in Honduras.—A sugar industry is about to be initiated in Honduras. One company will grow the sugar-cane, a second will prepare it for shipment, and a third will provide for its transport to the United States. Another company, with a capital of £400,000, will instal a sugar mill designed initially to crush 1500 tons of cane per 24 hours, but capable of being extended to treat 6000 tons. The company which will grow the cane owns 30,000 acres of land between the Chameleon and Ulna rivers, two-thirds of which is admirably suited to the crop. The centre of the industry will be at Lima, which will be joined up to the National Railway.—(*U.S. Com. Rep., July* 1, 1920.)

CORRESPONDENCE.

RAIL CONVEYANCE OF CHEMICAL COMMODITIES.

Sir,—I have read Mr. Lukes' paper in your issue of September 30 with some interest and some misgiving. He is interested in the coal-tar branch of chemistry, and seeks to wrest something from the present state of flux into which the war has thrown British railways; but others have to consider what the effects of adopting his suggestions would be on other branches of our industry. It is clear from what one has read that railways have to become self-supporting; they must charge such dues as will bring them in sufficient to pay their costs, interest on their capital, and a dividend. If we assume this to be represented by 100, and if the commodities dealt with be 100, one commodity would pay 1/100 of the revenue if it were spread evenly and the quantities were equal. There appear, however, to be good reasons why the spread of the revenue should not be even, as sand obviously cannot pay what drapery can pay; but it should be fair. It is here that I find fault with Mr. Lukes' presentation of the case; he quotes oils as in Class C and petrol as in Class 2, and alleges that the difference between Class C and Class 2 rates is for the difference in risk; but I understand that this is not so. Petrol has a much higher price than cotton oil or whale oil, and a great part of that difference is due to the different values of the two. Does Mr. Lukes seriously think that the difference between the rates charged on sand and drapery is due solely to risk with the one not present with the other? Personally I cannot see any good reason why petrol should not pay twice as much carriage as whale oil; it can so much better stand it. The spread of the rates, I have said, should be fair; and as all businesses have been built on a certain spread which has existed many years, it can be fairly presumed that the spread has gravitated to something approaching all-round fairness. Mr. Lukes' suggestions upset all this and seek to pull down the transport costs of expensive distillates, but—and this is of the utmost importance—who is going to pay more that his branch of the trade may get off for less? It is certain that the revenue must be found by some one or more groups; and why should bleaching chemicals, for instance, be pushed up in order that petrol may come down? It is of no use to reply that bleaching chemicals need not go up; they might; something would have to go up, and if it were not bleaching chemicals, it would be something else. By all means let us have such adjustments as we can reasonably obtain, but I am old enough to remember the shock of 1893, when a disturbance of railway rates, which we fondly hoped would lead to cheaper transport, produced a chaos that resulted in an all-round advance of about 5 per cent., and thus restored the old balance of things and left the spread of the burden where it was before.—I am, Sir, etc.,

JOHN BULLOCK.

London, Oct. 1, 1920.

SIR,—In the above letter, Mr. J. Bullock accuses me of seeking to wrest some improper advantage for what he terms "expensive distillates," and the specific point on which he finds fault with my representation of the case is that I place the difference in carriage between non-dangerous oils in Class C and dangerous oils (petrol and benzol) in Class 2 as a premium charged by the railway company to cover the risk. He says the difference in charge is not to cover risk, and suggests that the value is the determining factor. One would like to ask in what way the *value* of a liquid conveyed in owner's tank wagons affects the railway companies when carried at the sole risk of the trader? (Incidentally it may be mentioned that in America, benzol, naphtha, cottonseed oil, castor oil, etc., are carried in the same class in tank cars, and the cost in this country of conveying a tank of non-dangerous oil is the same as that of conveying a tank of dangerous oil between the same points.) To substantiate his case *re* values, he mentions cotton oil and whale oil, and says that petrol should pay twice as much carriage as whale oil because "it can stand it so much better." These oils are, however, more expensive than petrol or benzol, the following being the current prices: —

Whale oil	.. £78 per ton	All chargeable as oils not dangerous, Class C, in owner's tank wagons.
Cottonseed oil	.. £76 „ „	
Linseed oil	.. £80 „ „	
Rapeseed oil	.. £88 „ „	
Petrol or Benzol	.. £56 „ „	Chargeable Class 2, in owner's tank wagons.

Oils, dangerous and non-dangerous, conveyed in tank wagons, are fairly comparable traffics, but sand and drapery, referred to by Mr. Bullock, are not comparable, the conditions under which they are conveyed being quite different; and if the classification is to depend on values, why should petrol or benzol at a value of £56 per ton be charged in the same class as confectionery at £560 per ton, whilst cloth in bales in Class 3 varies from £900 to £3120 per ton?

Mr. Bullock considers that businesses have been built up on a certain spread of rates, and thinks that the result has been fairly equitable. That the Minister of Transport does not share this view is proved by the following extracts from his Statement as to Railways, 1920 (Command Paper 654, p. 5): —

"RATES.—Having completed their inquiry into the temporary increase of rates necessary to restore the financial equilibrium of the railways, the Rates Advisory Committee are now embarking upon the larger and more important question of a thorough and scientific revision of the basis of railway rates and charges. Such a revision is overdue both in the interests of the traders and the railways.

"The present Parliamentary classification of goods for the purpose of conveyance charges is at least 30 years old, and although an endeavour is made to keep the working classification up to date, there are undoubtedly certain anomalies owing to changed conditions of trade, new uses of materials, etc.

"In originally determining the class, it is evident that the value of the goods was largely taken into consideration, and although this should probably enter into the question, *it is for consideration whether more weight should not be given to the cost of the service and the conditions under which the traffic is conveyed as to quantity, bulk, regularity of flow, method of packing, etc.*

"Class rates have been provided for the various classes on a more or less uniform scale throughout the country, but not more than 25 per cent. of the total business is carried at these class rates, the remainder being carried at what are known as 'exceptional' rates, which are lower than the class rates. These exceptional rates are really specific rates for a certain commodity between a pair of stations (sometimes for specific quantities), and in framing them a variety of considerations have been taken into account, such as the risk of loss or damage, the method of packing, the quantities in which the commodity moves, ... etc.

"The general result has been that a most complex system of varying rates has been built up, there being probably hundreds of millions of different rates on the railway companies' books, with inevitable anomalies.

"At all recent inquiries into railway matters there has been considerable agitation on the part of the traders to have the cost of cartage eliminated from the rates. There are also objections to the present practice from the railway companies' point of view, and these have been particularly emphasised in recent years owing to the fact that the cost of cartage has increased out of all relation to other railway costs. . . . Other anomalies arise from different causes, and *it will be evident that a reclassification and simplification is most desirable.*" (The italics are mine.)

Although value may have some bearing on classification, the cost of the service to the railway company is, in my opinion, the first consideration.

The shock of 1893, which Mr. Bullock so well remembers, did not leave the old balance of things as it stood prior to that date; schedules to the Orders Confirmation Acts of 1891—1892 set out a new classification of merchandise, which considerably altered the charges previously applicable to many articles of commerce; and it is significant that at that time practically no provision was made for the conveyance of traffics in owner's tank wagons; but thirty years have passed, and during that time the railway companies have decided whether they will convey dangerous goods, determined the charges and conditions applicable, etc., whereas the charges for whale oil, cottonseed oil, sand, and drapery were set up by an impartial tribunal—even at that date.

Whether Mr. Bullock desires the present conditions to remain or not is immaterial; the Minister of Transport has sent a Reference to the Rates Advisory Committee to inquire into and recommend a general revision, and all that I am asking for is that sand, drapery, whale oil, cottonseed oil, petrol, benzol, *and goods of every description* should be fairly classified by an impartial business tribunal. —I am, Sir, etc.,

J. LUKES.

Leeds, Oct. 8, 1920.

REPORTS.

Report of the Committee of the Privy Council for Scientific and Industrial Research, 1919 1920. *Pp.* 120. *London: H.M. Stationery Office.* 1920. [*Cmd.* 905. 1*s.*]

The fifth annual report of the Advisory Council to the Committee of the Privy Council covers the period August 1, 1919—July 31, 1920, and includes a review of the five years' work. The subject matter relates to :—I. The encouragement of the individual research worker; II. The organisation of national industry into co-operative research associations; III. The direction of research for national purposes; and IV. The aiding of suitable researches undertaken by scientific and professional organisations.

I. The new research associations—essentially "man-consuming agencies"—are finding it difficult to secure scientific staffs of the necessary ability; the supply of research workers is the function of the Universities, to which the Department cannot make grants-in-aid, but it can and does assist individual workers in them. Since the establishment of the Department, grants have been made to 136 students, 89 independent workers, and 48 research assistants, exclusive of 38 grants for clerical and laboratory assistants and 49 for equipment. Ninety-seven professors have assisted in the selection of the recipients of these grants. Whereas only £3207 was distributed in grants in 1916–17, the amount for 1919–20 was £26,700, and it is anticipated that £45,000 will be needed next year. No conditions are attached to these grants when the sole aim is the extension of knowledge, but the Department must be consulted when commercial exploitation of discoveries is contemplated. In choosing recipients, scientific capacity is the only criterion, the aim being to assist promising workers as well as promising lines of inquiry. No attempt is made to control research.

II. The policy of the Committee is to finance industrial research from the £1,000,000 granted by Parliament in 1916 until conviction is brought to each industry of the necessity for scientific research. When this result is achieved a research association is formed by co-operative action among the firms in the industry (wherever possible), and the association then launched is partially financed by the Department for five years, the idea being that each association shall ultimately finance itself. Thus the cotton industry hopes to raise £250,000, and other industries are following suit. Eighteen research associations have been established (9 during the past year) and 5 others will shortly come into being. The 18 associations have guaranteed to raise £38,400 annually for five years, but it is expected that this will be greatly exceeded, as the 10 already at work raised an aggregate of £40,000 from 2300 members in their first year. Of the million fund, £63,800 has been expended in grants; commitments for existing associations total £450,000, and for those approved a further £120,000; whilst the total commitments are expected shortly to reach £800,000.

III. In connexion with researches of direct and great national importance, a report has been furnished by the Fuel Research Board for the years 1918–19 (*cf.* J., 1919, 151 R); Prof. P. Purcell, Peat Investigating Officer to that Board, has been working on the machine-cutting and winning of peat during the past 18 months; a report has been published on pulverised coal (*cf.* J., 1919, 190 R), and further work is being proceeded with. The Food Investigation Board has issued two reports, and the new low-temperature research station at Cambridge has received a grant from, and will be maintained by, the Department. A Building (Materials and Construction) Research Board has been established and is working in close co-operation with the Ministry of Health and other State Departments. The extension of the activities of the National Physical Laboratory (brought under the Department in 1918) may be gauged from the increase in its income from £40,000 in 1914 to £203,000 in the current financial year. At the instance of the Government the Department has recently initiated the formation of a series of co-ordinating boards to deal with the scientific work of the fighting services. Boards for chemistry, physics and engineering, and the Radio Research Board formed the nucleus of the scheme, which has been placed under the direction of Mr. H. T. Tizard, of Oxford University. The Department is also responsible for boards or committees dealing with tin and tungsten, lubrication, mine-rescue apparatus, atmospheric conditions in deep and hot mines, oxygen, gas cylinders, adhesives, and aluminium corrosion. Committees dealing with the following subjects have been dissolved :—Metallurgy, glass and optical instruments, illuminating engineering, abrasives and polishing powders, vitreous compounds and cements for lenses and prisms, standardisation of the elements of optical design, anti-glare glass, lubricants and lubrication, chemistry of lubricants, copper and zinc, brass and copper castings, Irish peat, building materials, zirconium, and chemistry of food and cooking.

IV. One of the Department's first activities was to prevent important researches being abandoned by making grants-in-aid to scientific and professional societies; and this policy has been continued. Grants recommended to 32 bodies for 69 researches totalled £68,816. Among the researches subsidised are, or were, the deterioration of sea structures (Institution of Civil Engineers), the de-gumming of silk (Silk Association), the efficiency of the open fire (*cf.* p. 334 of this issue), laboratory and optical glass (Institute of Chemistry), colour sensitiser dyes (Royal Society), etc.

The remainder of the Report deals at greater length with the various problems previously outlined, and with the results of researches.

Some interesting results are given of the work of the Food Investigation Board. The Meat Committee has found that beef, which has hitherto been preserved by chilling, can, like mutton, also be frozen in such a way as to preserve the qualities of the fresh meat, but it has not been possible to apply this discovery on a commercial scale for want of apparatus. The bacteriology of putrefaction has been investigated and some results indicated, and further progress on the growth of moulds is reported, especially under cold storage conditions. It has been shown that the fungus causing "black spot" in meat will grow and spore at $-5°$ C. An important point for breeders is that dried blood added in small amounts to the diet of pigs causes a remarkable increase in the rate of fattening. By employing artificial atmospheres in storage chambers, the life of fruit may be lengthened greatly. The chemistry of the ripening process of fruit has been investigated with special reference to the changes in pectin, and the limits of temperature within which fruit moulds will grow have been ascertained. A process for the synthesis of glycerol has been discovered, and the physiological properties of fats in which glycerol has been replaced by other polyhydric alcohols have been determined. Experiments have been made on the production of an edible oil from linseed oil, the production of oils by vegetables has been studied, and a monograph on the unsaturated monobasic acids related to fats has been completed. The work of the Lubricants and Lubrication Inquiry Committee is to be published shortly, and will include a bibliography of the commercial, physical and engineering aspects of lubrication (also to be published separately), abstracts of papers (chemical) on lubrication, researches on fundamental problems, monographs on cutting and on solid lubricants, etc. The Zirconium Inquiry Committee investigated the preparation of ferro-zirconium and zirconium steels. Great difficulty was experienced in obtaining a true alloy, but 50 lb. batches of a ferro-zirconium steel containing considerable proportions of carbon and zirconium carbide were made. The Committee failed to ascertain any source of supply of ferro-zirconium with low contents of carbon and silicon, or any evidence that the addition of zirconium to steel confers on it any beneficial quality, or that light armour of enemy origin contained zirconium; hence the alleged use by the enemy of zirconium steels of remarkable hardness for aeroplanes and tanks was held to be disproved. Other interesting researches referred to are:—Separation of tin from its ores by volatilisation as chloride; size and weight of oxygen cylinders for hospitals; stresses in gas cylinders; efficiency of cooking stoves; technical problems relating to the preservation and restoration of antique objects in the British Museum, including the examination of alloys 2000 to 4000 years old, and disintegration of leaden objects, by Dr. Alexander Scott, etc.

The Report concludes with a statement concerning the attitude of the Department towards the many learned societies which are experiencing difficulties in publishing scientific matter owing to increased cost of printing, paper, etc., and which solicit State aid to meet them:—"It is not possible for us to recommend a grant for this purpose without any estimate of the cost to public funds which would result from the general adoption of such a policy." "A grant which reduced the sale price of scientific publications below the cost of production would in effect be a grant for the assistance of a particular section of the community and, as a permanent arrangement, would be at least as difficult to defend as other trade subsidies."

Forty-Fourth Annual Report of H.M. Inspectors of Explosives, 1919. *London: H.M. Stationery Office*, 1920. [*Cmd.* 841. 3*d.*]

The number of explosives factories now on the books is 147; during 1919 one new licence was granted, and 37 were surrendered. The number of magazines is 452, of which 14 are in disuse; four new licences have been issued and 12 have been surrendered.

The accidents reported during the year numbered 430, causing 58 deaths and injuries to 502 persons. This is a return to pre-war conditions, the averages for the years 1905 to 1914 being: Accidents, 434·5; deaths, 56·1; and injuries, 433·9. There were 65 accidents in factories, causing 8 deaths and injuries to 31 persons; six of the fatalities occurred during the breaking up of ammunition.

Messrs. F. H. and P. V. Dupré, chemical advisers, examined 349 samples during the year, and of these 57 were reported as unsatisfactory, the fault in the majority of instances being an excessive proportion of moisture. A brief *résumé* is given of such special research work in connexion with fulminate of mercury as they think may be of general interest. The points touched upon are as follows:—Sensitiveness of fulminate of mercury to direct percussion; influence of foreign matter derived during manufacture on the sensitiveness of the fulminate; sensitiveness of moist fulminate and chlorate mixtures; sensitiveness of fulminate, chlorate, and antimony sulphide mixtures; velocity and energy of blow required to detonate 6.6.4 mixtures; effect of pressure on the detonation of fulminate; the working of counterweight controlled presses; jelly bag mixers; destruction of fulminate.

An Order in Council, dated June 25, 1919, exempted di-nitrophenol from the provisions of the Explosives Act, subject to the observance of the conditions of the Order. By an Order in Council under the Revenue Act, 1909, the fees in respect of importation licences were increased by 20 per cent. An Order of Secretary of State brings all acetylene-compressing stations under supervision. Two new explosives were placed on the Permitted List, and the definitions of three were amended. The Order of Novmber 14 substituted a new schedule of explosives, which excluded many explosives not now actively used.

In connexion with the use of explosives in coal mines, a series of experiments at the Rotherham Testing Station was begun, using natural methane instead of coal gas.

Report on the Trade of South Africa for the Year 1919. *By* W. G. Wickham, *H.M. Senior Trade Commissioner in South Africa. Pp.* 50. *London: H.M. Stationery Office*, 1920. [*Cmd.* 956. 6*d.*]

The year under review was one of disappointment, inasmuch as English manufacturers failed to re-establish trade upon as satisfactory a basis as had been anticipated during 1918; they have been unable to quote firm either for price or delivery. There had been over-importation of many classes of goods during 1918, and after the armistice purchases almost ceased in anticipation of lower prices and free supplies. Manufacturers have failed to realise the importance of economical and scientific distribution, and have aggrieved co-operative societies and others because of the lack of credit facilities. The year was disastrous to agriculture because of drought followed by floods early in 1920. Labour conditions in all industries were unsettled owing to the unchecked rise in the cost of living; there is an acute shortage of housing, and until 1920 rents and the prices of foodstuffs and imported products were controlled by speculators. In many parts of the country there is a serious shortage of native labour.

High freight rates have caused a relatively high demand for the best quality goods in most trades, but in many cases stocks are so low that the consumer has little choice. For the re-establishment of industries more machinery and power plant, better transport facilities (including the supply of more locomotives and rolling stock), and agricultural supplies, such as fertilisers and fencing material, are urgently needed. Trade conditions are especially influenced by the price of gold, and although the price was increased in the middle of 1919, stability in the relative values of gold and other commodities has not yet been reached.

Agriculture.—The country is almost entirely dependent on imports for implements, fertilisers, dips, sprays and other requisities. The soils mostly require phosphatic fertilisers, only small quantities of nitrogenous guano being used; sulphate of ammonia is exported from Natal. A small deposit of phosphatic guano in the South-West Protectorate was purchased by the Government, but shipping difficulties delayed distribution. The annual requirement of superphosphate is 35,000 tons and of basic slag 10,000 t.; only 11,000 tons of all fertilisers was imported in 1919, but increased supplies are now forthcoming. The scarcity of arsenite of soda for cattle dipping and of lime and sulphur for sheep dipping has now been overcome. Materials for spraying fruit trees have been expensive, but there was no marked shortage. Supplies of tinplate for dairy utensils have improved.

Imports.—Trade has been lost by the United Kingdom and gained by the United States in almost all branches; there is no sign of renewed German competition, and Japan has lost ground. Linoleum imports valued at £42,000 represented only one-sixth of the normal quantity; paper and stationery amounted to £2,180,000, but owing to the enormous advance in prices this cannot be compared with that of a normal year. Importations of candles, soap, blasting compounds and chemicals into Southern Rhodesia showed considerable decreases, that of sodium cyanide alone amounting to 986,010 lb. less than in 1918. Trade in the following classes of goods has been practically captured by the United States during and since the war, the figures denoting the percentage of total imports in each line taken by that country in 1919:—Drugs, etc.: phosphoric acid 87, potash compounds 77, unenumerated 20; dyes and tanning materials 40; plate and window glass 50 (each); rubber manufactures 37; scientific instruments 21; glue 56; starch 50; U.S.A. and Canada combined: varnish 43, white lead 86, red lead 72, all other paints 32 (British, pre-war, 90). Japan supplied one-half the china imported, and India is beginning to supply hides and linseed oil in addition to paraffin wax.

Exports.—The increase in the value of exports is due mainly to higher prices rather than increased quantities. Hides and skins valued at £4,971,650 were exported, compared with £2,010,000 in 1913, the respective weights being 71,300,000 lb. and 62,500,000 lb. The value of the diamond exports was £11,500,000, or nearly as much as in 1913. In 1913, wattle bark worth £309,000 was exported, mainly to Germany; the total value of exports is now £600,000, 13·75 million lb. of extract having been exported from the recently established factories in Natal. There are prospects of increased trade in coal as transport facilities have improved, 1,400,000 tons of bunker coal and 1,092,000 tons of cargo coal being exported last year.

Manufacturers are urged to join the South African Association of British Manufacturers formed last December on the lines of similar organisations in Australia, New Zealand, and Canada.

Report on the Post-War Economic and Industrial Situaton of Denmark. *Department of Overseas Trade. London: H.M. Stationery Office.* 1920. [*Cmd.* 955. 4*d*.].

The early years of the war brought prosperity to Denmark, for her agricultural products were in great demand at increased prices, and her merchant trade and shipping obtained greatly enhanced profits. With the progress of the war, however, trade continuously diminished, and by the the middle of 1918 it had almost come to a standstill. The margarine industry was particularly hard hit by the shortage of raw materials (*cf.* J., 1920, 322 R), and other manufactures greatly affected by the same cause were textiles, wool, soap, glass, rope, fertilisers, spirits, and beer. But little success was achieved in the production of substitutes. Although much wealth was accumulated in the prosperous period of the war, recovery after the armistice has been more difficult and slower than was expected, owing, in part, to the continued isolation of Russia, to currency depreciation in neighbouring Baltic countries, and to labour difficulties at home.

During 1919 every effort was made to replenish stocks. The oil-pressing industry and margarine factories were well employed, but, generally speaking, all industries suffered from the high price and scarcity of fuel. Available supplies of the latter are only about 50 per cent. of the pre-war annual average (3,000,000 t. of coal and 2,300,000 t. of coke, practically all from the United Kingdom), and, consequently, attempts have been made to import American coal, which, however, is slightly higher in price than the British. This situation has led to attention being paid to the development of the local peat resources, especially in regard to the quality of the peat sold, and to the use of oil as fuel.

The export trade in agricultural produce improved during 1919, but the importation of feeding-stuffs was below the pre-war average, and that of fertilisers was still less. The imports of fertilisers in 1919 were: Raw phosphate, 3500 tons; superphosphate, 6600 t.; artificial nitrate, 3600 t.; Chile saltpetre, 4800 t.; other fertilisers, 10,700 t. The sugar production was fairly successful, home requirements being covered and a small amount (3900 t.) exported. The leather industry is suffering from a depression of the market due to the enormous quantities of American under leathers brought in during 1919 for re-export to Germany and the Baltic markets.

By the end of 1919 the Danish market was overstocked with practically every class of goods, and as the great excess of imports over exports had practically exhausted Danish credits abroad, the outlook at present is not hopeful. Under normal conditions practically all classes of British goods find a market in Denmark, so that even if there is little prospect of immediate business, British firms should not lose touch with their Danish connexions. In general, it may be said that, with the high prices of raw materials on the world market and the high scale of wages ruling in the country, Danish industry as a whole has difficult times ahead.

Report on Economic Conditions and Prospects of Rumania at the end of 1919. *By* A. Adams, *Commercial Secretary to H. B. M. Legation, Bucarest. London: H.M. Stationery Office.* [*Cmd.* 828. 9*d*.]

From the industrial standpoint the best developed industries in Rumania are the petroleum, sugar, and timber industries. Before the partial destruction of the petroleum industry in December, 1916, there were 962 producing wells and 341 drilling wells, with a total daily production of 5000 tons. When the Germans left in December, 1918, these figures had fallen to 437,200 and 3000 respectively, and stocks had been reduced from 1,500,000 t. to 300,000 t. As the pipe-lines were badly damaged and railway transport was very inadequate, little or no oil could be exported during 1919. The smaller companies that do not refine could not obtain new equipment, and were awaiting compensation for damage done in 1916; they also suffered from the fact that the Government paid the refiners in local currency about 100 per cent. above pre-war normal exchange instead of many hundreds per cent. Until the Royal Decree, issued during the latter part of 1919, prohibited the purchase of oil lands, oil shares were booming on the Bucarest stock exchange, and although the actual industry was practically stagnant, a dozen new Rumanian oil companies were formed and nearly 100 million lei (lei=9½d.) was subscribed in the country, a fact without precedent. Thus during 1919 the oil industry was extremely unsettled; field and refining activities were held up for lack of transport; the rich companies were preparing ambitious schemes; and the smaller companies, including all the British companies, were occupied almost solely with their claims for compensation. The actual exports were:—Petrol, 26,188 t.; benzine, 2024 t.; gas oil, 4778 t.; fuel oil, 1200 t.; and crude petrol, 3600 t. All this was shipped on the Danube. Under more normal conditions the future of Rumanian oil should be very hopeful, as there still remain some 35,000 acres of proved and 350,000 acres of probable oil lands as yet untouched, and new wells are frequently being found. In 1913 the production of raw petroleum was 1,885,619 tons, and the export of petroleum and petroleum products 1,036,000 t., compared with about 37,700 t. exported in 1919.

As regards general trade, the total imports into Rumania in 1912 were worth about £25,500,000, and it is expected that with the accession of the new provinces this amount will at least be doubled. Therefore British exporters should attempt to gain a hold on the market before German and Austrian goods can compete, and even if the trade at first be small, it will expand with the economic growth of the country and future rewards will be great. The suggestion is made that British manufacturers should pay more attention to the appearance and packing of their goods, as these are the favourite criteria of the Rumanian consumer.

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for September 23 and 30 and October 7.*)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
Australia ..	Chalk, wax dry colours, shellac, enamel	443
.. .. ..	Dyes, gums, oils, varnish	444
British India ..	Cement	421,422
.. .. ..	Cement, glass, bottles, paint, varnish, soap	445
.. ..	Metals	446
British West Indies ..	Paint, varnish, soap	462
Canada ..	Glass, pottery	453
Cyprus ..	Glass, earthenware	410
Newfoundland	Tinplate	463
New Zealand ..	Paper	405
.. ..	Heavy chemicals	458
.. ..	Leather	459
South Africa ..	Metals, galvanised goods, rope ..	424
.. ..	Galvanised iron roofing, leather, glassware	*
Belgium ..	Sheet and strip tin	427
Germany ..	Oils, fats	415
.. .. ..	Hides, skins, rubber	433
Spain (Canary Isles)	Chemical fertilisers	473
China ..	Machinery for oil mills, tool-steel, dyes, paint, glass, chemicals ..	417
United States..	Charcoal, iron sheets	439
.. ..	Minerals, ores	475
.. ..	China, earthenware	476
Argentina ..	Glassware, pottery	418
Do. Chile, Peru	Perfumes, soaps	482
Brazil ..	Light chemicals, cement, paper ..	479
Central America	Chemicals, drugs, glass, crockery ..	486
Hawaii ..	Perfumes, soaps, inks	477
Peru ..	Linseed oil, paint, industrial chemicals	483
Uruguay ..	Paper, iron, steel, glass, earthenware, oils, glue, shellac, chemicals ..	485

* The South African Government Trade Commissioner, 90, Cannon Street, London, E.C.4.

Markets Sought.—A firm in Nova Scotia able to export barytes wishes to hear from importers in the United Kingdom.

A Canadian firm desires to get into touch with U.K. importers of pulpwood.

[Inquiries to the Canadian Government Trade Commissioner, 73, Basinghall St., London, E.C. 2.]

A firm in Czecho-Slovakia wishes to hear from U.K. importers of glassware and mineral colours. [412.]

A firm at Salonika desires to get into touch with importers of scrap metals. [435.]

TARIFF. CUSTOMS. EXCISE.

Antigua.—The export of sugar is prohibited save with the consent of the Governor.

Argentina.—The general provisions of the Law No. 11,022 increasing the customs duties came into force on July 1 with some exceptions.

It is proposed to suspend for one year the export duties on hides and skins.

Australia.—The customs and excise duties on beer and spirits have been increased.

Ammonium chloride for galvanising may be imported duty free under the British Preferential Tariff.

The export is now permitted of, *inter alia*, hides, leather, rubber, celluloid, certain acids, alkalis and salts, chlorine, bromine, iodine, certain tar distillates, acetones, methyl and ethyl alcohols, ether, glycerin, oils, fats, resins, turpentine, camphor, wood tar, tanning substances, lubricants, bones, soap, cork, asbestos, carborundum, mineral oils, and tinplate.

Austria.—The consumption duties have been increased on alcoholic beverages, mineral waters, sugar, matches, and mineral oils.

Belgium.—Articles 4 to 13 of the Law of June 10 relating to the method of assessing and levying the *ad valorem* duties came into force on October 1.

The import of sugar (except molasses) is prohibited.

Export licences are still required for alcohol, matches, foods (with some exceptions, including cocoa and edible oils), oilcakes, and soap.

Belgian Congo.—The import duties on spirits have been increased.

The export of gum copal containing more than 3 per cent. of gangue, earth, broken stone, vegetable waste, or other foreign substances is prohibited.

Canada.—The revised regulations governing the import, export, and inspection of preserved fruits, vegetables, and milk are set out in the issue of October 7.

Chile.—It is proposed to double the export duty on boric acid and borates.

France.—A supplementary "Turnover Tax" on imports of 1·1 per cent. has been levied, with some exceptions which include pharmaceutical specialities.

Greece.—All restrictions on the import of copper sulphate have been removed.

Particulars of the statistical duties on imports and exports are given in the issue of September 30.

Latvia.—The import of flax and linseed is duty free, but coconut oil and white tinplate are subject to a duty of 5 per cent. *ad valorem*.

Export duties have been levied on, *inter alia*, hides, chemicals, toilet soap, cement, glass, flax, linseed, and scrap iron.

The import is prohibited of alcoholic beverages (except wines), articles of gold, silver, and bronze, perfumes, toilet soap, and patent leather.

Madagascar.—The "coefficients of increase" on tinplate and cardboard have been modified.

Madeira.—Molasses containing not more than 55 per cent. of saccharose may be imported by manufacturers of sugar and alcohol up to 2000 metric tons at a duty of 60 centavos per 100 kg.

New Caledonia (French).—An export duty of 5 per cent. *ad valorem* has been levied on tallow.

New Zealand.—Recent customs decisions affect asbestos cord, "double nickel salts," cryolite, felspar and fluorspar powders, lead oxide, and quartz powder.

Nigeria.—The import duty on spirits is fixed at 15s. per imperial gallon, with an additional 5d. for every degree in excess of a strength of 40 per cent.

Northern Rhodesia.—The Customs Amendment and Excise Duties Extension Proclamation, 1915, continues in force until July 31, 1921.

Norway.—The import of hides and skins is prohibited.

Salvador.—The complete text of the law relating to the sale of pharmaceutical preparations may be seen at the Department.

Serb-Croat-Slovene State.—The monopoly tax on salt and petroleum has been increased.

South Africa.—It is proposed to amend the customs duties on, *inter alia*, asphalt, bitumen, pitch, heavy oil, fertilisers, paper, certain ammonium salts, and dyes.

Southern Rhodesia.—The customs and excise duties on spirits, perfumes, medicinal and toilet preparations containing over 3 per cent. of proof spirit have been amended

Spain.—Among the articles which pay a new "container" tax of 10 centimos per receptacle on importation are patent medicines and mineral waters.

For the month of October the rate of surcharge in respect of import duties when paid in Spanish silver or in notes of the Bank of Spain is fixed at 29·18 per cent.

Sweden.—The suspension of the customs duties on lard, margarine, and condensed milk is extended to November 30.

Switzerland.—A general export licence covers castor oil, boric acid, borax, certain acetates, ammonium chloride, oxalic acid, potassium oxalate, ether, acetic ether, arsenite of soda, sodium sulphite and bisulphite.

TRADE NOTES.

BRITISH.

Trade of Dominica in 1919.—The returns of Dominica show a very favourable balance of trade during 1919, the value of the exports having increased by £53,430, while the imports were of the same value as in 1918. The exports reached in value the highest figure yet recorded, being £256,789 as compared with £209,305 in 1918; of this total the lime industry contributed £194,022, and cocoa £37,293.

The lime industry is the premier industry of the colony and has made rapid strides during the past few years. Ten years ago the value of the crop was only £36,952, and now it is approximately £200,000. The bulk of the crop is converted into concentrated lime juice. There has been a decline in the output of citrate of lime for some years, but a demand arose in 1919 and a very much larger quantity than usual was manufactured. During 1919 products of the lime were exported as follows:—

Product.		Quantity.	Value. £
Concentrated lime juice ..	galls.	166,718	79,691
Raw lime juice	,,	298,312	25,089
Green limes	brls.	21,384	26,909
Pickled limes	,,	—	683
Citrate of lime	cwts.	6,772	38,593
Essential oil of limes	,,	—	13,737
Otto of limes	,,	—	9,320

In the last twenty years there has been a decline in the cultivation of cocoa. At one time the quantity exported was upwards of 600 tons, but in 1917 it had dropped to 150 tons. Since then an improvement has taken place, over 200 tons being exported in 1918 and 369 tons in 1919.—(*Bull. Dept. Trade and Com., Canada, Aug.* 16, 1920.)

The Paint and Varnish Industry in Canada.—An advance chapter of "Chemicals and Allied Products in Canada in 1918" has recently been issued by the Dominion Bureau of Statistics, Canada (Mining, Metallurgical, and Chemical Division), which contains very complete data concerning the paint and varnish industry. The total assets of this industry in 1918 were valued at $15,784,610, and the number of wage-earners was 1388, exclusive of 614 engaged in administrative or clerical positions. The principal materials used were valued at $9,203,530, and from them paints and varnishes valued at $17,678,049 were manufactured. In the same year Canada imported over 6 million dollars' worth of paints, varnishes, and materials used in the industry; of this sum one million was spent in gums, nearly two million in zinc white, and over one million dollars in rosin. The report can be obtained gratis on application to the Dominion Bureau of Statistics, Ottawa.

FOREIGN.

Chemical Industry of Basle.—The growth of the chemical industry in Basle during the last five years can be readily appreciated from the subjoined table, which gives the exports of chemical products in millions of francs:—

	1915.	1916.	1917.	1918.	1919.
Aniline dyes and indigo	31.2	57.8	97.6	98.0	136.0
Drugs and perfumery	24.5	32.2	33.7	29.5	39.9

During 1919, despite the abnormal exchange rates, the chemical works were kept busy supplying France and Belgium with dyestuffs; in fact the demand greatly exceeded the supply. Inability to increase output was due to transport difficulties, lack of raw materials, notably coal, and the introduction of the 8-hour working day. Manufacturers of artificial indigo, though hampered by the scarcity and high price of aniline oil, and faced with considerable British and American competition, were able to double the previous year's exports. Tannin extracts were in good demand, and sufficient raw material of good quality was obtainable. The position with regard to pharmaceutical chemicals was satisfactory: orders from armies in the field practically ceased, but the eastern European countries entered the market, though the effects of German competition began to make themselves felt. The market for patent medicines, however, was far from satisfactory, the low fluctuating exchange made the conditions of sale difficult, and the price often prohibitive, whilst the general uncertainty with regard to the legal rights concerning trade marks and trade names introduced other complications.

A report from the Commercial Secretary to H.M. Legation at Berne states that there has been a slump in the market in some parts of the world, notably the East, but the present demand for aniline dyes exceeds the available supply. Despite slight variations in the price of raw materials, the price of colours has remained fairly constant during the latter half of the year.—(*Bd. of Trade J., Sept.* 16, 1920.)

Bulgarian Otto of Roses.—From 1900 to 1912, the area devoted to the production of otto of roses in Bulgaria was 20,000 acres, but by 1919 it had fallen to 15,000 acres. Similarly, the average yearly production decreased from 126,800 oz. in 1900—1912 to 52,000 oz. in 1919, and further decreases are expected as much of the land is now growing tobacco and cereals. Owing to the inability to export during the war, stocks in hand amounted to 275,000 oz., about 40 per cent. of which was of poor quality. A third of the stocks was exchanged in 1919 with the United States for necessities of life, and it is estimated that only 50,000 oz. of otto, worth about £100,000, is now available. The recent decline in prices is attributed to the accumulation of stocks in

England and America, and in the latter country, where stocks sufficient for three or four years are said to exist, the situation is complicated by the fact that in many cases otto of roses has been replaced by the synthetic product. However, although otto of roses, by reason of its more delicate perfume, will always be able to compete with the artificial product, it is suggested that the best way to protect the industry lies in centralisation, thereby avoiding unnecessary expenses.—(*Chem. Ind., May* 26; *Z. angew. Chem., Sept.* 21, 1920.)

Italian Production of Copper Sulphate in 1920.—The requirement of Italy in copper sulphate varies from 70,000—75,000 metric tons per annum. The production in 1920, up to June 15, was 73,000 t., and that for the whole working year, which continues until July 15, is estimated at about 80,000 t. As 15,000 t. was left over from 1919, the needs of the Italian vine growers are amply secured for 1920.—(*U.S. Com. Rep., Sept.* 3, 1920.)

Foreign Company News.—*Holland.*—A company with a capital of 5 million florins (florin= 1s. 8d.) has been established at the Hague for the purpose of manufacturing coal-tar dyes.

France.—The "Produits Azotés" company is to increase its capital from 10 to 20 million fr., and the "Enterprises Simon Carvès" from 8 to 12 million fr.

The "Société Chimique de Garland" has ratified the proposal to absorb the "Société Electro-Métallurgie du Zinc," and will double its present capital of 1,600,000 fr. by the issue of 16,000 shares of 100 fr. each, 2000 shares being reserved for the shareholders of the latter company.—(*R. Prod. Chim., Sept.* 15, 1920.)

A syndicate, entitled "Union des Producteurs et des Consommateurs pour le Développement en France de l'Industrie des Produits Chimiques, Pharmaceutiques de Synthèse, Sels de Quinine et Ecorces de Quinquina," has been founded at Paris to purchase, import, distribute, and dispose of chemical-pharmaceutical products, and to assist scientific institutions, including State-owned and private research laboratories.—(*Z. angew. Chem., Sept.* 3, 1920.)

United States of America.—One of the largest chemical manufacturing corporations of the world will result from the projected amalgamation of the General Chemical Co., the Barrett Co., the National Aniline and Chemical Co., the Solvay Process Co., and the Semet-Solvay Co. The new company will be known as the Allied Chemical and Dye Corporation, and, it is stated, its capital will not exceed \$65,000,000 in 7 per cent. cumulative preference shares and 3 million shares of common stock.

New Japanese Duty on Dyestuffs.—The Japanese Diet recently passed a new duty on dyestuffs, which will now be charged 35 per cent. *ad valorem*, instead of only a few sen a pound. In the case of costly dyes this means a rise in price of several hundreds per cent., though the duty was specially designed to protect Japanese makers of the cheaper sorts. The result is to all intents a tax on Japanese printed goods, and it seems probable that foreign dye makers will only be harmed to the extent to which the Japanese export trade in coloured goods suffers (*cf.* J., 1920, 327 R).—(*Ch. of Comm. J., Sept.* 10, 1920.)

Economic Conditions in Cuba.—Now that the grinding of cane of the 1919–20 sugar crop has finished, it is possible to estimate its quantity. This is placed at 3,650,000 tons, compared with 3,971,594 t. in 1918–19, the decrease being caused mainly by deficient rainfall, but partly by fires. Owing to the exceptional conditions in the sugar market, Cuba continues to experience unparalleled prosperity; but in view of the increased salaries paid to civil servants it has been found necessary to impose additional taxation, including new taxes on stamps and bills of exchange, a 6 per cent. tax on mining profits, a profits tax of 4 per cent. on industrial undertakings; and a tax on sugar.

In 1919 the share of the United States in Cuban trade was over 76 per cent. for both exports and imports; the United Kingdom took about 14 per cent. of the exports and supplied less than 3 per cent. of the imports; the position in the latter respect appears to be slowly improving.—(*Bd. of Trade J., Sept.* 9, 16, 1920.)

The Uyuni Mining District in Bolivia.—The Uyuni District of Bolivia, which lies almost midway between Antofagasta and La Paz, is an important mining centre. The Pulcayo mines are among the most important, and produce silver, lead, zinc, and copper. A British company, with headquarters and reduction plant at Quechisla, owns mines at Chocaya, Chorolque, and Tasna, and produces bismuth (of which it has a virtual monopoly in Bolivia), tin, silver, and antimony; tin is also produced by a Chilean company with mines near Chocaya. The mines buy large quantities of goods, such as lumber, cement, oils, galvanised iron, dynamite, tools, and machinery, practically all of which are of American origin. All the trade of this district passes through Antofagasta.—(*U.S. Com. Rep., July* 20, 1920.)

Brazilian Rubber Trade.—According to a report in Willmar's "Brazilian Review" there has been a decrease in the output of raw rubber from Brazil during the first six months of 1920. Of 18,203 tons exported from the Amazon basin, 9849 tons have been of fine quality, 1007 tons of medium, 3175 of coarse, and 4172 tons of caucho. Compared with the corresponding period of last year there has been a decrease of 8·7 per cent., or 1690 tons. This is accounted for by the fall in exports to Europe of 2000 tons and an increase in American consumption of 701 tons. Of the total exported, 30·4 per cent. went to Europe and 69·6 per cent. to the United States, and of fine Para Europe took 44·2 and America 55·8 per cent. In the case of the caucho America consumed 88·8 per cent. and Europe only 11·2 per cent.—(*India-Rubber J., Sept.* 4, 1920.)

Paraguay in 1919.—The chief source of wealth in Paraguay is the cattle industry, and though farming is in an undeveloped state, with proper encouragement sugar and cotton crops should become important, both climate and soil being favourable. The production of refined sugar in 1919 was 2,490,393 kg., against 561,820 kg. in 1917, and 2,559,000 kg. in 1914; the annual consumption of sugar is about 3 million kg. The cotton crop only averages about 1000—2000 bales of lint cotton, and therefore cannot be considered of much commercial importance. Attempts are being made, however, to encourage the cultivation of the crop and to improve market conditions.

The exports in 1919 were valued at 14,816,117 pesos (peso=3s. 11½d.) and included:—Tallow, 483,729 kg.; orange oil, 37,976 kg.; quebracho extract, 32,876,077 kg.; groundnuts, 23.841 kg. (1918); and 256,958 hides. Of the exports Argentina took 56. Spain 10, and the United Kingdom 4·6 per cent.

The value of the imports in 1919 was 15,835,970 pesos, some of the chief items being:—Chemicals, drugs, mineral oils, and paints, 805,494 pesos; china, earthenware, and glassware, 125,013 pesos; hides and skins, tanned, 61,656 pesos. Argentina furnished 42·8 per cent. of the imports, a large proportion not being of Argentine origin, whilst the United Kingdom and the United States furnished 24·7 and 17·2 per cent., respectively.—(*U.S. Com. Rep. Suppl., July* 22, 1920.)

The Resources of Tumaco, Colombia.—Tumaco, Colombia, is the trade centre for the district south of Popayan in the Department of Cauca and for the Department of Narino. Amongst the products of the region served by Tumaco are rubber, chicle, corozonuts and gold dust, but lack of labour and transport facilities makes exploitation difficult. The value of the exports from Tumaco in 1918 was £247,380, and included corozonuts £49,174, rubber £45,191, and gold dust £32,048, all of which were taken by the United States. The exports for the first six months of 1919 were valued at £115,073, of which the United States took 82 per cent.—(*U.S. Com. Rep., May* 28, 1920.)

Coal-Tar Dyes in Argentina.—The following table gives the importations of aniline dyes (in kilogrammes) into the Argentine Republic during the period 1910—1918:—

	1910-14.	1915.	1916.	1917.	1918.
Germany	848,032	2,365	117	40	—
Belgium	29,554	541	—	—	—
United Kingdom .	8,063	4,401	1,877	1,397	7,593
France	52,664	316	2,880	3,381	10,067
Italy	26,942	1,504	113	736	—
Switzerland ..	42,969	18,550	22,376	24,241	15,835
United States ..	3,961	7,513	27,292	97,109	247,257
Other countries ..	6,372	2,181	10,258	6,795	3,676
Total (kg.) ..	1,018,557	37,371	64,913	132,699	284,428

REVIEWS.

Food Inspection and Analysis. *By* A. E. Leach. *Revised and enlarged by* A. L. Winton. *Fourth edition. Pp.* 1099, *with* 41 *plates. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1920.) *Price* 45*s. net.*

This new edition, the fourth within sixteen years, retains the order, arrangement, and most of the illustrations of the old, and apart from the insertion of new matter, the most conspicuous change is the substitution of footnotes for lists of references at the end of each chapter.

The book is naturally written from the American standpoint, and although the scientific problems confronting the American public analyst are similar to those arising here, the widely different laws and methods of administration in the two countries are necessarily reflected in the contents of a book of this kind.

The American public analyst, with the authority of a powerful Government Department behind him, is obviously more favourably situated than his *confrère* over here, who is hampered by worn-out laws and the vagaries of apathetic or even hostile local authorities. The outstanding feature, however, of the American system of food control is the existence of legal standards or definitions of purity for all the important articles of food, which although not framed so as to exclude all forms of adulteration, nevertheless serve to cut a number of Gordian knots which in this country have to be unravelled by the costly machinery of the law. About 70 such standards have now been fixed, and although some are merely verbal definitions, the majority embodies analytical figures with which the articles have to comply, thus greatly simplifying the routine work.

Nothing like a critical review is possible in the short space at our disposal. The thorough and practical spirit in which the book is written will impress the reader at once. Essential details are rarely omitted, and references to other sources of information are numerous, but it is difficult to avoid disappointment at the comparatively scant attention paid to the literature of this country, which may with justice claim to be one of the pioneers in this branch of chemistry. The omissions in this respect seriously detract from the valur of the book, especially to British readers. Although the American and Canadian bulletins are constantly referred to, the official publications of our Government are rarely mentioned. The revised alcohol tables of Sir Edward Thorpe, the new Original Gravity tables of Thorpe and Brown (1915), the Report of the Commission on Potable Spirits (1909), that of the Commission on Arsenical Poisoning (1903), and the mass of work by Chapman and others on this important subject all appear to have escaped notice, as well as a number of the valuable reports of the Local Government Board, including the following: "On Tin in Certain Canned Foods" (1908), "On the Facing of Rice" (1909), "On Calcium Sulphate in Baking Powders and Self-raising Flours" (1911), "On the Bleaching of Flour" and "On the Addition of Improvers to Flour" (1911), and reports on condensed and dried milks issued in 1914 and 1918.

Apart from official documents, recent English papers dealing with the methods for the detection or estimation of arachidic acid, tannin, caffein, and saccharin, and much new informative work on the analysis of margarine mixtures and on cocoa and cocoa-shell powder have been entirely overlooked, and the book is the poorer as the result.

If omissions such as these be disregarded, the new issue is deserving of the highest praise. There is hardly a subject within the scope of the title which has not been dealt with, and with very few exceptions space has been allotted with excellent discrimination to the innumerable topics included in such a comprehensive work. Occasionally the American genius for mechanical appliances has been allowed to run riot; some of the photomicrographic illustrations are too confused and indistinct to convey any useful information, and at times our etymologists will be shocked by the spelling; but these are small defects in what is, after all, the best single volume on the subject in our language.

Cecil H. Cribb.

The Extra Pharmacopœia. *By* W. Harrison Martindale *and* W. Wynn Westcott. *Seventeenth edition in two volumes. Vol. I. Pp.* 1115. *(London: H. K. Lewis and Co., Ltd.* 1920.) *Price* 27*s. net, post free* 27*s.* 6*d.*

This little pocket volume is truly a "multum in parvo," containing as it does the fullest information on every drug and chemical used in medicine, with references to its composition, properties, and therapeutic uses. It is essentially the physician's *vade mecum*, but comprises details useful to the pharmacist and the manufacturer. The new edition is thoroughly up-to-date, and, among other topics, deals with the treatment of wounds by the newer antiseptics largely used during the war, such as eusol, acriflavine, malachite green, chloramine, etc. Sections are included on vaccines and serums, colloidal metals, arsenobenzol, vitamines, and organotherapy. The chief materia medica are arranged alphabetically, the preparations of each being under the heading of the drug. A therapeutic index of diseases and the remedies employed therein occupies some 60 pages and an excellent general index covering nearly 100 pages completes the volume.

Particular attention is drawn to the organic synthetic remedies introduced before the war by German chemical manufacturers, who simultaneously registered an invented name as a trade mark, the effect of which was to create a complete monopoly of manufacture. The objects of the Patent, Designs and Trade Marks Act (1914) and the new Act of 1919 are briefly set out and a list of the medicinal drugs is given, the trade marks of which have been avoided. Scattered through the volume are the chemical names of many of these organic chemicals, with references to the patent literature, their chemical composition, and in many cases details of manufacture based on actual experience. The prescribing of these drugs by their chemical names would greatly assist in giving preference to British products.

The analytical and bacteriological sections will be dealt with in Volume II., which will be published shortly.

It is somewhat difficult to criticise fairly such a mass of information as is presented in this book. A close study of it, however, has revealed few printer's errors, and the proof-reading appears to have been very carefully done.

The arrangement of the work is excellent, the details are concise to a degree, and no unnecessary matter has been included. To the practitioner and the pharmacist this volume is essential for daily reference, and to the consulting chemist we can thoroughly recommend it as a most useful addition to his library.

C. T. Bennett.

Les Colloïdes Métalliques: Propriétés et Préparations. *By* Paul Bary. *Pp. viii.*+95. (*Paris: Dunod.* 1920.) *Price 5fr. 50cts.*

Beyond a theoretical introduction, which might have been written ten years ago, and some descriptions of apparatus for the electric dispersion of metals, designed by the author, this book contains hardly anything which is not to be found in Svedberg's classical "Die Methoden zur Herstellung kolloider Lösungen anorganischer Stoffe." It is also necessarily much less complete, since the latter work runs to 499 pages of text, of which probably two-thirds is devoted to metal sols. Almost a third of the book under review is taken up with electric methods of dispersion, the importance of which hardly justifies such a ratio Within its limitations the treatment is clear and simple, and the work may possibly be of some slight use to readers who do not read German.

The author's desire to avoid reference to modern German authorities sometimes leads him into strange courses. Thus the standard method of determining the size of ultramicroscopic particles is credited to Pöschl (!), the author of a small introduction to the subject. In many cases names are wrongly given, *e.g.*, Helmoltz instead of Helmholtz, Kutspert and Küstpert instead of Küspert, Oeschner instead of Oechsner, Wohler instead of Wöhler, etc.

The last chapter, as appears to be the fashion, is devoted to "applications," of which, however, only two are treated, viz., catalysis and therapeutic applications. A table giving "Catalytic reactions obtained with platinum and metals of the platinum group" fills six pages, although from internal evidence most of the investigations quoted were certainly not carried out with colloidal metals. The remarks on the therapeutic uses of metal sols lack all authority and repeat statements which have become familiar from what might be called trade literature, *e.g.*, that "only those colloidal suspension which clearly show Brownian movement are considered efficacious." The object of such assertions is primarily to "épater les bourgeois," and it would be interesting to know what attitude their authors take towards the manufacture and use of a standard preparation like "Ferrum hydroxydatum dialysatum" or of amicroscopic palladium sol, in neither of which particles—nor, *à fortiori*, Brownian movement—are visible.

Emil Hatschek.

Corrigendum.—The period covered by the statistics for Canadian trade on p. 136 R (Apr. 15, 1920) should be Jan. 1919 to Jan. 1920.

OBITUARY.

F. C. TIPLER.

We regret to record the death, at the age of 56, of Frederick Charles Tipler, for 21 years chief chemist to the London and North Western Railway Company. He was recognised as an authority on all chemical matters affecting the railways. His last work was in connexion with oil-fired locomotives, his experiments being interrupted last May by the illness which terminated fatally on September 20. He had been a member of this Society since 1894, and his death is a distinct loss to applied chemistry.

PUBLICATIONS RECEIVED.

Electro-Deposition of Metals. *By* G. Langbein. *Translated, with additions, by* W. T. Brannt. *Eighth edition, revised and enlarged. Pp.* 863. (*London: Hodder and Stoughton, Ltd.* 1920.) *Price* 42*s*.

The Principles of the Phase Theory. *By* D. A. Clibbens. *Pp.* 382. (*London: Macmillan and Co., Ltd.* 1920.) *Price* 25*s*.

The Carbohydrates and Alcohol. *By* S. Rideal and Associates. *Industrial Chemistry Series, edited by* Dr. S. Rideal. *Pp.* 219. (*London: Ballière, Tindall and Cox.* 1920.) *Price* 12*s*. 6*d*.

A Laboratory Outline of General Chemistry. *By* H. N. McCoy *and* E. M. Terry. *Pp.* 155. (*New York and London: McGraw-Hill Book Co., Inc.* 1920.) *Price* 7*s*. 6*d*.

Memoirs and Proceedings of the Manchester Literary and Philosophical Society. *Vol.* 63, 1918—1919. *Price* 12*s*.

Digest of Comments on the Pharmacopœia of the United States of America and on the National Formulary for 1915 and 1916. *By* A. G. DuMez, *Hygienic Laboratory, United States Treasury Department. Bulletins Nos.* 118 *and* 119. (*Washington: Government Printing Office.* 1919.)

Publications of the United States Bureau of Mines. (*Washington: Government Printing Office.* 1919):—

Removal of the Lighter Hydrocarbons from Petroleum by Continuous Distillation. *By* J. M. Wadsworth.

Experiment Stations of the Bureau of Mines. *By* Van H. Manning.

Determination of Molybdenum. *By* J. P. Bonardi *and* E. P. Barrett. (*Tech. Paper* 230.)

The Properties of Some Stoneware Clays. *By* H. G. Schurecht. (*Tech. Paper* 233.)

Indicators for Carbon Dioxide and Oxygen in Air and Flue Gas. *By* L. H. Milligan, D. O. Crites, *and* W. S. Wilson. (*Tech. Paper* 238.)

Publications of the United States Geological Survey. (*Washington: Government Printing Office.* 1919):—

Mineral Resources of the United States, 1916. Part I., Metals; Part II., Non-Metals.

Bibliography of the Metals of the Platinum Group, 1748—1917. *By* J. L. Howe *and* H. C. Holtz. (*Bulletin* 694.)

The Analysis of Silicate and Carbonate Rocks. *By* W. F. Hillebrand. (*Bulletin* 700.)

CHEMICAL STANDARD SAMPLES.

C. O. BANNISTER.

During recent years a considerable amount of interest has been taken in the question of the supply, certification, and distribution of chemical standard samples, and this interest has been shared by several of the British societies directly or indirectly interested in particular branches of analytical chemistry. The Iron and Steel Institute has committees engaged in the preparation of iron and steel standards; these are probably the most important at the present time owing to the fact that similar standards have for years been largely used in steel-works laboratories, and their function and value are therefore well understood. The Institute of Metals has a committee considering standards for non-ferrous metals; the Institute of Chemistry and the Society of Public Analysts have also committees appointed to consider the desirability of making provision for supplies of standard chemical substances, and have issued a preliminary report (J. Inst. Chem., 1920, 169). The Society of Chemical Industry has been represented at a conference dealing with the subject, and at a meeting of the Birmingham Section a paper on Chemical Standards by Messrs. C. H. and N. D. Ridsdale was read and discussed (*cf.* J., 1919, 15 T). The first serious attempt to undertake the preparation of a series of standard samples of steel was the result of a suggestion made at the Bath meeting of the British Association, in 1888, by Prof. J. W. Langley. The object was to prepare international standards to control the analysis of iron and steel, and a committee was formed which published reports during the following five years. This committee co-operated with similar committees in several of the most important iron-producing countries, and definite instructions were agreed to in respect of the method of preparation and preservation of the samples obtained. As a result of this committee's work, five samples were prepared, four by Prof. Langley and one by Dr. Stead.

The samples were submitted to several prominent authorities in this and other countries, and the results obtained were found to be in close agreement. These samples, in the form of drillings contained in hermetically sealed glass tubes to prevent oxidation, were retained in the custody of the British Association, and are still available as standards. One serious objection to these samples is that they are too coarse for the requirements of modern methods of analysis. In considering the further development of standard samples, it must be remembered that these have been prepared for special purposes by many professional chemists, and have been largely used to clear up discrepancies which have been found to occur on the same sample from time to time between one laboratory and another. In the majority of cases these standard samples have been prepared and very carefully analysed in one laboratory only, but in a few cases the prepared samples have been analysed by several independent chemists in order to obtain authoritative results.

After the issue of the international standard samples of steel by the British Association the most important series was prepared by the American Foundrymen's Association. These consisted of four sets of standardised pig irons, and were placed under the control of the Bureau of Standards, Washington, in 1905, thus acting as a commencement to what has proved to be an important branch of the work of the Bureau. From this date the Bureau has been actively engaged in the preparation, examination and supply of standard samples of iron, many classes of steel, various alloys, etc.

In this country much work has been done by Messrs. Ridsdale, of Middlesbrough,* who have been actively engaged not only in advocating an extended use of standard samples, but also in preparing and issuing such samples after analysis by representative co-operating chemists, together with certificates showing results obtained and methods used. Messrs. Ridsdale have done pioneer work as the organisers of a movement for the supply of standards which have an authoritative value to chemists interested in iron and steel analysis, and have been fortunate in obtaining the active support of many steel chemists of repute both in this country and abroad. As this organisation actually issued 1826 portions of standard samples between September, 1916, and September, 1919, it will be realised that it has been responsible for most of the supply of certified standards in this country.

The value of properly prepared standard samples is undoubted, but unfortunately the discussion of the subject has frequently been confused by the introduction of questions relating to the standardisation of methods of analysis, questions upon which the opinions of well-qualified and competent chemists are not in agreement.

The chief uses of standards are for checking analytical work and methods of analysis, for settling and avoiding disputes, for standardising volumetric solutions, and for the trial and development of new methods of analysis. It is thus evident that standards may be an invaluable aid to the advancement of methods of analysis. On the other hand, the introduction of standardised methods of analysis, unless revised frequently, is liable to have a retarding effect on improvements, as they find their way into specifications which may be used for years and thus become irksome to independent qualified chemists.

For the standards to be of any value whatever, great care is necessary in their selection, preparation, and analysis, and this has been recognised from the first. Homogeneity is of the utmost importance in the original material, and has always received very careful attention. Fortunately our present knowledge of the possibility of segregation in steels and other alloys, and of methods for detecting it in the original ingots or billets, minimises the probability of segregation affecting the final samples. The size and nature of the final samples are also of considerable importance and have not always received the necessary care. In the case of metalliferous samples, drillings, millings, or turnings are most suitable, and these should be of such a size that they may be weighed out readily to definite accurate amounts, should be attacked quickly by acids and, in the case of steel samples, should be capable of being burnt throughout in the combustion furnace during the determination of carbon.

In some cases it is found that in preparing particles sufficiently small a considerable amount of dust is produced, the analysis of which varies considerably from that of the main sample in the case of some of the constituents. The best practice is to sieve off this dust during the preparation of the samples, as it should be remembered that the problem is to prepare homogeneous standards and not necessarily that the standards should represent the original material.

The analytical results reported as representing the standards are of paramount importance, and in all the organised attempts to prepare standard samples great care has been taken to obtain authoritative figures. The British Association standards were submitted to five well-known chemists in this

* See Report on the First Three Years' Working of the Movement. Published by the Organisers, British Chemical Standards, 3, Wilson Street, Middlesbrough, 1920.

country whose results were in close agreement, and, in addition to this, were analysed by a number of chemists in each of the countries interested in the matter, and so became true standards of international value. In the case of the Bureau of Standards' samples, the analyses are made by commercial chemists, works chemists, and the Bureau chemists, and not until concordant results have been obtained are the samples issued. Messrs. Ridsdale have from the first recognised the imperative necessity of results which buyers, sellers, and independent chemists would accept, and have obtained analyses from referee analysts, works chemists, users' chemists, and in many cases from Government chemists also. The committees of the Iron and Steel Institute are following on similar lines in order to obtain results as accurate as possible.

The American Bureau has not confined its attention to standards of iron and steel but has prepared samples of various ores, including those of iron, manganese, zinc, etc., and has also taken up the important question of the supply of materials of great purity for various purposes. As an example of the necessity of the latter, may be mentioned the use of pure metals for the calibration of pyrometers, etc., and in this connexion the Bureau already supplies pure tin, zinc, aluminium, and copper. It has been proposed that the National Physical Laboratory should supply the needs of this country in this direction. The Bureau also supplies pure chemicals—for example, sucrose as a calorimetric and saccharimetric standard, and benzoic acid and naphthalene as calorimetric standards. It seems desirable that similar substances, standardised and guaranteed of a definite degree of purity, should be available in this country also. Lastly may be mentioned the supply of cement of standard fineness by the Bureau. This standard is supplied at a very cheap rate and is of great value for testing sieves. Only those who know the difficulties of obtaining sieves of uniform mesh at the present time will realise the value of a reliable standard of fineness, especially in the case of sieves used to control the fineness of material subject to a rigid specification.

The history of Messrs. Ridsdale's enterprise here and of the activities of the Bureau of Standards in America indicate that there is a field for the development of this work, and it is to be hoped that the interest being taken in the matter by the various societies will eventuate in something definitely useful. The active demand for American and British chemical standards is proved by the fact that several of those already issued have been exhausted and replaced, in spite of the fact that large quantities were prepared in the first instance.

THE CELLULOID INDUSTRY.

F. SPROXTON.

The employment of celluloid in the arts and manufactures during the comparatively short time since its discovery in 1855 has continually increased, and it now extends to many industries where the general public would hardly expect to find it. Originally it was looked upon chiefly as a material in which it was possible to imitate various expensive natural products, such as ivory and tortoiseshell; but, as has happened in so many other cases, cheapened production and the inventiveness of manufacturers have made outlets for the commodity which were not foreseen by its discoverers. History has repeated itself in this respect in the case of more than one "celluloid substitute," which has failed to replace celluloid, but has found room for economic existence by the side of it. The chief raw materials of celluloid manufacture are cotton cellulose, sulphuric and nitric acids, camphor, and alcohol, so that the United States, Egypt, Spain, Chile, Japan, China, and the West Indies all contribute, directly or indirectly, to the production of the material. Disturbances of trade in any of these countries affect the celluloid manufacturer.

The process of manufacture consists briefly in nitrating cotton cellulose, usually in the form of paper, with a mixture of sulphuric and nitric acids, the nitrogen in the nitrocellulose produced amounting on the average to 10·7 per cent. The nitrocellulose is bleached, thoroughly washed and dried, and then gelatinised with a mixture of camphor and alcohol which converts it into a stiff jelly. At this stage the pigments and dyes required for producing coloured materials are added. The material is manipulated on hot rollers and pressed into blocks or extruded from special machines in the form of tubes or rods. The blocks are sliced on planing machines into sheets which are seasoned in warm stoves to drive off excess of volatile solvent. Seasoning is completed when the loss of weight has become inappreciable. A high polish can be imparted by pressing the sheets between heated polished plates. An important section of the industry is the utilisation of scrap celluloid, which is sorted over, softened in appropriate solvents, and re-worked in the same manner as new celluloid.

The demand for celluloid in normal times varies in proportion to its cost more largely than is the case with most commodities. If it were expensive, it would compete only with comparatively scarce natural materials such as real tortoiseshell and ivory, which are used principally in the manufacture of articles of luxury. Cheap celluloid, partly in virtue of its adaptability to various industrial operations, competes with ebonite, glass, metals and wood, and the demand is correspondingly enlarged. It is used for such diverse purposes as cutlery handles; articles of toilet such as combs, brushes and mirrors; pumps, mudguards, windscreens, and other motor and cycle accessories; telephone mouthpieces, eyelets for boots and shoes, accumulator cases, cutting plates for the stationery trade, and as a component of other articles such as scientific and drawing instruments.

Celluloid cinematograph film absorbs a large quantity of celluloid, but it is made from a more highly-nitrated cellulose, and the proportion of camphor in it is considerably smaller than in ordinary celluloid. This accounts for the greater fierceness with which it burns. The inflammability of celluloid is fortunately well known, and this fact is in itself no inconsiderable safeguard against accidents. The whole question of the danger due to the inflammability of celluloid was investigated by a Departmental Committee of the Home Office in 1913.

The extent to which celluloid was used as a war material was a surprise even to many of those engaged in the industry. For a considerable time England was the only one of the Allied countries in Europe where the manufacture was carried on, and the demand for accumulator cases, eyepieces and transparent screens absorbed a very large proportion of the output. If the manufacture of celluloid had not been carried on vigorously in England prior to the war, it would probably have achieved the doubtful honour of being described as a "key" industry.

In times of peace, celluloid is manufactured in the United States, Germany, and France, as well as in the United Kingdom. The industry is also being developed in Japan (*cf.* J., 1920, 14 R, 176 R). There is therefore no lack of internal competition. Its chief external competitors are vulcanite and ebonite, and casein products such as galalith. These products are made from casein hardened with formaldehyde, and though they have many mechanical disadvantages compared with celluloid, they compete strongly in the manufacture of coarse articles such as buttons and cheap combs. The phenol-formaldehyde condensation products, of which "bakelite" is a type, surpass celluloid in transparency, but tend to be brittle and resinous. They have found other outlets, *e.g.*, in the manufacture of electrical insulators, which do not seriously affect the demand for celluloid. Viscose, which at first glance would appear to be a serious competitor to celluloid, is affected by water, and the difficulties attending its conversion into massive form have not been overcome; it has, however, found unlimited scope in the manufacture of artificial silk. Lastly, there is acetylcellulose or cellulose acetate, to which public attention has been drawn for a variety of reasons during the last two years, although it has been known for at least twelve. No one is more alive than the celluloid manufacturer to the fact that the chief, almost the only, drawback to celluloid as an article of commerce is its inflammability, and no one examines a new material which claims to eliminate this drawback with more care or with a keener appreciation of what such a material would be worth if the claims made for it could be substantiated.

The properties of ordinary celluloid which create the demand for it are chiefly its capacity for taking delicate colours, its low specific gravity, its adaptability for operations such as sawing, turning, drilling, polishing, moulding and blowing, its toughness and elasticity, its uniformity, and its comparatively low cost. Acetylcellulose fails chiefly in respect of uniformity, toughness, and cost. The lack of uniformity may be due to the difficulty of accurate temperature control during acetylation of the cellulose. As is generally known, acetylcellulose is soluble in the acetylation mixture, so that the product of acetylation is a highly viscous solution of acetylcellulose in acetic acid. Temperature control under such conditions is a matter of extreme difficulty. The want of toughness, using that word to signify a combination of tensile strength and elasticity without brittleness, is probably due to the length of time required for acetylation and the profound disintegration which the parent cellulose structure must undergo during the process. The chief ultimate product of the acetolysis of cellulose is an esterified sugar, and although in the preparation of acetylcellulose the degradation of the cellulose is stopped long before this point is reached, the transition from colloid to crystalloid has progressed considerably further than is the case in celluloid manufacture. Hence, as would be expected, the brittleness which one associates with the crystalline state of matter begins to show itself, and the addition of "softeners" creates the quality known in the trade as "leatheriness" in proportion as it reduces the brittleness. The effect on output of want of uniformity and deficiency in strength, in a factory devoted to the rapid manufacture of celluloid articles on up-to-date machines, is evident.

Lastly, there is the question of cost. The yield of acetylcellulose is rather greater than that of nitrocellulose from the same weight of cellulose, but this is more than set off by the higher cost of acetic anhydride and acetic acid compared with that of nitric acid. The cost of the fillers used in the manufacture of acetylcellulose material (corresponding to the camphor in celluloid) may, in some conditions of the market, reduce the relative price a little, but it is still considerably higher than that of celluloid, and, quite apart from manufacturing difficulties, commercial experience shows that the public will pay very little, if any, more for articles of non-inflammable celluloid. The position at present is that acetylcellulose must be regarded as a material whose capacity for competing with celluloid in the manufacture of solid articles is not proved. Its possibilities cannot be denied, but the smallness of the impression it has made on the position of ordinary celluloid in a campaign of twelve years has a significance which cannot be overlooked.

Acetylcellulose has, however, come into considerable prominence as the base of aeroplane dopes. The reasons for the preference given to it over nitrocellulose for the purpose are stated to be its non-inflammability, and the property it imparts to dopes of shrinking considerably during drying, thereby drawing the fabric taut. The problem of producing a nitrocellulose dope with this property was, however, never placed before the celluloid industry during the war, so that probably it was on account of its non-inflammability that the preference was, quite rightly, given to it. The development of civil aviation will no doubt favourably affect its production

Of recent years the growth of colloid chemistry has attracted to the celluloid industry a degree of attention which celluloid chemists find somewhat embarrassing. The truth is that technique in the celluloid industry is far ahead of theory. The industrial chemist who works with gases, liquids or crystalline solids has at his disposal a mass of exact data, expressed in more or less exact laws, which give some notion how to proceed when faced with a new problem. The celluloid chemist has few scientific data at his disposal, and most of the data he has are only qualitative. The manufacture of celluloid itself (apart from solutions of celluloid) is confined to the most difficult zone of the colloid state, namely, the transition from a viscous gel to a solid. Hence the chemistry of celluloid manufacture is directed chiefly to the analytical control of raw materials and the maintenance of the exact conditions of reaction shown to be best by many years of experience.

The most interesting chemical fact in the industry is the unchallenged position of natural or synthetic camphor as the solid "solvent" for celluloid. The position rests on a unique combination of properties. It is a ketone, which in alcoholic solution forms a strong solvent for a wide range of nitrocelluloses. It is colourless, and remains so on exposure to light. Its solubility in every organic solvent is a great technical convenience, and its odour is pleasant to all but a few patentees of substitutes. Many other compounds have been proposed from time to time to replace camphor in celluloid, some of which have been employed in comparatively small quantities, but camphor is still as much of a necessity to the industry as ever, and it is greatly to be regretted that the cultivation of the camphor laurel has not been seriously developed in some part of the British Empire.

NEWS FROM THE SECTIONS.

MANCHESTER.

The Annual Dinner of the Section will be held at the Grand Hotel, Manchester, on Friday, November 26, at 7 p.m. It is anticipated that the President of the Society, the Lord Mayor and Lady Mayoress of Manchester, and the Mayor and Mayoress of Salford will be present. Ladies are specially invited to accompany members. As the accommodation will be limited, applications for tickets, with remittance (12s. 6d. each, exclusive of wine), should be made at once to Mr. L. Guy Radcliffe, at the College of Technology, Manchester.

CANADA.

For the first time in its history the Canadian National Exhibition included this year a section devoted to industrial chemistry. The exhibition is held each year at Toronto, and as the attendance is now annually over one million, several chemical and allied manufacturers of the Dominion, aided by the Canadian Section of the Society of Chemical Industry, decided that the time had come when the chemical industries should be represented. Accordingly a section was secured in the Industrial Building, and a number of firms sent attractive exhibits. The Society of Chemical Industry had a stand at the entrance to the Section with a representative in attendance, the exhibitors and exhibits being as follows:—Watson Jack and Co., dyes and colours; Canadian Laboratory Supplies, Ltd., apparatus; T. E. O'Reilly, Ltd., general chemicals and pharmaceutical preparations; Brunner, Mond (Canada), Ltd., alkalis; Canadian Salt Co., caustic soda, etc.; International Nickel Co. of Canada, Ltd., nickel, etc.; Hiram Walker and Sons, Metal Products, Ltd., electric furnaces and nickel alloys; Ontario Oil and Turpentine Co., Ltd., Canadian natural magnesium sulphate, B.P.; Canadian Industrial Alcohol Co., Ltd., alcohol; Nichols Chemical Co., Ltd., heavy chemicals; Abbott Laboratories, pharmaceutical preparations; and the National Electro-Products Co., oxygen and hydrogen gases. The exhibit was such a success that for next year a committee has already been formed with a view to enlarging the section and including metallurgical and engineering exhibits.

MEETINGS OF OTHER SOCIETIES.

SOCIETY OF DYERS AND COLOURISTS.

Addressing this society in the capacity of president, at Bradford, on October 15, the Right Hon. Lord Moulton referred to his indebtedness to many dyers and colourists during the war, but criticised them because they had never raised their pursuits to the status of a great chemical industry. The basic importance of dyeing to the textile trades and to the country's export trade depended upon the application of chemistry, yet in the past this industry had been dominated too much by rule of thumb (*cf.* J., 1920, 301 R); dyers must ally themselves more closely with the great body of chemists, secure the permanency of their industry by substituting scientific research for empiricism, and liberate themselves from the bondage of dependence upon foreign manufacturers. The war had taught us that every nation must be prepared at a pinch to stand alone, and that of all the industrial sciences chemistry was about the most important and the one which we had most neglected. This neglect was no doubt to be ascribed to the lack of self-assertion and unity among chemists. We must realise that the whole of the past war was based on chemistry (the iron industry supplying the means of using the chemists' materials). Had it not been for the exploits of German chemists, the victory would have gone to us within the first three or four months, and if the next war were conducted on the lines of the last, particularly as regards the use of toxic substances, and it found us in a similar state of unpreparedness, it would be over long before the danger could be met. England had to be made a great chemical nation. The chemical industry had to be prepared to receive the men now in training at the universities; and, above all, it was necessary to dispel any illusion that industrial chemistry was in any way inferior to laboratory chemistry. Their tasks were the same, and as it was industrial chemistry which ultimately brought national wealth and prosperity, it must be duly honoured and duly studied. In regard to industrial troubles Lord Moulton said that the indiscriminate snatching of wages largely resulted in the workmen taking away the value of the wages of other workmen by making prices rise. The belief that reduced output could be beneficial to the working classes was an insane delusion, and it behoved societies and industries, as well as individuals, to see that labour was made more fertile, an end which could be achieved by the provision of adequate apparatus, supplies, and organisation.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At the first meeting of the winter session of the above Institution, held in the Rooms of the Royal Society of Arts on October 19, a lecture on "Coal as a Future Source of Oil Fuel Supply" was given by Sir Arthur Duckham, in the course of which he dealt with the development of the use of various fuels from the time when heat was supplied by wood and light by animal or vegetable products, down to the present time when heat and light are dependent on the supplies of coal and petroleum; and he predicted that the time is not far distant when coal or solid fuels as such will be entirely replaced by liquid or gaseous fuels. The demands for these will call for further development in the primary utilisation of our coal supplies, in order to obtain the largest possible combined production of liquid and gaseous fuels. The author then described the developments which have taken place in the utilisation of coal for the manufacture of gas and for the manufacture of liquid fuel, and touched upon the various methods of carbonisation now in general use. In regard to future developments, the lecturer laid stress on the fact that, owing to the general congestion of transport, it would in the near future be unprofitable to transport solid fuel from the source to the consumer, and suggested that the solution of this problem lies in the carbonisation of coal at the source, with subsequent transport of liquid and gaseous fuels through pipe-lines to the consumer.

By the ideal system (from the standpoint of liquid and gaseous fuel production) coal should be completely gasified, preferably in one vessel, in such a way that the maximum amount of volatile constituents would be recovered in liquid form and without having undergone any serious "cracking." The gas should be stripped of all saturated hydrocarbons, and the maximum amount of nitrogen in the coal recovered. The plant should be designed to work with any coal and be composed of one or more vertical retorts superimposed on a water-gas producer. The coal should be fully converted into coke before it enters the producer, and the latter should be so built as to obviate the formation of hard clinker.

In the discussion Sir J. Cadman said that he considered the time was ripe for the trial of the suggestion made by the late Sir W. Ramsay as to the carbonisation of coal *in situ*. Mr. Cunningham Craig suggested the establishment of central carbonising stations, which should be erected with due regard to the transport to them of coal, and from them of the fuels produced, both gaseous and liquid, claiming that at such stations more efficient working could be obtained than by carbonising at the individual collieries. Other speakers dealt with the question of the quality of oil produced, and indicated the necessity for further research work. In reply, Sir Arthur Duckham stated that, as an engineer, he considered Ramsay's suggestion was entirely unpractical, for as soon as one portion of the coal was gasified *in situ*, the roof, losing its support, would fall in and automatically stop operations. He did not consider the erection of central retorting stations, which would treat coal from the various districts, to be a feasible one; but possibly the erection of carbonising units to treat the coal from one district, which would be of fairly constant composition and would require no radical changes from time to time, would give a method of retorting more efficient than either retorting at individual collieries or at large central stations.

ALCOHOL AS A MOTOR FUEL.

On October 18, Prof. H. B. Dixon delivered a lecture entitled "Researches on Alcohol as a Motor Fuel" to the Conference convened by the Imperial Motor Transport Council. The Right Hon. Walter H. Long presided.

The object of the researches, which were undertaken at the request of the Departmental Committee on Power Alcohol, was to obtain data for comparing alcohol with petrol and other hydrocarbons as a fuel for motor and other small engines, and to determine how far the properties of alcohol are modified by admixture with other volatile liquids.

On account of the small vapour pressure of alcohol at low temperatures, it is difficult to start off from cold when it is used in an ordinary petrol engine. This difficulty can be overcome in several ways, but it may be avoided by mixing with the alcohol another liquid which will readily form an explosive gas with air in the cold. Vapour-pressure curves for various temperatures have been ascertained for pure alcohol, pentane, hexane, ether, and for mixtures of 80% alcohol and 20% hexane, 80% alcohol and 20% ether, for natalite (45% ether and 55% alcohol), and of 80% alcohol and 20% benzene. The last-named mixture is remarkable for the fact that its vapour pressure is above that of either constituent; no difficulty has been found in starting up from cold with it in motor and aero engines. Owing to the high heat of evaporation of alcohol, it is necessary to warm the intake when using alcohol mixtures by passing all or a part of the exhaust gases round it. The addition of water to an alcohol-benzene mixture results in the liquid separating into two layers, the denser aqueous liquid containing less benzene, and the lighter liquid containing more benzene, than the original mixture. Also the solubility of benzene in alcohol diminishes with falling temperature. A large number of determinations has been carried out to find the separation-temperatures of various alcohol-benzene and alcohol-hexane mixtures on addition of water; as a result it was decided to use mixtures containing 20—30% by volume of benzene for the further experiments.

The ignition-temperatures of alcohol and other vapours have been determined by heating at atmospheric pressure, and by adiabatic compression. In the first method, the vapour and the air or oxygen were heated separately by passing them upwards through two concentric tubes fitted into a long electrical furnace, the temperature of which could be slowly raised and accurately measured, special precautions being taken to counteract the catalytic action of heated solids on the ignition temperature in oxygen. The ignition-temperature of alcohol vapour was found to be 510°—515° C. in oxygen and 595°—600° C. in air, and of pentane 550° C. and 560°—570° C., respectively. Ether presented a quite abnormal property; when all contact with solids was avoided it fired below 240° C. in oxygen, but had to be heated to nearly 580° C. before it would inflame immediately in air. The second method was to compress mixtures of the vapour with air or oxygen in a steel cylinder (maintained in most cases at 50° C.) by means of a falling weight driving in an air-tight piston. Owing to discrepancies in the recorded values of the specific heats of the vapours, difficulty was experienced in calculating the ignition-temperatures from the observed compressions, but the results from alcohol and pentane were found to agree with those obtained by the first method. The results for ether were very consistent and definite, but were much lower with air and much higher with oxygen than those found with the heated tube at atmospheric pressure.

Photographic observations on the movements of flame through explosive mixtures showed that the alcohol flame starts faster than the hexane, pentane, and ether flames, which keep close together, whilst the benzene flame is left far behind; but the alcohol flame does not increase its pace like the others. In all cases of firing by adiabatic compression it was found that the flame starts comparatively gently, and does not set up detonation immediately. As detonation must be avoided in the internal-combustion engine, investigations were made into the conditions under which it can be set up in alcohol and other vapours. Measurements were made on the rates of the explosion-wave in vapours of alcohol, pentane, benzene, and ether, when mixed with varying volumes of oxygen, and with oxygen and nitrogen in varying proportions. The results showed that there was no marked difference between the four fuels; the ether mixtures gave slightly the fastest rates, and alcohol the slowest, under similar conditions.

The main conclusion drawn by Prof. Dixon from his researches—which are by no means finished—is that alcohol possesses most of the properties required in a motor fuel. As compared with petrol, its lower calorific value is almost compensated by the greater compression at which it can be used, and this property (of high ignition-temperature under compression) is hardly altered by admixture with 20 per cent. of benzene, or of petrol itself. Such a mixture readily starts in the cold, and has been shown to run very smoothly in an engine.

PERSONALIA.

Dr. H. W. Brownsdon has succeeded the late Mr. L. P. Wilson as chairman of the Birmingham Section of this Society, and Prof. G. T. Morgan has been elected a vice-chairman in his stead.

Dr. W. Pauli has been appointed professor of bio-physical chemistry in the University of Vienna.

It is announced that Dr. O. Kamm, of the University of Illinois, has been appointed director of the chemical research department of Messrs. Parke, Davis and Co.

Dr. V. K. Krieble, assistant professor of chemistry at McGill University, has succeeded Dr. R. C. Riggs as Scoville professor of chemistry at Trinity College, Hartford, Connecticut.

Dr. F. E. Rowland, assistant professor of chemistry at the University of Kansas, has been appointed head of the department of chemical engineering at the Oregon Agricultural College.

The death is announced of W. H. T. Harloff, the well-known sugar technologist, at the age of 49. His principal book, which has been translated into English and Spanish, is the "Handleiding voor Tropische Witsuikerfabricatie," now in its fourth edition.

NEWS AND NOTES.

UNITED STATES.

Gasoline Substitutes.—As in Great Britain, so in America, steps are being taken to encourage the discovery of a satisfactory gasoline substitute. There have been gasoline famines in some of the Western States, purchasers being allowed only one or two gallons at a time. A Bill has been introduced into Congress to appropriate $250,000 to the research in question, and it is proposed to carry on the work along four different lines:—(1) By seeking methods for increasing the recovery of oil from oilfields; (2) by developing processes for making synthetic gasoline from heavy oils; (3) by encouraging the development of processes for making gasoline and gasoline substitutes from oil shales, coals, lignites, and peats; and (4) by the development of processes for making alcohols, ethers, etc., from waste vegetable material.

Potash Situation.—The American potash industry is showing considerable promise at the present time, as the whole output for 1920 has already been contracted for, and terms are being offered for the ensuing year. The industry, though hindered by labour troubles and difficulty in obtaining materials, has benefited from the refusal of the German potash syndicate to quote prices at American ports. Large new plants are being built at New Brunswick, N.J., and at Searles Lake, Utah, where the producers have reduced the borax content of their potash to 0·5 per cent. Potash produced at Searles Lake had previously caused damage to crops on account of its borax content, but it is stated that the borax content could easily have been lowered had its harmful nature been known.—(*Chem. and Met. Eng., Sept.* 29, 1920.)

Bulking Values and Yields of Pigments and Liquids used in Paint and Enamel Manufacture.—The Cost Accounting Committee of the U.S. Paint Manufacturers' Association has published (Circular No. 104) a very comprehensive account of the specific gravities of pigments and paint media used by American paint grinders. The circular is intended to enable manufacturers to calculate the bulk or gallonage of paint produced from any pigment. The authors, Messrs. H. A. Gardner and H. C. Parks, have standardised methods for the determination of the specific gravities of dry pigments, paint products and paint media, and in connexion with the former they give special directions for removing the last traces of occluded air by subjecting the pigment, contained in a special form of pyknometer under dry kerosene, to a vacuum of at least 3 mm., a lesser exhaustion having been shown to yield inconsistent results. Attention is drawn to the desirability of manufacturers checking the yields of paint products reported by the factory by means of the bulks calculated from the specific gravities of the constituents and those yielded in practice. The specific gravity of different makes of the same pigment varies greatly, different batches of the same make varying also, but to a lesser degree. Tables are given comprising the specific gravities of practically all the pigments used in American paint-grinding practice, together with the weight per solid U.S. gallon (8·33 lb. of water) and its reciprocal of solid bulk per lb. In many cases the pigment manufacturers have voluntarily submitted information as to the details of composition of their product, which has been included in the tables. The circular is of considerable interest, as it gives the first comprehensive table of specific gravities of the pigments published, whilst the inclusion of the composition of a number of modern pigments fills a want that has been felt by progressive paint grinders for some time past.

Chromite in 1918.—In 1916 the domestic production of chromite of all grades was 47,035 long tons, valued at $14—$20 per ton. In 1917, notwithstanding the strong demand and the advance in the average price to $24, the shipments declined by about 3000 tons. Extraordinary inducements were held out to miners in the spring of 1918 to meet the urgent demand for chromite, and the total quantity mined and shipped in the United States amounted to 82,430 long tons, valued at nearly $4,000,000. Later in the year victory stopped the demand for this ore, and producers were left with heavy bills to pay for the cost of production and with large stocks on hand of unsaleable chromite of declining value. These and similar losses led to the passing by Congress of a War Minerals Relief Bill, providing for a commission which is now adjusting claims in respect of war minerals.

The imports of chromite amounted to 100,142 long tons, or 28,079 tons more than in 1917. Large imports came by land from Canada, and 27,868 tons was supplied by the neighbouring countries of Cuba, Brazil and Guatemala.—(*U.S. Geol. Surv., May* 15, 1920.)

CANADA.

The Coal Situation.—The coal shortage, which a few weeks ago seriously threatened Canadian industries, has now become less acute, although domestic coal is still in short supply and at a high price ($17—$19 per ton). The Canadian Branches of the Society of Chemical Industry have many times urged an increased development of the country's coal resources. That such representations have not been entirely unsuccessful may be gathered from the fact that the output from Canadian mines during the first three months of this year was nearly half a million tons greater than in the corresponding period of 1919. Should the present rate of production be maintained, the output for 1920 will exceed that of the record year 1913, when 15,532,878 t. was produced. During the past five years Canada has imported bituminous coal from the United States in annual amounts varying from 9 million tons in 1915 to $17\frac{1}{4}$ million t. in 1918; imports of anthracite during this period have varied from 4 to $5\frac{1}{3}$ million t.

According to the *Times* of October 15, negotiations are pending for the sale to the British Admiralty of 200 sq. miles of coal land belonging to the Ground Hog estate, which contains the largest smokeless steam coal deposit in the world. The Ground Hog property is in British Columbia, at the head of the Portland Canal, about 700 miles north of Vancouver.

Graphite.—A report on the graphite industry of Canada, by H. S. Spence, has been issued by the Mines Branch of the Dominion Department of Mines. After dealing with the mode of occurrence, origin, composition, and economic importance of graphite ores, the deposits found in Canada are described. The graphite occurrences that have hitherto received any measure of attention lie in the eastern area of the country, and the number of graphite mines and mills in operation during the last few years is about six, with an average annual production of 2438 tons, chiefly milled graphite. In a full account of the wet and dry methods of concentration it is stated that the latter have mostly been discarded in favour of the film or other flotation process; methods of refining are also dealt with. The manufacture of artificial graphite and the uses of graphite in industry receive full attention. About 75 per cent. of the world's production of natural graphite is utilised in the manufacture of crucibles, the remainder being used for lubricants (10%), pencils (7%), foundry facing and stove polish (5%), and paints (3%). The uses of the artificial product include the preparation of electrodes, lubricants, paints, dry batteries, and boiler-scale preventives. A review of the sources of the world's supplies of graphite is given, and it is of interest to note that, although graphite is very widely distributed, the bulk of the production in 1916 came from three countries. Austria produced 54,501 short tons (1913), Ceylon 37,420 t., Madagascar 28,080 t., Korea 18,704 t., Italy 9017 t., Germany 13,263 t. (1913), and the United States 8088 t. The final chapter is devoted to the determination of the carbon content of graphite and graphite ores, and a bibliography of Canadian graphite is given as an appendix.

AUSTRALIA.

Castor Oil Production in Queensland.—Much experimental work on the cultivation of the castor oil plant is being carried out by the Queensland Agricultural Department. Mr. D. Jones, the cotton expert, in drawing attention to the suitability of Queensland for this purpose, states that there is no reason why the State should not provide the country's requirements, amounting to about 4000 tons of beans a year, and in addition be able to export considerable quantities. Queensland beans have been grown containing from 46 to 52 per cent. of oil. The experimental work was proving satisfactory (*cf.* J., 1920, 111R).—(*Ind. Austral., July* 22, 1920.)

The Broken Hill Field.—According to the official report of the inquiry into the Broken Hill labour question, the underground workers have been offered a 44-hour instead of a 48-hour week, and an increase in day pay from 13s. to 15s., as against 20s. demanded. The terms have been accepted by the mine-owners, but the attitude of the men is not yet known. The Broken Hill Proprietary is about to raise its capital by £3,500,000, in order to provide for a great expansion of its iron and steel business at Newcastle, N.S.W. Among the projected extensions are a fourth blast furnace, together with coke ovens and by-product plant, a sulphuric acid plant for the supply of acid used in the production of sulphate of ammonia, a duplex steel plant, a rod mill, locomotives and other railway plant, etc.—(*Mining Mag., Oct.*, 1920.)

FRANCE.

Industrial Notes.—*Metallurgy.*—As a direct result of the fall in the price of coke, the "Comptoir Sidérurgique de France" has decided to make corresponding decreases in the prices of cast iron and steel which will amount to an average reduction of 20 per cent. on existing prices. The lowering of the price of coke is, however, subject to the complete fulfilment of the terms of the Spa Agreement, and in the case of cast iron and steel will only hold good until December 31 next. Also, the new prices are subject to revision up to the end of the year.

It is reported that an arrangement will soon be made between France and Germany, according to which France will send siliceous cast iron to Germany in exchange for coke, such coke to be reckoned as outside the quantities due under the Peace Treaty.

Coal.—The shadow of the coal strike in Great Britain is causing much anxiety, but the continued influx of German coal in excess of the stipulated quantities is satisfactory, as is also the report that the production in Upper Silesia is 20 per cent. and that in Westphalia 31 per cent. greater than in the corresponding period of 1919. Unfortunately there is much congestion on the French railways, and if it cannot be removed the country will suffer, because, by the Spa Agreement, France is responsible for the transport of the German coal supplies, and tonnage not conveyed cannot be carried forward to the account of the following month. From January 1 to July 31, 1920, the total available supply of solid fuel was 24,146,783 t. of coal and 515,933 t. of lignite.

Chemical Industry.—As a result of the overflowing of the River Arc (Savoy), the numerous electrochemical factories deriving water power from it have suffered greatly, the damage to the Alais and Camargue works alone being estimated at several million francs. The waters of this river are very muddy, and when they are suddenly turned into torrents their abrasive power is very greatly increased. A couple of months must elapse before the works thus affected can be put into full working order.

German competition in the chemical market is daily increasing, and chemicals such as potassium salts, carbonates, sulphates, permanganates, ferrocyanides, sulphocyanides, bichromates and chromates are being offered at prices far below those obtaining in France. Belgian chemical products are also appearing in the market.

Successful attempts are being made to utilise several chemical war products. Owing to the scarcity and prohibitive price of formalin, chloropicrin and "yperite" have successfully replaced it as an insecticide and disinfectant. Cordite can also be transformed into a fertiliser containing 6 per cent. of nitrogen and about 20 per cent. of moisture. TNT finds application in the dye and perfume industries.

Utilisation of Tidal Energy.—The latest step in the direction of fuel economy is a scheme for harnessing tidal energy which has been initiated, and is being supported, by the Ministry of Public Works. Preliminary work is being carried out at La Landriais, on the river Rance, about 8 km. from St. Malo (Brittany), where two natural basins exist, one on each side of the river, which are filled by the incoming tide. The idea is to provide a constant head of water and a continuous supply of energy, the amount of which is estimated at 150 million kw.-hrs., equivalent to 250,000 t. of coal, per annum.

Position of the Dye Industry in France.—The "Union des Producteurs et des Consommateurs pour le Developpement de l'Industrie des Matières Colorantes en France" has recently issued a report which states that in spite of every effort to satisfy the urgent home demand for dyes, delay in the ratification of the Peace Treaty has necessitated purchasing direct from Germany, and during the period July—December, 1919, 1093 tons of dyestuffs were purchased by the Union from this source. The dyestuffs were invoiced in terms of the French franc, instead of the Swiss franc, thus affording an advantage to the Union. The dyes were distributed among users at the lowest possible price, and as nearly as possible in accordance with the users' individual requirements. The claims of the industrial centres at Roubaix and Tourcoing were taken into due consideration, and the geographical distribution was as follows (metric tons):—Nord 323, Alsace 42, Paris 51, Lyons 31, Rouen 29, Vosges 37 and other localities 71.—(*Chem. Ind., Oct.* 6, 1920.)

JAPAN.

The Sulphuric Acid Industry.—The development of the sulphuric acid industry has made great progress during the last decade. Whereas in 1910 the production was less than 90 long tons, in 1915 it rose to 219,643 t. and in 1918 to 566,607 t. The production for 1919 is estimated at over 580,357 t. In 1915 and 1916 the exports increased very greatly (1915, 5913 t.; 1916, 11,165 t.), largely owing to the demand from Russia; since then they have receded, and last year only 2390 t. was shipped abroad. The chief countries which derive supplies from Japan are China, Dutch India, Straits Settlements and Hongkong. Egypt imported a little sulphuric acid from Japan in 1917 and 1918. The important trade with Australia is expected to be seriously affected by the new Australian customs tariff. At the end of May the position of the Japanese industry was not good. Owing to the high cost of production, the factories refuse to accept the low prices offered by buyers, in spite of the general market weakness.—(*Chem. Ind.*, *Oct.* 6, 1920.)

BRITISH INDIA.

Mineral Resources.—The General Report of the Geological Survey of India for 1919 contains an account of the various economic inquiries conducted during the year with a view to furthering the development of the mineral resources of the country.

Bauxite.—Attention has been paid to Indian bauxite, and schemes have been considered for the manufacture of alumina, and even of aluminium, in India. It was decided to examine all the well-known bauxite deposits, and it is hoped that the field work will be completed by the end of the season 1919–20. The output of bauxite in 1918 was 1192 tons, entirely from Jubbulpore.

Chromite.—In consequence of the discovery of chromite near Fort Sandeman in Baluchistan, it was decided to resume the survey of the Zhob and neighbouring areas. The first discovery of chromite in Zhob was made nearly twenty years ago, but since then no systematic exploration has been undertaken. Average samples of the Fort Sandeman chromite yielded 43·62% Cr_2O_3, and although these only represented second-grade ores, they are of importance as proving the presence of chrome-bearing basic rocks and suggesting the possibility of further discoveries. The production during 1918 was 57,769 tons.

Coal.—During the survey of the Tenasserim valley, the Kawmapyin-Theindaw coalfield was re-visited, but little new information resulted. All the samples taken indicated very poor material, carrying about 30% ash, but samples taken at Kyankmithwe were found to cake strongly and to contain only 3·77% ash. At the request of the Madras Government, the Beddadanol coalfield in the Godavari district was visited and sites fixed for deep borings. The production of Indian coal has steadily increased in recent years, but the coal resources of the country have not yet been fully exploited. In 1918 the production rose to over 20 million tons.

Copper.—During investigations at Fort Sandeman, Baluchistan, a supposed copper lode occurring in the neighbourhood was examined, but the deposit appears to be a poor one. Attempts to work commercially the indigenous deposits of this mineral have met with very limited success so far. A certain amount of argentiferous copper ore occurs in association with the lead-zinc ore bodies of the Bawdwin mines in the Northern Shan States of Burma, and the existence of considerable quantities of copper in Sikkim has been established, but it remains to be seen whether its extraction is commercially possible. The output of copper in 1918 amounted to 3619 tons.

Iron.—The recent discoveries of iron ore in the southern parts of Singhbhum having resulted in a large number of applications for prospecting licences and mining leases, it was decided to examine the ferruginous belt. The results show that the iron ore usually occurs at or near the top of hills, the most important being in the range running from about 3 miles south-west of Gua to the Kolhan Keonjhar boundary east of Naogaon. Similar ranges run from the Duargui stream to the Karo river near Ghatkuri, and again from the Karo river, east of Salai, to the east of Chota Nigra. The Kolhan hæmatites usually contain:—iron, 64%; phosphorus, 0·03 to 0·08%, and, in some cases, 0·15%. The sulphur content is usually below 0·03%. Traces of titanium are also found occasionally in the ore. Samples from the better parts of the ore-deposits contain as much as 68—69% iron. Little prospecting work has been done hitherto on the deposits, but enough is known to justify the belief that the quantities available will run into hundreds of millions of tons. In most cases, the chief obstacle to development lies in the difficult and inaccessible nature of the country.

Kaolin.—Extensive examination of the China clay deposits of Upper Burma proved the existence of very large quantities of clay eminently suitable for the manufacture of porcelain. The raw sand is said to contain about 60% of free silica, 25—30% of kaolin, and to be very free from iron and alkalis. Laboratory tests indicated that the plasticity, refractoriness, and colour of the levigated material were good.

Soda.—An inquiry has recently been made into the soda deposits and industry in Sind. Prior to this little was known regarding the nature and extent of these deposits. The salt obtained is a crude trona known locally as *chaniho*, and is used for washing and dyeing clothes, for hardening treacle, for the preparation of molasses from sugar cane, but principally as a yeast in the manufacture of *popars* or pulse biscuits. The total output in Sind averages approximately 1000 tons per annum.

Sulphur.—Early in 1919 the old sulphur mines near Sanni in Baluchistan were examined, but the results showed that there was likely to be only a small amount of sulphur available.

Tin.—A good show of tin was found in the streams adjoining the Tenasserim river (Tavoy) from the west. Tin mining is now a well-established industry in Burma, the output of 1918 amounting to 15,607 cwt.

Mining.—A school of mines and geology is to be established by the Indian Government at Dhanbaid, in the coal-mining district of Behar and Orissa, and a principal and senior professor of mining are soon to be appointed. A mining and metallurgical society has been formed at the Kolar goldfield.—(*Mining Mag.*, *Oct.*, 1920.)

GENERAL.

October Meeting of Council.—At the first meeting of the new Council, held on October 15, Sir William Pope, president, was accorded a hearty welcome by the members, and he in turn expressed the gratification of the Council at Mr. John Gray's presence among them again after his serious illness. In view of the increase in the annual subscription, which is to take effect from January next, it is very satisfactory to note that 118 new members were elected, which is the record number for the past 12 years at least; 46 of the applications came from Shawinigan Falls, Canada, where the formation of a new Section has been sanctioned by the Council. An application was unanimously approved for the dissolution of the present Canadian Section, and for the conversion of the branches at Montreal, Ottawa, and Toronto into independent Sections. The Society has now five Canadian Sections, viz., at Vancouver, Shawinigan Falls, and at the three centres above mentioned. There has been formed an Executive Committee for Canada consisting of the chairmen and honorary secretaries of the five Sections, whose business it will be to make arrangements for the Annual Convention of Chemists, and to take charge of matters affecting chemical industry that require action by the Dominion Government. The vacancy in the list of vice-presidents, caused by the election of Prof. H. Louis as hon. foreign secretary, has been filled by the election of Mr. T. H. Wardleworth, of Montreal. Members were elected to the seven standing committees which were inaugurated under Mr. John Gray's scheme (*cf.* J., Mar. 15, 1920), and a list of these will be given in an early issue of the *Journal.*

Chemical Industry Club.—The report of the Committee for the year ended August 30, 1920, records steady progress; the net gain of 101 brings the membership number up to 715, and the Hon. Treasurer intimates a surplus of £133, which compares with a debit balance of £55 a year ago. As the accommodation in the premises at Whitehall Court is still in excess of the attendance, the Committee would be glad to welcome new members. The Federal Council for Pure and Applied Chemistry, being in full sympathy with the objects of the Club, has co-opted Mr. H. E. Coley, the Secretary, and the Committee has co-opted three members of the Council, viz., Sir William Pope, Dr. C. A. Keane, and Mr. E. V. Evans. Owing to the rapid growth of the Club and the increasing pressure of work on its honorary officers, an assistant secretary has been appointed in the person of Capt. R. P. C. Harvey, M.C. The Club's rooms have been made use of by several of the chemical and allied societies, and the Committee looks forward to a new year of increased activity and of usefulness to all who will take advantage of the exceptional facilities offered. Arrangements are being made for the holding of the second Annual Dinner at the Connaught Rooms, W.C., on Friday, October 29.

Streatfeild Memorial Lecture.—The third annual lecture to commemorate the work of the late E. C. Streatfeild at the Finsbury Technical College was delivered by Mr. J. H. Coste, an old student, at the College on October 14, the subject being "The Gases Dissolved in Water."

The first part of the lecture dealt with the purely physical aspects of the subject, special reference being made to the historic work of Henry, Dalton, and Bunsen. A short account was given of Adeney's work on the rates of absorption of atmospheric oxygen and nitrogen by air-free water, and of the work of Winkler, Roscoe, and Dittmar on the correlation of temperature with the volumes of gases dissolved by distilled water and sea water. Sir John Murray's calculation that the seas of the globe contain some 10 billion tons of dissolved oxygen and 120 billion tons of carbon dioxide was quoted, and after the two general methods of determining the solubility of gases in water had been outlined, a description was given of a method of collecting water samples so as to avoid access of extraneous air. The latter part of the address contained references to the *rôle* played by dissolved oxygen in biological and certain industrial processes. The importance of dissolved air to subaqueous life was emphasised, and the importance of dissolved oxygen in respiration, in the treatment of sewage and of public water supplies, and in the corrosion of iron in hot-water radiators and in steam-raising systems received due treatment. The lecturer concluded with a powerful protest against the projected closure of the Finsbury Technical College in July, 1921, and his remarks were warmly supported by the chairman, Prof. H. E. Armstrong, by Prof. G. T. Morgan, Mr. Julian L. Baker, and other speakers. The Streatfeild medal was presented to Mr. Coste, and the Streatfeild prize to Mr. D. G. Murdock.

Investigations at Rothamsted.—Among the investigations now in progress at Rothamsted, one, on the relations of fertilisers to plant growth, seems to foreshadow the possibility that the soil may contain unexpected chemically active substances which may play an important part in determining high soil fertility. With regard to the effect of organic manures on plant growth, no evidence has been found that these are more effective than nitrates or ammonium salts, or that they leave residues of much value in the soil. Whilst their high price is to some extent justified by their freedom from the harmful effects shown under certain conditions by ordinary artificial fertilisers, this advantage will become less as these secondary effects are better understood. Although weakness in the stems of cereals and grasses is usually ascribed to lack of potash, investigation has indicated that potassium salts tend to weaken rather than strengthen the anatomical structure of the stems. A new application of soil analysis has been made, in the reclamation of waste land, in which the analysis of the waste-land soil was compared with that of adjoining cultivated land of a similar type. The differences found between the two sets of data made it possible to indicate what changes must be brought about in the waste land to bring it up to the level of the cultivated land.

Examination of accumulated data on the nitrate content of water percolating through drain gauges, and on the loss of nitrogen from the Rothamsted unmanured plots, lead to the conclusion that part of the ammonia and nitrate produced in the soil must normally be at once converted into some insoluble form, which subsequently becomes reconverted into nitrate. The nitrogen immobiliser concerned is of biological nature. A new and important factor has been discovered in connexion with soil population and partial sterilisation. The ineffectiveness of certain sterilsing agents, *e.g.*, naphthalene and thiocyanates, has been traced to the readiness with which they are decomposed by some of the soil organisms, and search is now being made for retarding agents which will delay but not prevent the decomposition. An interesting relationship has been traced between biochemical activity in the soil and the ammonia content of rain, the maximum ammonia content synchronising with the greatest biological activity.—(*Official.*)

Oil Exploration in Great Britain.—A recent official statement in regard to the progress of the oil-drilling operations during the current year gives information concerning seven borings in Derbyshire, two in Staffordshire, and two in Scotland. In addition to the Hardstoft boring, which still continues to yield 7 barrels a day, indications of oil have been found in the Ironville bore No. 1 at 3650 ft. in the Carboniferous Limestone series. One bore has been suspended and another abandoned. One of the bores (Apedale) in Staffordshire has also been abandoned, but a new one is to be sunk near by. At West Calder (Scotland) a depth of 3844 ft. has been reached after encountering a slight show of oil at 3705 ft.—(*Mining Mag., Oct.*, 1920.)

Tungsten in Italy.—With the redemption of Venezia Tridentina (Trentino), Italy has acquired a deposit of tungsten, a mineral which has hitherto been imported. The new mine is situated at Bedovina, in the Fiemme valley, near Predazzo, and it is estimated that there is about 180,000 metric tons of mineral in sight, corresponding to 2160 t. of copper and 450 t. of tungsten trioxide.—(*Gior. di Chim. Ind. ed App., Aug.*, 1920.)

Sulphur Situation in Italy.—The war imposed a serious check on the development of the Italian sulphur industry, and production declined from 330,000 short tons in 1914 to 180,000 t. in 1919, owing to the labour shortage and the difficulty of maintaining the mechanical equipment of the mines. Before the war labour cost 80—85 lire (lira=9½d.) per ton of sulphur mined in Sicily, as against 420—430 lire per ton in May, 1920. Similarly, pre-war prices of from 110—115 lire per ton f.o.b. Sicilian ports rose to 650 lire in May, 1920, whilst the sulphur tax plus the cost of administering the sulphur consortium increased from 8·50 to 70 lire per ton. The sale of Italian sulphur, 90 per cent. of which is produced in Sicily, is now practically limited to the vine-growing regions of Southern Europe. Unusually trying conditions surround labour in the Sicilian mines, and the sulphur has to be recovered by a wasteful process owing to the cost and scarcity of fuel (*cf.* J., 1920, 258 R, 275 R).—(*U.S. Com. Rep., July* 1, 1920.)

Mineral Exploration in Switzerland.—*Iron.*—The Commission appointed to investigate the deposits of iron ore in the Frick Valley (Frickthal, Canton Aargau) completed its experimental work at the end of August with very satisfactory results, the existence of deposits of very high-grade ore over 17 ft. thick being proved. Exploration is to be started at once (*cf.* J., 1920, 185 R). Another deposit in the Canton of Soleure (parish of Rienberg) is now being explored.

Coal.—Although the winning of anthracitic coal of good quality for certain purposes is proceeding satisfactorily in the Canton of Valais, and lignite mining is being carried on in the Canton of Berne (Goldiwyl), borings put down in other parts of the country have so far proved unsuccessful. Attempts to reach the continuation of the Alsatian coal deposits at Buix were a failure. Notwithstanding the many disappointments and the heavy expenditure incurred, prospecting is to be continued. Geologists, however, are of the opinion that even if the coal strata were struck, they would be so deep and the temperature so high (over 50° C.) that practical exploitation would be impossible.

Potash.—As the well-known Alsatian potash deposits are situated within a comparatively short distance of the frontier, it was thought that potash might be found in the neighbouring Swiss territory, especially as at Schweizerballe, Rheinfelden, a few miles east of Basle, there are important deposits of rock salt which have been worked on a large scale for many years. With this object in view, a boring was put down at Allschwil, near Basle, not far from the Alsatian frontier. Rock salt was found after passing through the very deep Jurassic formation, but no trace of potassium salts was discovered.

Sodium Sulphate Manufacture in Belgium.—The Belgian glass factories need some 80,000 metric tons of sodium sulphate annually, and a further 10,000 is required for the production of sulphides, Glauber's salt, etc. As the home supply does not exceed 30,000 t., and it is desired to reduce purchases in Germany and England, two companies (the Société des Cuivres, Métaux et Produits Chimiques d'Hemixem and the Société des Verreries des Hamendes) have decided to erect a sodium sulphate factory.—(*Chem. Ind., Oct.* 6, 1920.)

Lubricating Oil from Asphalt in Asia Minor.—It is reported that, in order to meet the shortage of lubricating oil in 1916, the directors of the Syrian and Hedjaz railways distilled the bituminous limestones (asphalt) which occur abundantly in Syria and Palestine. A special distillation plant was set up and oil was obtained at a cost of 3·45 piastres per kg. (3·4d. per lb.). Thirty distinct deposits of bituminous schists are known between Aleppo and the Red Sea, the most important of which is that of Mekarine, on account of its size and high oil-content.—(*U.S. Com. Rep., Sept.* 2, 1920.)

The Tanning Industry in Spain.—The Spanish tanning industry is of some importance, for prior to the war there were about 1500 plants, with a total of 100,000 workmen. Most of the tanneries are very small, and not one has a technical director or a chemist. The old method of tanning skins for soles and kips is still in use, but since the war chrome tanning of sheep, goat, and calf skins has been introduced, without, however, reaching excellence in the products owing to the lack of modern machinery. Two companies prepare tanning extracts, mostly from dry Argentine quebracho, mixed with extracts of chestnut, sumac, pine, cork oak, etc. Large amounts of tannin extract are imported from South America and Northern France, and some chestnut extract and oak wood are imported from Italy. The number of important tanneries in Spain is small compared with the population, roughly 20 millions. A tanning school attached to the University of Barcelona was founded by a small group of manufacturers, but only six or eight students enter the school each year, and these usually leave without a diploma, as they desire to do the practical work without acquiring a scientific foundation.—(*U.S. Com. Rep., Aug.* 6, 1920.)

Production of Non-dusty Calcium Cyanamide.—Over one hundred suggestions were sent in for the prize offered by the Prussian Ministry of Agriculture for the best process for overcoming the dusty nature of cyanamide, but not one was considered satisfactory. The dustiness and corrosive nature of this substance are mainly due to the presence of free lime and unchanged calcium carbide. The suggested use of water is not practical, as the lime, being "dead-burnt," combines but slowly with it, and the resulting calcium hydroxide leads ultimately to the formation of dicyandiamide, which is injurious to plants, and to loss of nitrogen as ammonia.

There are also practical technical difficulties attending the use of small amounts of cyanamide and efficient cooling, and if too little water be used the granules soon fall to powder. Von Stutzer's suggestion to add colloidal matter, *e.g.*, bog-iron ore, involves the use of large amounts—up to 100 per cent.—of the added substance, and the use of solutions of iron and aluminium salts, molasses, cellulose lye, magnesium and calcium chlorides, etc., is expensive and leads to the occurrence of undesirable subsidiary reactions. There appear, however, to be prospects for the use of iron and aluminium solutions; but the most likely method is the addition of 3—4 per cent. of heavy tar oil, which almost completely prevents physical disintegration, although it does not counteract the caustic action.—(*Chem. Ind., May* 26, 1920.)

Felspar (1913—1919). (*Imperial Mineral Resources Bureau, pp.* 16, *price* 6*d.*)—Felspar is used chiefly in the manufacture of pottery both in the body and in the glaze, although its use in the manufacture of glass and, particularly, chemical ware is steadily growing. English porcelain has a flux composed partly of felspar and partly of bone ash, and the Continental hard porcelain is very closely related to the English stoneware and other types of vitreous body used in making insulators, chemical plant, etc. Felspar is an important constituent of most enamels used for coating kitchen utensils and other metal wares, and it has also uses in the manufacture of artificial teeth and as a flux in the manufacture of carborundum and emery wheels.

The world's production is about 250,000 tons per annum. The United States is the greatest producer with about 100,000 tons per annum. The production of the United Kingdom in 1919 was 48,651 tons, of which Cornwall supplied 43,043 tons as "China stone" or "Cornish stone," which may be considered a natural mixture of felspar and quartz with kaolin, fluorspar, white mica, and topaz as accessory minerals. Most of the felspar quarried for industrial purposes is orthoclase or microcline occurring as crystalline masses. In order that deposits may be worked at a profit they must be very favourably situated for transport. It must be possible to use the simplest quarrying methods, and it is desirable that a deposit should have a thickness of quite 25 feet. In America a haul of more than two or three miles to the railway would render most of the low-grade deposits quite unprofitable. Moreover, felspar should be obtainable free from such deleterious minerals as mica, garnet, tourmaline, hornblende, apatite, and pyrites. Ferruginous impurity is objectionable as it discolours the finished product. As a rule, a felspar may contain up to 20 per cent. of quartz, but some manufacturers of porcelain specify 5 per cent. as the maximum. Much research work has been carried out, and many patents applied for in connexion with the utilisation of the potash content as a fertiliser, but no commercial application has yet resulted. The usual appendix gives references to the technical literature on the subject.

Talc and Soapstone in 1918.—The world's production of talc in 1918 amounted to 296,478 metric tons, of which the United States furnished 173,706 t., France 57,588 t., and Italy 23,951 t. The American production, chiefly from Vermont, New York, and California, was valued at over 2 million dollars, and represented a decrease of 4 per cent. in quantity and an increase of 11 per cent. in value compared with the previous year. The United States is well supplied with low and middle grades of talc suitable for paper, but is deficient in high-grade material suitable for toilet powder, pencils and burner tips. During 1918 that country imported 14,169 short tons of talc (269,497 in 1917), 96 per cent. of which came from Ontario, Canada, the remainder being chiefly high-grade material from Italy, with a small amount from France. French talc is of excellent quality; about 80 per cent. of the output comes from Ariège, near the Pyrenees, whilst "French chalk" comes from the Toulon district. The production of talc in France was 66,000 metric tons in 1913, and it is anticipated that this figure will be again reached when production is fully resumed. Italian talc is highly prized for its purity, and is chiefly used in the manufacture of toilet powder, though some of it is sufficiently compact for use as burner tips; the chief region of production is in the Alps to the west of Turin, and the total output represented about 8 per cent. of the world's production in 1918. Other sources of talc include Austria, Norway, Spain, Germany, India, and South Africa.

Soapstone, or steatite, is a massive crystalline rock composed chiefly, but not wholly, of talc, the grains of the latter being bound together by associated mineral matter. It is a soft mineral, and when mined losses by breakage are said to be as much as 90 per cent. The world's production in 1918 was 16,204 metric tons, of which the United States supplied 15,268 t. (mainly from Virginia), the rest, 936 t., coming from England, where production (begun in 1912) is increasing. France, Spain, and Germany also produce it, but the output is usually classified with talc. Soapstone is used, especially in the United States, for making laundry tubs and laboratory tables, hoods, and tanks.—(*U.S. Geol. Surv., Mar.* 23, 1920.)

Borax Industry in Czecho-Slovakia.—An English firm has erected a new borax factory in Czecho-Slovakia, and production is expected within a short period.—(*Chem. Ind., Sept.* 22, 1920.)

PARLIAMENTARY NEWS.

Imports of German Dyes and Chemicals.

In the House of Commons, on October 20, Sir P. Lloyd Greame, in answer to Major Barnes, stated that the import of German synthetic dyestuffs, including intermediates, in the first nine months of this year amounted to 1574 tons, worth £1,399,027, and included 877 tons consigned under the reparation clauses of the Peace Treaty. Details of the chemicals imported from Germany were only available for the period January-June, 1920. No chemicals other than dyestuffs had been received by way of reparation.

LEGAL INTELLIGENCE.

DONATIONS FOR SCIENTIFIC RESEARCH. *W. Wynn Evans v. Brunner, Mond and Co., Ltd.*

In this action, which was commenced on October 15 in the Chancery Court, Mr. W. W. Evans, of Wrexham, applied on behalf of himself and a few other shareholders for an interim injunction to restrain Brunner, Mond and Co. from distributing the sum of £100,000 to British universities and other scientific institutions for the furtherance of scientific education and research, as authorised at an extraordinary meeting of shareholders held on August 5, 1920.

The plaintiff contended that the resolution was *ultra vires* because it was outside the main objects of the company's memorandum and articles of association. He was aware of the words in the memorandum—"the doing of all such business and things as may be conducive to the attainment of the objects of the company," but held that they did not cover such expenditure as was now proposed. The directors in their affidavit said that the company's business required the scientific aid and trained assistance which could only be obtained from efficient schools and universities, and these institutions must therefore be supported financially. But how far should this principle be applied? All firms required clerks, but that would not justify them in giving money to any institutions which taught reading, writing, and arithmetic.

Counsel for the company gave an undertaking that no part of the money would be expended on the object specified until the action was decided, and Mr. Justice Eve said that he would hear the action at a very early date.

ALLEGED INFRINGEMENT OF SOCIETY'S CHARTER. *A. H. Jenkin v. The Pharmaceutical Society of Great Britain.*

In the Chancery Division, on October 19, Mr. A. H. Jenkin, a member of the Council of the Pharmaceutical Society, brought a friendly action to test that Society's power to embark on certain undertakings which he contended were beyond its power, because they would benefit the employing members of the Society as distinguished from the employed, and would not benefit the members as a whole. The complaint was that the Society had taken part in the promotion of an Industrial Council Committee for the Drug Trade which had for its objects the regulation of wages, hours and working conditions in the industry, and the adoption of methods for the inclusion of employers and employees in their respective organisations. Further, the Society threatened to undertake a variety of other things, including the functions of an employers' association, the provision of an employment register, and a register of unsatisfactory employees. These things were *ultra vires* because they were in the interest of employers alone; they were not contemplated by the Charter, and even if they had been contemplated in 1843, they could not be used for the benefit of one class of members only.

The defence submitted that as one of the objects mentioned in the Society's Charter was the protection of those who carried on the business of chemists and druggists, these matters were not *ultra vires*, and that the Society would not be likely to go beyond what was necessary for trade protection. But even if they were *ultra vires*, the acts complained of were not illegal. Judgment was reserved.

REPORTS.

Mines and Quarries: General Report, with Statistics, 1919. *By the* Chief Inspector of Mines. Pt. I.—Divisional Statistics. *Pp.* 25. *London: H.M. Stationery Office.* [*Cmd.* 925.] *Price* 3*s.*

The number of mines operated in 1919 was 2943 under the Coal Mines Act, and 495 under the Metalliferous Mines Regulation Act, compared with 2801 and 474, respectively, in the previous year. There were, in addition, 5135 quarries at work (4362 in 1918), making a grand total of 8573 mines and quarries, or 936 more than in the preceding twelve months. The total number of workers employed in or at the mines and quarries was 1,270,050, of which nearly 94 per cent. was employed under the Coal Mines Act, and the number of deaths from accidents was 1229, the corresponding totals for 1918 being 1,072,903 and 1487, respectively. The accident death-rate under the Coal Mines Act was 0·94 per 1000, compared with 1·39 per 1000 in 1918. The output of minerals from all sources in the United Kingdom was as follows:—

Summary of Output of Minerals from Mines, Quarries, and Brine Wells.

Description of mineral.	Total output. 1919. Tons.	Total. 1918. Tons.
Alum shale	4848	5231
Antimony ore	—	1
Arsenic	2527	2349
Arsenical pyrites	75	477
Barium (compounds)	60,087	66,360
Bauxite	9221	9589
Bog ore	3045	603
Chalk	2,629,406	2,304,248
Chert, flint, &c.	50,082	54,518
Chromite of iron	150	140
Clays* and shale	7,765,965	6,003,787
Coal	229,779,517	227,748,654
Copper ore and copper precipitate	372	1213½
Fluor spar	36,860	53,498
Gravel and sand	2,048,427	2,022,567
Gypsum	220,003	178,734
Igneous rocks	4,387,703	3,961,524
Iron ore	12,254,195	14,613,032
Iron pyrites	7336	22,195
Lead ore	13,868	14,784
Lignite	—	150
Limestone (other than chalk)	9,537,495	10,156,603
Manganese ore	12,078	17,456
Natural gas	(cb. ft. 90,000)	(cb. ft. 85,000)
Ochre, umber, &c.	10,547	9480
Oil shale	2,763,875	3,080,867
Phosphate of lime	—	3372
Rock salt	90,938	113,884
Salt from brine	1,817,142	1,862,130
Sandstone	1,699,853	1,553,151
Slate	164,098	110,197
Soapstone	688	936
Sulphate of strontia	1872	1014
Tin ore (dressed)	5156	6378
Tungsten ores	166	302
Zinc ore	6933	9025
Total	275,384,528	273,988,449½

* Including china clay, china stone, and mica clay.

Annual Report of the Chief Inspector of Factories and Workshops, 1919. *Pp.* 124. *London: H.M. Stationery Office.* 1920. [Cmd. 941. 1*s.* 6*d.*]

The first year after the conclusion of peace was noteworthy for the remarkable completeness of the transition from war to civil production, and for the wonderful smoothness with which the change was accomplished. The most marked features of this transformation were the gradual withdrawal, now nearly complete, of women from industry, and the resumption of the manufacture of ordinary articles of commerce. The inspectors' reports record, without exception, how unprecedented were the inquiries for goods, and how great was the (unsatisfied) demand for building and plant with a view to extension. Throughout the country there appears to have been a general conversion of workshops into factories using mechanical power, the number of the former decreasing by 8060 and that of the latter increasing by 12,396. The use of electrical power has greatly extended. Among the industries which underwent noteworthy development were glass manufacture, flax cultivation and de-seeding, and substantial progress is reported in the manufacture of dyes and fine chemicals in the North-East Division.

Fatal accidents increased from 1287 in 1914 to 1385 in 1919, and non-fatal accidents, which were probably not fully reported, decreased from 158,585 to 124,632. The worst explosion of the year happened in an oil-tank steamer at Cardiff. Light crude oil was stored, improperly, in the coffer-dam and leaked into the fore-peak tank, where it mixed with air and was ignited by a naked light. An explosion which occurred in the manufacture of phosphor bronze was due to the stoppage of the flow of molten phosphorus passing down a plumbago pipe into a crucible of molten metal; and two fatal explosions took place in the manufacture of synthetic acetic acid owing to the formation of copper acetylide resulting from the action of free acetylene on copper. An unexplained explosion occurred in a machine for polishing powdered aluminium (*cf.* J., 1920, 201 R), and a violent explosion happened during the grinding of anachrome brown in an electrically-driven drum containing loose iron bars. Other explosions took place in the reduction of nitrobenzene to benzidene with nascent hydrogen, in the purification of salicylic acid by sublimation in a current of hot air, etc. The rules and regulations in regard to safety precautions in chemical works are stated to be quite inadequate, and it is hoped that the new regulations drafted before the war will soon be issued.

The reported cases of lead poisoning numbered 207, compared with 144 in 1918 and an average of 522 in 1912—1914. The industry which is now regarded as offering the greatest risk of plumbism is the manufacture of electric accumulators. After perusal of some 25,000 reports, the Chief Inspector re-affirms his conviction that locally applied exhaust ventilation is the sheet anchor in the protection of workers from leady dust and fume, and that these alone are the operating causes. The recommendations of the International Labour Conference in regard to the employment of women and young persons under 18 in lead processes are detailed (*cf.* J., 1920, 68 R). Among other cases of industrial diseases may be noted the poisoning of a man employed in the drying and finishing room for phosphorus sesquisulphide; in this case there would only be exposure to phosphorus fumes when firing occurred. Of seven cases of mercurial poisoning, three occurred in the manufacture of philosophical instruments. Poisoning by **TNT** lead to three fatal cases of toxic jaundice. Accidents due to escape of gas included the following:—Carbon monoxide, 85 (12 fatal); chlorine, 9; benzol, naphtha, aniline, 9; ammonia, 8; sulphur dioxide, 7; and 3 each for carbon dioxide, hydrogen sulphide, and arsine.

In a chapter on "Employment: Hours of Work," it is stated that the inspectors' reports show that the shortening of the working hours, which now rarely exceed 48 per week, has had a beneficial effect on the operatives, not only on their health, but also on punctuality and discipline. The reports show wide differences of opinion as to the effect of shortened hours on production, but it may be said that where output depends almost entirely on the speed of machinery, it is reduced in a proportion nearly, if not quite, equal to the reduction in hours. In machine operations requiring constant attention, output has not suffered to this extent, and in exceptional cases has not been affected at all. In processes where output is mainly or entirely dependent upon the exertion of the worker, there is frequently no loss at all. A few of the reports indicate a very unfavourable result of shortening the hours of work, for which no adequate explanation has, as a rule, been given.

Report of the Food Investigation Board, 1919. *Department of Scientific and Industrial Research. Pp.* 36. *London: H.M. Stationery Office. Price* 6*d.*

This report gives an interesting account of the work being carried out under the guidance of the various committees which deal with certain important branches of food investigation. The greater part of the research work during the year 1919 was devoted to studying the preservation of food by cold. Dr. A. Harden has investigated the effect of cold storage upon the accessory food factor which occurs in butter ("fat soluble A" or growth factor), and has found that there is no material loss of this substance during 12 months' storage of the butter at a temperature of $-8°$ to $-15°$ C.—an observation which is of considerable practical importance.

The work of the Fish Preservation Committee has been somewhat restricted owing to the small freezing plant available for research purposes, but in spite of this considerable progress is recorded. Miss I. H. Green has made an extensive study of the bacteria which occur in the herring. Her results indicate that the number of bacteria present in herrings which have been frozen in brine is less than that in herrings frozen in the air. This is believed to be due to many bacteria being killed by the cold brine before they are able to spore. She has also ascertained that ungutted herrings have more satisfactory keeping properties than those which have been gutted. Reference has already been made to the work of the Meat Committee, which has now obtained much valuable information on the freezing of meat and on the processes of putrefaction (*cf.* J., 1920, 343 R). The anærobic spore-bearing bacilli have been made the subject of a special investigation, since they undoubtedly play an important part in the process of putrefaction. The difficulty in cultivating these organisms is well known, so that a description of the preparation of a simple and cheap culture medium which gives good results will be appreciated. The Engineering Committee also reports valuable progress. Mr. G. C. Hodsdon and Prof. C. H. Lees were appointed a sub-committee to draw up a bibliography dealing with refrigeration and cold storage. This has now been completed, and forms the special Report No. 2 of the Food Investigation Board. A sub-committee on insulation devoted itself very largely to an examination of the common insulating materials, nearly all of which have now been tested over a long range of temperature. It is also paying attention to the laws governing the heat transmission from the walls of a room to the air. The sub-committee on refrigerator cars and barges has continued its experiments during the year, and trial runs with insulated cars have been made on the Great Western and Midland Railways.

The work which has been carried out by the Fruit and Vegetable Committee and the Oils and Fats Committee has already received some notice (*cf.* J., 1920, 343 R), but mention should be made of the interesting research by Dr. Maclean on the production and nature of yeast fat. Both the quantity and the character of the fat appear to be influenced by the conditions under which the organism grows, and further studies are being made to throw more light on this subject. The Canned Food Committee began work during 1919, and this has already yielded promising results, which form the subject of a special report by Dr. W. G. Savage (Special Report, No. 3, F.I.B.) on the methods used for the inspection of canned food and their reliability for this purpose.

Report on the Economic and Financial Situation of Egypt for 1919. *By* E. H. Mulock, *H.M. Commercial Agent, Cairo. Pp.* 24. *London: H.M. Stationery Office.* 1920. [*Cmd.* 843. 3*d.*]

The present financial prosperity of Egypt is due to the favourable balance of trade in the period 1913—1917 and in 1919, to the money brought in by the Expeditionary Force, to fortunes made by speculators in uncontrolled commodities, and to the phenomenal rise in the value of cotton.

Natural Resources.—The agricultural products include cotton, cereal and fodder crops, and among the exports are comparatively small quantities of barley, beans, groundnuts, maize, wheat, raw wool, vegetables and fruit, and since 1917, raw flax.

Statistics of mineral production are not available for 1919, but the following are the amounts in metric tons for 1918 and 1913 (in brackets):—Phosphate rock 31,147 (104,450) petroleum 281,885 (12,786), gold (oz. fine) 2856 (4602), nitrate shale 4520 (4740). In addition to the above, the following are now being exploited:—Building stones, clay, gypsum, natron, salt, and turquoise. The existence has been proved of alum, copper ores, emeralds (beryl), granite, iron ores, ornamental stones, and sulphur. There are large quantities of manganese ores in the Sinai region, and 27,498 tons of manganese-iron ore was produced in 1918.

Fuel.—Egypt has also its fuel problem. Cotton-seed cake is no longer available, coal is expensive and hard to obtain, and the supply of Egyptian *mazout* very uncertain. Cotton sticks proved their value as fuel during the war, and should be obtainable in greater quantity owing to the increased acreage under cotton, but the solution of the fuel problem will probably lie in the importation of crude oil.

Imports.—The total imports during 1919 amounted to £E47,409,717, of which the United Kingdom supplied £E21,840,957, or 46·1 per cent., and the British Empire a total of £E27,607,951, or over 58 per cent. (1 £E=£1 1s. 6d. at par). Comparison of the import trade of 1919 with that of previous years is not possible in many cases as the customs statistics have been reclassified in accordance with those of the United Kingdom. The values of the chief materials in 1919 and the percentage furnished by the United Kingdom were:—Dyes, tanning materials and colours, £E691,000 (27·4%, including colours worth £E85,048); chemicals, medicines and perfumes, £E3,345,751 (24·1%, including soap £E289,964, sulphuric acid £E444,493, caustic soda £E51,710, etc.). There has been a phenomenal increase of late in the trade with Japan, the value of goods imported from that country being:—£E70,704 in 1913, £E332,642 in 1916, £E2,533,967 in 1918, and £E1,729,164 in 1919.

Openings for British Trade.—The following British goods would sell well in Egypt (the nature of the demand and the chief competitor are given in parentheses):—Cement (big; Belgium); chemicals, including alum, ammonia, aniline salts, bicarbonates of potash and soda, caustic soda, cream of tartar, copperas, soda crystals, sulphate of ammonia, tartaric acid, etc.; china and glassware (big; Japan); plate glass (good); aniline dyes (big, especially blue and black); glue (constant); synthetic indigo (big); natural indigo (steady); paint, including colours, enamels, oils and varnishes (constant); starch (good); ultramarine (poor; chiefly France); zinc white (good); window-glass (good; Belgium supremacy challenged by only two United Kingdom firms).

Exports.—The increase in exports for 1919 over those in 1918 was mainly due to increased shipments of more valuable cotton. Of the total value for 1919, viz., £E75,888,321, the United Kingdom took 53 per cent. and the British Empire 54·3 per cent. Exports to Great Britain consisted chiefly of raw cotton, cotton seed, onions, cottonseed cake, eggs, cigarettes, raw wool, hides and skins, and raw flax.

REPORT ON THE COMMERCE AND INDUSTRY OF NORWAY TO THE END OF 1919. *By* C. L. PAUS, *Commercial Secretary to H.M. Legation, Christiania. Pp.* 128. *London: H.M. Stationery Office.* 1920. [*Cmd.* 839. 1*s.*]

The exceptional prosperity enjoyed by Norway during the war enabled her to build up a strong financial position and so to enter well equipped on the period of depression which followed the armistice The depression continued throughout 1919, but it has since become less acute as labour costs have also risen in other countries. At one time German competition caused anxiety, but this has largely disappeared since the German Government has taken steps to control exports; however, Norwegian manufacturers are still asking for increased tariff protection, existing duties being held to be quite inadequate to protect home industries. The large adverse balance of trade in 1919 caused much apprehension, but many of the goods imported in that year had been stored for considerable periods for Norwegian account.

Minerals.—Exports of iron ore and iron ore concentrates diminished steadily from 311,433 metric tons in 1914 to 25,680 t. in 1919, owing to the loss of the German market during the war period, to difficulties in regard to payment by Germans, and to high cost of production in 1919. At the end of last year the large iron mines held big stocks and were practically closed down. Owing to German shortage of steel-hardening materials, there was a great increase in the production and export of Norwegian molybdenite during the war, the export figures being:—1912, 3 tons; 1914, 87 t.; 1916, 140 t.; 1917, 201 t. Shipments were practically stopped by Allied action in 1918, when many mines were closed down. In 1919 the demand disappeared and the industry seems to have become extinct. Similarly, the chromite industry enjoyed a period of great prosperity from 1914 to 1917 and then became inactive. (For pyrites industry, *cf.* J., 1920, 77 R).

Fuel and Water Power.—The present position in regard to supplies of coal is said to be very satisfactory; 1,740,000 tons was imported in 1919, stocks are estimated at 500,000 tons, and future annual requirements at two million tons. American coal has lately entered this market, but it is somewhat dearer than British. About 90,000 tons of coal, of which one-third was of inferior quality, was imported from Spitzbergen in 1919. The question of a national supply of electricity is under investigation by a special Commission, which is expected to report this year. Many new municipal power schemes were initiated during the war, but the many Government schemes do not appear so far to have made much headway.

Chemical Industry.—The war stimulated the production of chemicals, but many of the new factories have failed to withstand competition. It is reported that German alum, sulphate of alumina, potash salts, Epsom salts, sulphuric, oxalic and hydrochloric acids are selling at lower prices than those of any other country. The two chemicals which are being exported from England are chloride of lime and sulphate of soda, whilst Belgium, possibly by agreement with British producers, controls the market for caustic soda and soda ash. Prior to 1914, drugs and fine chemicals were mainly imported from Germany, owing to the fact that the Germans adapted their wares to the needs of the Norwegian market, and to lower prices. After the German embargo of December, 1914, English goods were imported for a time in very large quantities, but their quality was generally far from satisfactory. During 1916–17, when importation from England became difficult, American goods appeared, but the importation ceased when the United States entered the war. Since the armistice imports, mainly from America, have been large, and stocks have been replenished.

During the war period there was a continual shortage of fertilisers, but thanks to the home production of artificial nitrate the difficulties were overcome. The Government is still granting large subsidies to this industry, and the consumption of home-produced nitrate was 8286 t. in 1914–15, 19,490 t. in 1916–17, 53,399 t. in 1917–18, and 49,000 t. in 1918–19.

The electrochemical industry experienced unprecedented prosperity throughout the war period; two large carbide plants were erected, aluminium extraction was started, and the existing aluminium factories under French control extended their operations. With the end of the war the demand for electro-chemical products greatly decreased, and the present position and prospects of the industry are not bright, labour troubles and shortage of coal being the outstanding difficulties. Norway has two superphosphate works, one near Christiania, which produced 3500 t. annually before the war, but is being extended to turn out 20,000 t. this year, and a new factory which started up at Bergen in 1917, now being enlarged to produce 60,000—70.000 t.

The following statistics of exports indicate the trend of the electrochemical industry during recent years:—

	Metric Tons.			
	1914.	1916.	1918.	1919.
Carbide	63,723	58,432	41,772	25,599
Cyanamide	13.719	13,152	10	9930
Nitrate of lime	75,176	46,001	53,625	63,880
Nitrate of ammonia ..	11,959	59,639	49,588	5163
Aluminium . ..	2942	4488	6834	3120
Zinc	16.517	28,149	3390	3950
Ferro-chrome	2796	2875	—	—
Ferro-silicon .. .	6144	25,256	16,861	2458

Practically all the requirements in metals, ferrous and non-ferrous, have to be met by importation. This trade was very largely in British hands (American zinc sheets excepted) during 1919, and prospects for British manufacturers are held to be of the brightest if they will send Norway what she wants and not what they think she ought to have.

GOVERNMENT ORDERS AND NOTICES.

The following Orders have been made by the Board of Trade under the Defence of the Realm Regulations:—

COAL EMERGENCY ORDER, 1920.—The supply of coal for household purposes is limited to 1 cwt. per week, but none may be supplied if the stock in hand exceeds 10 cwt. Factories, workshops, and business premises are restricted to a maximum of 50 per cent. of the weekly average quantity of coal consumed in the four weeks preceding October 16, unless special permission be granted by the local authority. Power is given to district coal and coke supplies committees to regulate the supply and distribution of, or to requistion, existing stocks of coal within their area of jurisdiction.

GAS AND COAL (EMERGENCY) ORDER, 1920.—Gas undertakings may not use a greater amount of coal than is sufficient to produce gas of 450 B.Th.U. per cb. ft.; they may reduce the gas pressure at certain periods of the day or night after notification to the local authority and consumers.

Lighting, Heating, and Power (Emergency) Order, 1920.—The consumption of gas and electricity for public lighting is to be reduced to a minimum, and lighting for the purpose of advertisement is forbidden.

Prohibited Exports.—Raw flax has been removed from the list of prohibited exports as from October 21.

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for October 14 and 21.*)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
Australia	Glassware, crockery, iron, steel	526
"	China	*412/20/7/253
British India	Tanning materials, metals	490
Canada	Hides	531
Ceylon	Cement	495
Egypt	Glass, pottery	496
Newfoundland	Bar iron	497
"	China, earthenware	499
South Africa	Paint	533
Belgium	Earthenware	504
"	China	506
"	Printers' and lithographers' supplies	508
Latvia	Paper, ink	511
Netherlands	Paper	512
Portugal	Iron, steel, tin, tinplate, chemicals, perfumery	514
Spain	Glass	515
"	Tanning extracts, leather, packing paper	543
"	Boot polish	544
France	Minerals, metals, chemicals	536
Germany	Oils for soap making	538
Algeria	Paper, printing ink	517
Morocco	Candles, cement	549
China	Bar iron, drugs, china	518
United States	Optical instruments	551
Argentina	Rubber tubing	554
Chile	Chemicals, dyes	520
Cuba	Whisky, beer, rope, twine	521
Ecuador	Paint, cement, paper, tinplate, leather, china, pottery	523

* The Official Secretary, Commercial Information Bureau, Australia House, Strand, London, W.C. 2.

Markets Sought.—A firm in Canada wishes to get into touch with U.K. importers of heavy melting steel and No. 1 wrought-iron scrap.

A firm in Canada able to export pure Venice turpentine and Burgundy pitch wishes to hear from importers in the U.K.

[Inquiries to the Canadian Government Trade Commissioner, 73, Basinghall Street, E.C. 2.]

TARIFF. CUSTOMS. EXCISE.

Australia.—Recent customs decisions affect the classification of "Boron Compo," alumino-ferric, gold paint, nichrome wine, copper sheets and circles for vacuum pans, and the following articles when used for making porcelain enamel, viz., borax, boric acid, red lead, bicarbonates of potash and soda, ammonium carbonate, nitre, cobalt, calcined magnesia, and whiting.

Bulgaria.—Among the additional articles that may be imported without previous authorisation are linseed oil, industrial fats and oils (not perfumed), rosin, gums, paraffin wax, mineral lighting oils, varnish, caustic soda, sodium bicarbonate, petrol, ether, gasoline, benzene, chemicals not specially mentioned, cork, emery powder, crucibles, retorts, bottles, lead and iron pipes, yeast, paper waste.

Canada.—Recent customs decisions affect benzol, solvent naphtha, 10 per cent. iridium-platinum in sheets, and steel bars.

Cyprus.—Customs duties have been amended on, *inter alia*, petroleum, salt, wines, spirits, aniseed, and linseed.

Fiji.—The export of sugar is prohibited, except under licence, as from August 16.

Greece.—A stamp tax of 10 lepta per drachma of the retail selling price has been levied on perfumery and pharmaceutical specialities.

Italy.—The suspension of the import duty on newsprint paper continues in force until December 31.

Morocco (French Zone).—Export duties have been abolished on antimony sulphide, ores (except lead), sea salt, and rock salt.

Netherlands.—Export prohibitions have been withdrawn from potato sago, potato starch, dextrin, glucose, and grape sugar.

New Caledonia (French).—The rate of export duty on tallow is fixed at 8 per cent. *ad valorem*.

Palestine.—Certain building materials, including iron and steel bars, galvanised or corrugated sheets and plates, window glass, roofing tiles, and cement, pay reduced rates of import duty for the present.

Peru.—The new customs tariff became operative on October 15.

Serb-Croat-Slovene State.—A list of goods the export of which is permitted may be seen at the Department.

Among the articles that may be imported duty free under certain conditions are lubricating oils, motor spirit, building materials, and chemicals for making dyes and paints.

Switzerland.—The export of lead, lead wire, sheets and pipes, and dextrin, is now covered by general export licence, but the general export licence for oilcake has been abrogated as from September 20.

Turkey.—The export of salt is now permitted.

Uruguay.—The full text of the decree regulating the import, export, and sale of opium and its derivatives may be seen at the Department.

COMPANY NEWS.

ENGLISH OILFIELDS, LTD.

The directors have issued a long report by the company's scientific consultants on the oil-shale deposits in Norfolk, of which the following is a brief summary:—

All former estimates of the extent of the oil-shale deposits were too conservative; the field appears to be almost unlimited, for numerous test borings have shown that rich seams continue below 300 ft. Much valuable material occurs at such shallow depths that it can be removed by means of mechanical diggers. The shale in the two shallow commercial seams already opened up is of excellent quality, and sufficient reserves are in sight for the employment of opencast mining for many years to come; the cost of such shale delivered at the works will not exceed 5s. per ton. After many trials a highly effective commercial retort has been devised by Mr. J. Black, late works manager to the Oakbank Oil Co., and this has given yields of oil greater than those obtained in the laboratory. The average yield of crude oil obtained with the new retort is 38 galls. per dry ton, to which must be added a further 3 galls. from "scrubbing." Tests on core samples of shale have given an average yield of 22·6 lb. of ammonia per dry ton. With regard to refining, on the basis of a total yield of 33 galls. of crude oil per ton, the yield of refined products per dry ton is 30¾ galls., composed of motor spirit 7, kerosene 9¾, lubricating oil 9, solid bituminous residue 5 galls (50 lb.). The motor spirit contains 0·2 per cent. of sulphur, and a mileage test with it gave 37 miles per gall., compared with 33 for a well-known brand of No. 1 spirit. Among the most valuable of the by-products from the crude oil is ichthyol, of which some 12 tons per day should be recoverable from 1000 tons of shale, yielding a daily profit of at least £1344. A very conservative estimate of the prospective profits from oil, ammonium sulphate, and ichthyol exceeds £3 per dry ton of shale treated. The presence of free oil in the shale measures has been proved, and there is clear evidence of its occurrence in payable quantities at lower depths.

TRADE NOTES.

BRITISH.

The Bahamas in 1918–19.—There was a marked improvement in agriculture in the Bahamas during the year, cultivation having been extended and the harvest plentiful. The chief industry is the production of sisal, which is grown almost everywhere, and it is hoped that the Sisal Inspection and Grading Act will ensure a greater demand for it in foreign markets. The export for the year was 3447 tons, worth £154,231. Efforts are being made to encourage the plantation of coconuts; the export of sponges is of considerable importance, attention is being paid to their culture and valuable results are expected.

The imports during the year ended March 31, 1919, were valued at £367,180 (£493,584 in 1917), of which the United Kingdom supplied 5·3 per cent., Canada 1·7, British Possessions 10·4, and the United States 81·7 per cent. The decrease in trade (3·4 per cent.) with the United Kingdom was due to the difficulty of obtaining goods, their high cost, and increased transport charges. Exports were valued at £278,171 (£402,477 in 1917), and were distributed as follows:—United Kingdom 6·2, Canada 1·7, British West Indies 0·8, and the United States 82·7 per cent. The large decrease is due to the small demand for the staple exports, sponge and sisal.—(*Col. Rep.-Ann., No.* 1033, *April*, 1920.)

FOREIGN.

Trade of Italy in 1919.—The provisional statistics of Italian foreign trade in 1919 show a very large unfavourable trade balance, which, apparently, was considerably higher than in 1918.

The total imports in 1919 amounted to 16,552·8 million lire (lira=9½d.), compared with 16,039·3 million lire in 1918. The values of the chief imports in 1918 and 1919 are given below in millions of lire:—

	1918.	1919.
Chemical products, resins and perfumes	1,485,806	604,219
Colours and tanning extracts	473,594	137,423
Cotton	1,591,021	1,964,463
Skins	636,549	859,649
Minerals, metals and manufactures of	2,795,056	2,624,033
Vegetable fibres (hemp, flax, jute, etc.)	156,856	208,317
Stones, earths, pottery, glass and crystals	1,572,080	1,781,047
Indiarubber, guttapercha and manufactures of	104,616	157,808
Precious metals	705,366	6218

The quantities of some of the principal imports were, in metric tons:—Gums and resins, 18,391; hides, 42,384; indiarubber, raw and scrap, 12,036; oilseeds, 30,461; fixed oils for industrial use, 24,511; mineral oils (except petroleum) and resins, 214,082; acids, 16,822; paraffin and wax, 19,516; other chemical products, 19,807; colours, colouring extracts and varnishes, 5493; petroleum, 94,112; manufactures of indiarubber and gutta percha, 2357. Of the total imports the United States supplied 44·1 per cent., Great Britain 14, Argentina 8·5, and France 4·2 per cent.

The exports for 1919 were valued at 5189·5 million lire (3344·7 million lire in 1918), and included (metric tons):—Raw hemp, 38,085; zinc ore, 5787; sulphur, 53,866; refined sulphur, 66,591; olive oil, 7468; essential oils and essences, 11,207; acids, 17,026; citrate of lime, 3458; casein, 8238; soap, 5304; and paper, 10,508. France took 21·6 per cent. of the exports, Great Britain 12·8, Switzerland 12·3, and the United States 8·7 per cent.—(*Bull. Dept. Trade and Com., Canada, July* 5, 12, 1920.)

REVIEWS.

A Treatise on Chemistry. *By the* Right Hon. Sir H. E. Roscoe, F.R.S., *and* C. Schorlemmer, F.R.S. *Vol. I.* The Non-Metallic Elements. *Fifth edition, completely revised by* Dr. J. C. Cain. *Pp. xv.*+968. (*London: Macmillan and Co., Ltd.* 1920.) *Price* 30*s. net.*

A multiplicity of text-books and treatises on any branch of science may be regarded as a pretty fair indication of the appreciation in which that science is held in the country producing them. If we may judge, therefore, from this point of view, there is no valid ground for dissatisfaction with the estimation in which chemical science is held among the chief English-speaking communities. In this respect England and America are as one. The leading publishing houses of both countries have their branch establishments and agencies on both sides "the water," and their productions circulate on each continent, without let or hindrance, to an extent depending on their intrinsic merits or timeliness of appearance.

It has become a truism to say that the lessons of the last few years have opened our eyes to many shortcomings. That we have come through our trial so well says more for the innate benius and capacity of our people than it does for the educational training which prepared us for it. We recognise now that had the nation been better equipped, the ordeal would have been neither so prolonged nor so full of nxiety as it actually was. The public recognition of the influence of Science upon national wellbeing is to be seen in the unprecedented influx of our youth into our Universities, polytechnics, and secondary schools. All theses places are full to overflowing, and the capacity of our chemical, physical, and engineering laboratories is being strained to the utmost.

Good text-books therefore are, and will be, more than ever in request. The publishers of the work under review were well advised to take time by the forelock and prepare for the inevitable demand. This book has now had an existence of nearly half a century, and its position in public estimation is well assured. It may be said to have had its origin in the extraordinary sucess which attended its projector's "Lessons in Elementary Chemistry," first published by the Macmillans in 1866. That little work has gone through edition after edition. It has been translated into almost every European and some Eastern languages, and, as translated by Schorlemmer and published by Vieweg, has been extensively used in German schools and colleges. This well-tested faculty of being able to put together a readable and well-proportioned text-book on general chemistry induced Roscoe to plan the far more ambitious "Treatise," the first volume of which, now under review, is in its fifth edition. The work first appeared in 1877, and fresh impressions were struck off at frequent intervals until 1894, when the book was completely revised and reprinted. It was once more brought up to date in 1905, and again in 1911. Its revision and the correction of its proof-sheets was the last considerable piece of literary work upon which Roscoe, then in his 79th year, engaged.

The undertaking, as originally designed, in conjunction with Roscoe's colleague Schorlemmer, who was to be more immediately responsible for the organic section, was planned on a scale which may justly be described as magnificent. In its *format* and general get-up, in the wealth and excellence of its illustrations, it reflected the broad-minded character and lofty views of its author. It was to appear simultaneously in England and Germany. The English work was never completed. Partly owing to Schorlemmer's death in 1892, but mainly to the very limited demand for a comprehensive work on organic chemistry which existed in this country forty years ago, that division of the book never got beyond a limited section of the aromatic compounds. The German edition was, however, completed by the late Professor Brühl, of Heidelberg, but it has not been thought expedient, as a publishing venture, to issue an English equivalent.

It is interesting to compare the present volume with its predecessor of 1877 and to note the changes which upwards of forty years of progress have necessitated. To begin with, the size of the book has grown from 771 to 968 pages. But this increase in bulk gives a very partial and inadequate idea of the actual amount of new matter. In the occasional resetting of the work considerable compression has been exercised, with a view of preventing the volume from becoming unwieldy and awkward to handle. Moreover, much that ought to be embodied in the text is relegated to footnotes, which in many cases do not go beyond mere bibliographical references. These are of no practical value to the student with little facility of access to a comprehensive library. As regards the historical introduction no very great changes have been made. It is still to a large extent based upon Kopp's *Geschichte*, with additions and corrections due to subsequent commentators. But it only carries the story to within a century of our own time, and accordingly omits all reference to what is of the greatest value and interest to those who would wish to trace, even in broad outline, the modern development of the science. No doubt this subsequent history is of great complexity and difficult of simple treatment. But the question arises whether in view of the existence of the many excellent histories of chemistry we now possess, most of them published since 1877, it is worth while to retain the partial and incomplete account which prefaces the volume. When the work is again reset, it is worth consideration whether the space which might be gained by its omission might not be better employed by the inclusion of matter at present hidden away in footnotes. A book which approaches 1000 8vo pages tends to become irksome to handle, and this question of space will, with time, become increasingly pressing. Something might be gained by the omission of the very elementary matter which finds a place among the earlier pages of the book. With the more general introduction of the teaching of chemistry into our schools the pupil is made familiar with such fundamental conceptions as the indestructibility of matter, the nature of chemical action, the value of the experimental method, etc., and he learns of these and similar basic principles in text-books costing much less than 30s. Of course, even much that may be considered fundamental and elementary is by no means immutable, but no hint of possible or prospective developments is contained in the section referred to which remains in this respect exactly as written more than 40 years ago.

Excellent as the illustrations are, it may be doubted whether in the interests of space all of them should be retained. Some are obsolete and possess only a limited historical interest; others occupy a needless amount of room. One recognises lecture-table apparatus, devised half a century ago by Roscoe's faithful *famulus* Heywood, well known to Owens' College men, much of which has been replaced, in lecture illustrations, by other and simpler contrivances. The arrangement shown on p. 620 no longer represents the process by which phosphorus is manufactured, although a short description is given of the Readman Parker-Robinson system. No account is afforded of the Frasch process of extracting sulphur which has been so extraordinarily successful in America, although it is stated that the output of American sulphur exceeds that of Sicily.

The general plan of the work is so sound that no pains should be spared to maintain its position as the leading treatise in the language. This position can only be assured by timely revision and the excision of obsolete matter. Roscoe during his lifetime acted wisely in associating himself with younger men, in whom he had confidence, in this business of revision. He thereby contrived to impart to his work a perennial modernity and to render it, as far as possible, a faithful reflex of the spirit and knowledge of the time.

Dr. Cain, in bringing out this new edition, has had no light task, and, on the whole, he may be congratulated on the manner in which he has fulfilled it. In striving, as he says, reverently to preserve the general character and style of the book he has had to contend with the proverbial inconvenience of putting new wine into old bottles. Nevertheless he has succeeded in incorporating or noting practically everything of importance concerning the non-metallic elements and their compounds which has appeared since the last edition was published, although we venture to think the "tyranny of space" has compelled him here and there to express himself less fully than he could have wished.

T. E. Thorpe.

Technical Methods of Ore Analysis. By A. H. Low. *Eighth edition, revised and enlarged. Pp.* 338. (*New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1919.) *Price* 10*s. net.*

The new edition of this already well-known and useful book contains several additions which will be of interest to those dealing with the analyses of the particular elements referred to, especially those on uranium, tungsten, molybdenum and potassium.

The author has in many cases taken great pains to give minute details for the successful carrying out of the methods described, and added many personal observations of value to the operator; but it is to be regretted that although the book is intended for the student as well as for the technical chemist, no mention is made in certain cases of well-known and much used methods or variation of methods. As instances one might mention the quick and accurate distillation method for arsenic, which is particularly useful for the determination of comparatively small amounts in certain ores, and more especially in some metals and alloys (the analysis of the latter being dealt with to some extent in the book as well as ores). Again, in the case of gravimetric phosphorus determinations, the author always finishes by weighing the ammonium phospho-molybdate on a tared Gooch crucible, an admittedly accurate method, but no reference is made to the exact and easy method of finishing by conversion to lead molybdate with which a student will often get better results than by weighing the phospho-molybdate, owing to the ease with which the precipitate can be handled and ignited, and the fact that the phosphorus equivalent is even smaller than in the former method. In the case of molybdenum, again, no reference is made to gravimetric assay by determination as lead molybdate.

With regard to the additional matter in the appendix, it may be pointed out that in what is described as "Watt's" method for determining tungsten in ores, a certain amount of tungsten is almost invariably retained in the residues under the conditions of opening up, when using ammonia for extraction, whether the ore be completely opened up or not, and that for the re-treatment 25 per cent. caustic soda solution should be used, the residues being digested on the hot plate until completely decomposed, and the small remaining amount of tungsten estimated by the usual mercurous nitrate method, in place of the aqua-regia and ammonia re-treatment. With some types of tungsten ore, especially those containing titanium minerals, a low result would be obtained by Watt's method as described.

In the note on uranium on page 376 of the appendix, it is stated that a yellow filtrate from the ammonium uranate indicates incomplete precipitation. This is true, but it might be pointed out that the solution need not be noticeably yellow to hold sufficient uranium (especially if the bulk has increased appreciably by the addition of washings) to render the result of a 1 or 2 per cent. carnotite ore appreciably low; and that it is safer to treat the filtrate in any case by acidifying slightly, boiling, and precipitating again with ammonia, using water perfectly free from carbonic anhydride throughout, and allowing to settle and examining the bottom of the flask after five or ten minutes for any further small quantity of ammonium uranate. On the same page there is a printer's error in line 22 (U_3O_3 instead of U_3O_8) and repeated on line 28; but speaking generally the book is well and clearly written, and contains but few clerical or printer's errors.

Benedict Kitto.

Cocoa and Chocolate: Their History from Plantation to Consumer. *By A. W. Knapp. (London: Chapman and Hall, Ltd.* 1920.) *Price* 12*s*. 6*d*. *net*.

Mr. Knapp, research chemist to Messrs. Cadbury Bros., has written an entertaining but thoroughly well-informed work on the history, cultivation, and manufacture of cocoa. In a happy vein he discourses of the Spaniards' discovery of the chocolate beverage in Mexico and of the dainty seventeenth century chocolate houses in London. Even the statistical matter is enlivened by a ready imagination and by the use of diagrams. Illustrations, maps, and diagrams are alike admirable.

For the general reader this is quite the best book that has yet appeared, and the technical reader will find much of interest, including frequent references in the text to scientific and agricultural publications, and an excellent bibliography. Mr. Knapp is equally at home on the plantation and in the factory; on the Gold Coast or in the West Indian Islands. In his vivid descriptions of the orchards, the collection of pods, and curing of beans he has succeeded, as no previous writer has done, in conveying something of the remarkable charm of the cocoa grove. A humorous dialogue between a planter and manufacturer brings out the special qualities of cocoa beans desired by the latter. The rapid growth of the cultivation of cocoa by peasant proprietors on the Gold Coast is described; it constitutes one of the most remarkable chapters in the chronicles of tropical agriculture.

We offer two slight criticisms. The illustration of a criollo cocoa-pod, given on p. 27, is scarcely typical, and the least satisfactory section of the book is, perhaps, that on cocoa fermentation. Following the description of the alcoholic fermentation with yeasts, no allusion is made to the important part played by acetic acid bacteria in the normal course of fermentation, if this is prolonged beyond the third or fourth day.

OBITUARY.

LEONARD PHILIP WILSON.

By the sudden and unexpected death of Leonard P. Wilson on October 16, after an operation for appendicitis, applied chemistry is deprived of an investigator of the first rank, and the societies with which he was associated have lost a valued member.

Mr. Wilson, who was born in 1879, was educated at St. Dunstan's College, Catford, and gained a Clothworkers' Scholarship to the City and Guilds' Central Technical College, South Kensington, where he became Leathersellers' Research Fellow and Associate in 1899 and Fellow in 1912. After holding appointments with Messrs. Wilkinson, Heywood, and Clarke and the Vacuum Oil Company, he joined Messrs. Courtaulds, Coventry, as chemist in 1906, and at his death was the chief chemist on the staff. The development of the artificial silk industry and of Messrs. Courtaulds shows the part played by Mr. Wilson in the investigation of the problems of the industry. He was the author of numerous patents and papers in connexion with artificial silk and other subjects, and served on the Patents Committee of the Association of British Chemical Manufacturers. Mr. Wilson took great interest in the welfare of local scientific societies, and as chairman of the Birmingham Section of the Society of Chemical Industry he won the respect and admiration of all the members. The value of his services was recognised in his appointment last year as one of the vice-presidents of the Society.

R. S. Morrell.

PUBLICATIONS RECEIVED.

Third Report on Colloid Chemistry and its General and Industrial Applications. *British Association for the Advancement of Science. Department of Scientific and Industrial Research. Pp.* 154. (*London: H.M. Stationery Office.* 1920.) *Price* 2*s*. 6*d*.

Plantation Rubber and the Testing of Rubber. *By* G. Stafford Whitby. *Monographs on Industrial Chemistry, edited by* Sir E. Thorpe. *Pp.* 559. (*London: Longmans, Green and Co.* 1920.) *Price* 28*s*.

Hoo Cannel. *By* F. S. Sinnatt *and* M. Barash. *Bulletin* 6, *The Lancashire and Cheshire Coal Research Association*, 1920. *Price* 1*s*.

PRESIDENT'S ADDRESS TO THE LONDON SECTION.

SIR WILLIAM J. POPE.

This is the first occasion on which I have had the pleasure of addressing a sectional meeting since the Society of Chemical Industry did me the honour of electing me as its president at the Annual Meeting in June. I should like to take this opportunity not only to express my appreciation of this action of the Society, but also to assure you that I fully realise the responsibilities attaching to the position which you have called me to fill.

At the present moment, when our Society is entering upon a new year of its activities, it is probably desirable that attention should be drawn to some of the more urgent matters which will occupy us during the immediate future. You are aware, of course, that we have now in existence a Federal Council for Pure and Applied Chemistry, composed of nominees of about twenty of the chief societies concerned with chemistry and its applications, which has, as its purpose, the treatment of those chemical interests which are common to all our societies and which cannot be said to be the specific care of any particular body. It was to be foreseen that the constituent societies would select their nominees from among their most active and experienced members so as to ensure that the common interests should be properly cultivated.

We all of us recognise that if chemistry is to take the place it should in the public eye, the provision of a commodious central Chemical House is essential to the expansion of our corporate interests; that Central House requires to be munificently provided with meeting rooms and library accommodation, more especially in the interests of the younger chemists. We require also an organisation for the preparation and publication of collective chemical summaries: summaries conceived upon some carefully-thought-out and convenient plan. These two objects—the Central House and the bibliography scheme—will involve a capital expenditure of something like £500,000, and the Federal Council has devoted much time and thought to their consideration. In this project we are fortunate in having the leadership of Lord Moulton, who had such unique opportunities during the war of realising how vital co-operative action in chemistry and its applications is to the well-being of the nation. Commenting upon Professor Louis' stirring presidential address at our annual meeting last year, *The Times* said of conditions during the war:—" The country required chemistry and was prepared to pay for it. It got what it required. Our need of research in chemistry and of applied chemistry is even greater in peace than in war. We can get them if we will pay for them." In this important lay expression of opinion it is suggested, as it has been suggested in many other quarters, that we should apply to the State for money; the State helps those who help themselves, and I do not doubt that most of us feel that we should exhaust all other sources of financial aid before dipping into the public purse.

Another great problem which our large chemical societies now have to face is that of the cost of publication of periodical journals and of abstracts. It is perhaps hardly realised by many of our members that whilst in 1919 each member subscribed £1 10s. to the Society, the Society spent about £5 per member; advertisements in our Journal amounted to about £2 10s. per member, and a good part of the remaining £1 was paid for by a deficit on the year's working. The great bulk of the £5 per member was expended on the production of the Journal, and although the member received a very substantial bonus on his subscription of 30s., it was clear that the annual subscription had to be increased. The only ways, in my opinion, for obviating a further increase in the annual subscription are to spare no efforts in securing new members and to enhance still further the usefulness of our Journal; the latter question is now before the Federal Council, and I hope that the large chemical societies will shortly be invited to confer upon the possibility of some co-operative publication scheme.

The foregoing matters are all in train, but I should call your attention to one activity of the Federal Council which has been carried to a successful result. Following our example, practically all the Allies have formed each its own Federal Chemical Council, and these have all become federated as one large international organisation for the cultivation of universal chemical interests. This larger body is the Union Internationale de Chimie, which held its last annual meeting in July, in Rome; a report of this meeting has already appeared in our Journal (p. 251 R).

THE PHOTOGRAPHY OF COLOURED AND OF DISTANT OBJECTS.

The ordinary photographic plate is sensitive only to blue and violet light, *i.e.*, to the rays of shorter wave-length in the visual spectrum. When an image of some parti-coloured scene is thrown on to the photographic plate it receives much the same impression as we should obtain on viewing the scene through deep-blue spectacles. This limitation of light-action to a short range of the visual spectrum leads to photographic misrepresentations.

Long experience has led us to see nothing ridiculous in a photograph as such; we instinctively recognise the reproduction as a photograph, and see nothing absurdly anomalous in the manner in which the colours are represented in monotone. A photograph of a patch of primroses shows the bright yellow centre of the flower as black; similarly, a red rose photographs as black, and the deep-blue violet as white. By photographing the visual spectrum on an ordinary plate we can readily obtain a record of the range of wave-lengths of light to which the plate is sensitive. During the early seventies it was observed by Vogel, Waterhouse, and others that the incorporation of certain dyestuffs with the sensitive photographic film renders the plate sensitive to light other than blue and violet; thus, Erythrosine, Rose bengale, and Acridine Orange extend the sensitiveness of the plate into the green region of the spectrum. Ethyl Red, one of the cyanine dyestuffs, was then found to confer sensitiveness even to red light.

The discovery that the photographic plate can be rendered sensitive to comparatively long light-waves was of prime importance, but the extra-sensitiveness conferred was limited and accompanied by other disadvantages, such as liability to fog, and it did not, in consequence, find immediate widespread applications. A really substantial development of the discovery was made by the introduction of an isocyanine dyestuff in 1903 by Meister, Lucius, und Brüning, under the name of Pinaverdol; this substance sensitises the photographic plate right through the green and well into the red region of the spectrum. In 1905 the same firm introduced another allied dyestuff, Pinacyanol, which sensitises far into the red, although not so well in the green region. Both these dyestuffs are easy to apply to the photographic plate, and their use is not accompanied by the disadvantages of the former sensitisers.

A base is now provided for a successful attack upon two problems. The first is to obtain a correct representation in monotone of coloured objects; and the second to devise satisfactory reproductions in colour of parti-coloured objects. The first object can be attained by rendering the plate sensitive to the entire visual spectrum by the application of Pinaverdol and Pinacyanol, and interposing a yellowish or greenish coloured filter so as to diminish the amount of blue light which gets through to the plate during exposure.

A plate prepared with the sensitising dyestuffs is described as a "panchromatic" plate, and a series of pictures showing first a photographic reproduction in colour of a scene, and then the monotone reproduction on an ordinary plate, on a panchromatic plate, and, lastly, on a panchromatic plate with the interposition of the colour filter, shows the progress which has been made in photographic representation in monochrome.

The second object, the reproduction of the actual colours, is technically more difficult and has provided a subject for the exhibition of vast ingenuity and skill. In 1861 Clerk Maxwell, when Cavendish Professor in Cambridge, pointed out that by dividing the visual spectrum into three consecutive fractions, making three photographs of the coloured object through light filters corresponding to this sub-division of the spectrum, reproducing the three pictures in appropriate colours, and then superposing the three coloured prints, a photograph in natural colours would result. In due time this observation led to the very beautiful Sanger-Shephard process of colour photography. Another method of attacking the same problem originated with Professor Joly, of Dublin; he prepared a transparent grating ruled with alternate lines of three colours representing the division of the visual spectrum into three parts, and made one negative by exposing the photographic plate with its sensitive surface in contact with the grating. After development a print is made on glass and then bound up in contact with a ruled grating in colours corresponding with those used in preparing the negative. It is obvious that this specific method for producing a photograph in colours is capable of development, principally in the direction of preparing more minutely reticulated gratings; one of the developments of the Joly process consists in the substitution of a three-colour grating in squares for the Joly ruled grating.

Another method for carrying out the spirit of the Joly process may now be mentioned. It is clear that the preparation of the reticulated grating presents technical difficulties. These are overcome in the process devised by the Lumière Brothers by a particular method of construction. Three batches of starch granules are dyed each in one of the three colours corresponding to the triple division of the visual spectrum already referred to; these dyed granules are then thoroughly mixed in appropriate proportions and a single layer of the mixture is squeezed on to the surface of a panchromatic plate. The plate is exposed in the camera to the image of the parti-coloured scene through the pattern of starch granules. The plate is then developed, the deposited silver removed, and the residual silver halide converted into metallic silver; a picture in colours results. As an illustration of the fidelity of colour reproduction possible by the starch granule process, it is noteworthy that it expresses excellently well the interference colours shown by birds and beetles.

We may now turn from these technical applications of sensitising dyestuffs to consider briefly one or two of the purely scientific questions involved. At present we do not know why these substances exert the sensitising action described, but one point can be clearly demonstrated. The silver halogen salt absorbs the dyestuff; this can be shown by precipitating silver bromide from a solution containing the dye. Using a particular sensitiser of the Pinaverdol or Pinacyanol class we can show that the extra-sensitiveness conferred contains two maxima in the green and red; these maxima are, in individual cases, situated more or less far towards the longer wave-length end of the spectrum. A general relationship exists between the position of these maxima and the two maxima observed in the absorption spectra of the dyes in aqueous solution. When the extra-sensitisation maxima are found furthest towards the red, the absorption spectrum maxima also lie furthest towards the red; the converse is also true. It is to be noted that we do not know the absorption spectra of the silver halide dyed by the sensitiser, but it is very significant that the qualitative relation just noted exists between the sensitising action on the plate and the absorption spectrum of the dye.

We turn next to the chemical constitutions of the chief sensitising dyestuffs. Six years ago the constitutions of Pinaverdol and Pinacyanol were not known with certainty, but the work of my colleague, Dr. W. H. Mills, and others leaves little doubt as to the accuracy of the constitutional formulæ now generally accepted. An inspection of these constitutional formulæ indicates the possibility of introducing substituting groups in many positions in the molecule; and during the last few years Dr. Mills and I have prepared some fifty or more substitution products of these two types of compound and have, with some degree of precision, traced the relation between sensitising action and their constitution.

I turn now to my last point. The atmosphere is not penetrated with equal facility by light of all colours, or of all wave lengths. The rays of short wave-length, the blue and violet, are most readily absorbed and diffused by the air, and, in passing from short to longer wave-lengths, through the green and yellow to the red, the absorptive and diffusing effect of the atmosphere becomes progressively less and less. A simple demonstration of the truth of this statement is presented to us every day. When the sun is high it appears white or bluish-white, and its outline is sharp; but as the sun declines it appears yellow and loses its sharpness of definition. Just before the sun falls below the horizon it is bright red and shows a hazy outline. So that with perpendicular incidence the sun's light reaches us with but little absorption of the blue rays by the short length of atmosphere through which it has to pass. As the sun declines the blue is absorbed by the longer stretch of air, and just at the setting the atmospheric path through which the sun's rays reach us is so long that the blue, green, and yellow are absorbed and diffused and nothing reaches us but the red light. The same thing happens in a fog; if the fog is slight the sun appears yellow and not sharply defined, but if the fog is dense the sun shows red, and its circle is very indistinctly defined.

These facts, based upon common observations, have a very important bearing. If a distant view is photographed on an ordinary plate sensitive only to the blue and violet, absorption and diffusion of the light is considerable; the resulting photograph is thus more or less ill-defined. But since the atmosphere is penetrated to a far greater extent by the red rays, it follows that if a spectroscopically pure red filter is placed between the lens and the object, the resulting photograph will reveal far more detail.

In the air photographic service ordinary plates were used during the early part of the war, but as time went on the ordinary plate became more and more completely replaced by the panchromatic plate. At the armistice about 80 per cent. of the plates used in our air service was panchromatic.

Until the outbreak of war all the sensitising dyestuffs used throughout the world were made by Germany; outside the Central Powers practically no information was available as to the methods of preparation and constitution of these sensitisers, and the outbreak of hostilities found us deprived of sources for these essential materials.

An investigation carried out by Dr. Mills and myself put us in possession of methods of manufacture and of details concerning the constitution of both Pinaverdol and Pinacyanol, and the whole of the supplies of these two compounds required by the photographic air services of the Allies throughout the war were produced (as Sensitol Green and Sensitol Red) in the chemical laboratory of the University of Cambridge.

The production of these substances in this country and the familiarity gained by our technical chemists in dealing with them resulted in very substantial progress being made in panchromatic photography. The best commercial panchromatic plates previously available required about three times the exposure for red as for blue light, but those now available require less exposure for red than for blue. In consequence of this progress panchromatic plates were produced which could be used in air photography with an exposure through a spectroscopically pure red screen of only 0·01 of a second. This fact is of great importance in war aerial photography, but it will certainly become of far greater value now that aerial photography is becoming essential in surveying and topography.

RAIL CONVEYANCE OF CHEMICAL COMMODITIES.

(ANOTHER POINT OF VIEW.)

L. ARCHBUTT.

In a recent issue of this Journal, (Sept. 30, p. 315 R) Mr. J. Lukes has discussed the increased railway rates and charges as they affect the chemical trade. He tells us that from his point of view the chemical trade has been very unfairly treated, and for this he lays the blame at the door of the railway companies. He charges the railway companies, first, with having regarded practically all "Chemicals" as "Dangerous Goods," and then with having taken advantage of their statutory powers to charge for these goods rates which are excessive, "unreasonable," and even "onerous"; he even suggests that the Germans outstripped us in the chemical industry before the war because of the restrictions placed by the railway companies on the movement of chemicals in this country. It will perhaps be of interest if some of Mr. Lukes' charges are examined in detail.

Are the Rates on Chemicals Unreasonable?—The statutory maximum rates on non-dangerous goods, which include many staple products of the chemical industry, were fixed by Parliament in 1891/1892. Some of these rates have since been *reduced* by the railway companies, and large numbers of special low rates have been given as the result of representations made to the railway companies by the chemical trade.

Legal Conditions and Rates for Dangerous Goods.—Section 105 of the Railway Clauses Consolidation Act, 1845, to which Mr. Lukes refers, was enacted in the common interest, and the railway companies may refuse to carry goods which in their judgment are dangerous; but the companies have never abused their rights under this section, and do in fact carry large quantities of dangerous goods.

It is a sore point with Mr. Lukes that the decision as to what goods are dangerous under the conditions of railway transit should rest with the railway companies. Would any other arrangement be just or reasonable, seeing that the railway companies are responsible for the safety of the public, of their staffs and of the property entrusted to them? It must be admitted that the companies with their vast experience of goods in transit really are the only qualified authority on the subject.

The companies are, however, bound by law to exercise their judgment *bona fide*, and in the only three test cases heard before the Railway and Canal Commissioners in which the writer was interested, in two of which Mr. Lukes also was concerned, the Court decided that the railway companies did arrive at their decision in good faith and on good grounds. Is not the decision of His Majesty's judges sufficient?

Having accepted dangerous goods for conveyance, Part 4 of the Railway Rates and Charges Order Confirmation Acts, 1891/1892, enacts that the charges made for the conveyance must be reasonable, and the trader has a remedy if he considers the charges excessive.

It is alleged that the railway companies have made such use of their opportunities under the Act that they have included "practically all chemical products" within the term "Dangerous Goods." This assertion is wildly incorrect, as a casual glance at the Classification will show. The number of chemical products specifically named in the *white* pages of the General Railway Classification of Goods, *i.e.*, goods carried without special regulations, far exceeds the number listed as dangerous goods, and a closer examination will show that the number of chemical products classed as dangerous holds a yet smaller relationship to the whole, since a great number of chemicals having no dangerous properties and requiring no special regulations as to conditions of carriage are grouped together, without being specifically mentioned, under the generic entry which appears in the white portion of the Classification, viz.:—"Chemicals, not dangerous, corrosive or explosive. The "Alkali" List and "Packed Manure" List include a large number of staple products of the chemical trade which have been carried for many years as ordinary goods at exceptionally low rates. It may be that Mr. Lukes when speaking of "practically all chemical products" had his horizon limited by benzol, toluol, naphtha and the like, but the heavy chemical industry is a large and important one also.

Mr. Lukes not only charges the railway companies with having gone to the utmost limit of their powers in branding "practically all chemicals" as dangerous goods, but he cites the growth of the Dangerous Goods Section of the General Railway Classification of Goods since 1890 as evidence. Now in 1890 there was no Special Classification of Dangerous Goods as it exists to-day. The list of 1890 included a few explosives, a few highly inflammable liquids, and a few chemicals, in no sort of methodical arrangement, and it was full of inconsistencies. To-day we have an ordered list, arranged in sections. *All* Authorised Explosives are to-day carried by railway and are provided for in the Classification. Inflammable Liquids are arranged in two classes, those flashing below and those not flashing below 73° F. (close test), Dangerous, Corrosive and Poisonous Chemicals are divided into two sections, section 1 including the more dangerous articles, section 2 those less dangerous, and under the heading of Miscellaneous Goods are grouped articles such as Charcoal and Oily Rags, liable to spontaneous ignition, Matches, Compressed Gases, etc. The list has grown, not because the railway companies "have made the utmost use of their opportunities," but mainly owing to the inclusion of goods having properties which have led to accidents. Mr. Lukes lays stress upon the large number of pages in the Dangerous Goods Section, but he does not state that of the 212 pages exactly one half is taken up by the Index, By-laws, Government Orders, Consignment Notes, Specifications of

Packages, etc., that of the remaining half the greater part is taken up by the Packing Conditions, etc., and that the actual number of entries (which includes all Authorised Explosives) is only a small fraction of the total number of the entries in the whole book. He omits to mention that whilst on some pages of the Dangerous Goods Section only one or two articles are mentioned, 30 to 50 articles are to be found on nearly every white page, and he makes no reference to the fact that Explosives alone account for more than half the total number of entries in the Dangerous Goods Section. In the 1890 list the total number of Explosives was 18 entries on one page, whilst in the list as it appears to-day no fewer than 457 entries appear on 16 pages. The growth of the list is, indeed, to a great extent due to the inventive genius of chemists, which has been especially fruitful in this (Explosives) section of the Dangerous Goods. It must also be noted that the rates charged for the carriage of dangerous goods have not been generally raised, as Mr. Lukes' remarks would lead one to infer, as a consequence of their transference from the white to the yellow pages; only the conditions are amended, in order to ensure safe conveyance. In a great many cases, the transference has been made mainly to inform the railway companies' staffs as to the character of the goods and the precautions which must be taken in dealing with them to prevent accidents and damage to other goods.

Rates on Dangerous Goods.—As a chemist, I am not able to deal with Mr. Lukes' statements under this head, but a railway colleague expert in rates, whom I have consulted, informs me that Mr. Lukes confuses "Charge" with "Class." My friend remarks:—"Certain non-dangerous merchandise is included in Class 2, and the Acts of 1891 and 1892 contain the maximum rates applicable to the traffic in Class 2 divided into charges for Conveyance, Station Terminals and Service Terminals. The actual rates on the rate books for traffic in Class 2 (often considerably below the maximum rates) as a rule also include collection and delivery. Petrol in owner's tank wagons is, however, not in Class 2, as Mr. Lukes suggests, and the General Railway Classification says in respect of it 'Charge Class 2 rate, with the conditions Owner's risk, Station to Station,' which is just a convenient way of naming a rate without incurring the delay involved in arranging and issuing an exceptional rate in every case. In effect, there is no difference between charging traffic at a Class 2 rate of 20s., substituting for its ordinary conditions special conditions, and charging it at an exceptional rate of 20s., recorded with those same special conditions.

"Let us imagine that all Dangerous Goods now charged at Class 2 rates with S. to S., Owner's risk, conditions, were included in Class 2 and subjected to allowances for the services included in the Class Rates but not performed on Dangerous Goods, that would mean a loss of revenue on that traffic. How would that loss be redeemed? It could only be made good by imposing it on other goods; for example, the less Benzol pays the more must Alkali pay, but the heavy branch of the chemical industry may have some views on the relative claims of their goods to consideration.

"The same considerations arise in connexion with private sidings, *e.g.*:—

"A line is opened, stations are built, and the accommodation is increased as the traffic develops, until one day a firm using one of the stations finds its business has so increased that it will be an economy for it to put down a private siding. This is constructed, and one-fifth of the tonnage for which the station has been equipped is transferred to the siding; if the one-fifth is to be relieved of any part of the station expenses, the remaining traffic of the railway must take it if the revenue is to be maintained; if the revenue is not maintained, efficiency is at once crippled."

Decline of the British, and Growth of the German Coal-tar Colour Industry.—The suggestion that the British railways crippled the chemical industry in this country and incidentally helped to develop that of Germany is equally incorrect, and will be assessed at its proper value by members of this Society. The British manufacturers apparently found it better business to export their semi-manufactured chemical commodities to a country where the chemical industry was in such a highly-developed state that the works receiving these commodities could put them through all processes without having to "incur the expense of a series of movements by rail." Why, therefore, blame the British railways because the trade was so concentrated in Germany that a "series of movements by rail" was eliminated?

Contract Conditions.—The special contract conditions and indemnity clauses to which Mr. Lukes takes such serious exception apply, as a rule, in the case of explosives and specially dangerous traffics, and the trader only renders himself liable to penalties if he does not comply with the specified conditions as to packing, etc., which the railway companies consider necessary to ensure safety. It may be, and no doubt is very largely due to these conditions and regulations that in this country we have had so few serious accidents, whilst in America, especially prior to the establishment of the Bureau of Explosives, appalling accidents occurred.

Rolling Stock.—Under this heading Mr. Lukes makes sweeping charges of unreasonable railway rates, but many instances might be quoted of special low rates which have been given for traffic in Owner's Tank Wagons to meet traders' requirements; to mention only two, Crude Naphtha and Fuel Oil, the rates on which are much lower in tank wagons than in steel barrels. Mr. Lukes does not show that adequate provision has not been made for traffic in private owner's wagons, the empty haulage and manipulation of which is a very serious item of expense.

Comparison with Germany and America.—It may interest Mr. Lukes to know that the serious accidents which were occurring in America in the transport of Dangerous Goods led to the establishment of the Bureau of Explosives in 1907, and Col. Taylor came over here on purpose to study our British regulations. Conditions are, of course, very different in the two countries, but one instance occurs to me in which the American regulations are more severe than ours. All glass carboys there have to be boxed and to withstand a swing test. It is very difficult, if not quite impossible, to make a fair comparison between the rates of one country and another; the ideals, the economics, the geography and the conditions may be so entirely different. Mr. Lukes' figures are much too vague to be of any service as comparisons. To be of any value one requires to know what the various rates include, whether they are fairly representative, and whether the German rates belong to the preferential class or not. It will be remembered (by many with lasting bitterness) that the German chemical industry was prostituted, as well as subsidised through the railways, to further the greatest scheme of world domination ever witnessed.

Mr. Lukes' reference to the recent case in the Railway and Canal Commission Court is quite misleading. He says "it was declared that the railway companies did not accept 150° F. as the dividing line between danger and safety, and their contention was upheld by the Court." Mr. Lukes knows that the traffic in dispute flashed at 100° F., or only a few degrees above this, and his statement should be compared with the following remarks which were made by Mr. Justice Lush in delivering his judgment:—"The case for the defendants really is that if the flash-point of an oil like this is over 100° F., which is true of this product, there is no danger in carrying it. The railway companies and their advisers and witnesses place the limit of a safe flash-point at 150° F. Most of these 20 samples have a flash-point only slightly over 100° F., and the highest is 130°. Other authorities seem, from the documents in evidence before us, to take the same view as to 150° being the proper line of demarcation. The railway companies are quite entitled to take the view which they have taken, that that is the correct view. That they have not acted in bad faith in taking it is obviously true."

Dangerous or Non-Dangerous.—Mr. Lukes is very much disturbed because the English railway companies are guided by a body of chemists who he says, "generally speaking, have no works' experience of chemical processes and products; they do not appear to consider whether the merchandise is safe in the package in which it is conveyed, but what might happen in case of a train accident or an accident to a container." Works' experience, which, by the way, many of the chemists have, is excellent in its place, but is not a prime qualification in connexion with railway transport. The first and foremost qualification in this connexion is experience of commodities in transit and knowledge of the hazards, both human and mechanical, which are involved. A carboy of corrosive acid may be relatively harmless when standing in a works where all the employees know its exact nature, and the proper appliances are available instantly in case of accident. It is a very different thing when handed over to the servants of a railway company to be carried from one part of the country to another in company with a thousand other articles. The escape of acid may render all sorts of effects possible, some of them most serious. If the railway companies' advisers did not consider what might happen in the case of train accidents or the use of leaky containers they would be quite incompetent to give advice. Mr. Justice Lush said, referring to the heavy naphtha which was the subject of the dispute in the Law Courts to which Mr. Lukes has referred:—"If securely packed so that no leakage could possibly take place the risk might, no doubt, be treated as very small. But the question is, what the true character of the oil itself is, not what the danger is if it cannot escape from the receptacle that holds it," and further on in the same judgment he says "the defendants strongly rely on there having been no accident in the carriage of these goods when not properly declared, but that is only one element to be considered. The companies may have been fortunate in not having an accident. The fact that none has occurred does not prove that there was never any risk. The chief element, or one of the chief elements, of danger which the railway companies regard as serious is this, that if vapour should be given off, which with the flash-point I have mentioned may well happen, and were to ignite, most serious consequences would follow, and what might have been a small fire, easily controlled, would rapidly become a serious conflagration through the naphtha coming in contact with other goods on the companies' wagons or premises." Has Mr. Lukes ever heard of the Abergele accident in 1868, when the Irish mail ran into a goods train carrying barrels of paraffin oil which became ignited and led to 33 persons being burned to death? Such appalling accidents arising from the transport of dangerous goods on British railways have fortunately been few in number, and this has largely been due to the companies' vigilance; but accidents serious enough in their way do frequently occur with dangerous goods (the recent contamination of foodstuffs by leakage of arsenical weed-killer from a faulty package will be fresh in mind) and demonstrate that the manufacturer does not always appreciate the dangers of a substance from a railway transport point of view, although he may know all about it from his own works' point of view.

Assistance for Key Industry.—Mr. Lukes complains that no real attention or assistance has been given to the chemical industry so far as carriers are concerned, but I may remind him that many days have been spent during the past few months in classifying dye-intermediates in order to help the dye industry, and that an endeavour has been made to fix uniform rates and conditions for as many as possible of these important products. The assistance of "key" industries for State purposes is, however, not the province of a railway company.

Revision of Railway Rates.—Mr. Lukes is anxious that what he calls an "impartial business tribunal," easy of access and inexpensive, should be appointed with the power to classify merchandise of every description, including dangerous goods. If it should be decided to establish yet another tribunal, I hope that Mr. Lukes will find as much patient attention and consideration given to these matters, and as much desire to meet the requirements of traders, as has been given during my experience of nearly 30 years by the Chemists' and Dangerous Goods Committees of the Railway Clearing House. Our practice has been for a long time past, whenever serious complaints regarding important matters have come before us, to arrange interviews with the traders concerned, and in most cases we have been able to fix regulations which have removed the difficulties.

In concluding this article I have to thank several of my railway colleagues who have given me the benefit of their suggestions. One of them remarks:—"An adequate revenue for railway companies has to be found from somewhere, and it is largely a matter of indifference where it comes from. If the heavy chemical trade is prepared to pay more, it may be that it could be arranged for the light chemical trade to pay less; also, if the users of stations were prepared to shoulder the whole of the terminal costs, siding traffic might be free of it, but this is certain, that the benzol, toluol and naphtha industry cannot have its charges greatly reduced without somebody bearing the burden they drop, and it will have to be proved that they are in a worse position than others, and entitled to greater consideration in consequence, before this is likely to occur."

PROBLEMS AWAITING SOLUTION.

The address which Prof. W. D. Bancroft delivered, as chairman, to the Division of Chemistry and Chemical Technology of the National Research Council (U.S.A.), and which is published in the *Journal of Industrial and Engineering Chemistry* for September (pp. 911—918), contains many suggestive remarks concerning problems of scientific and technological importance which lie within the borderlands of chemistry and one or more other sciences. Some of these problems are briefly outlined below:—

It is well known that, in general, flour with more gluten makes a better loaf than flour with less gluten, whilst certain flours with a relatively low gluten-content make quite as good loaves as other flours with larger amounts of gluten. To account for this the bakers have assumed the existence of strong and weak glutens, but this does not seem consistent with their similarity or identity of chemical composition. Staleness in bread is apparently due to a displacement in the distribution of the water-content between the gluten and the starch, and it is an interesting problem in colloid chemistry to see if this can be prevented in an easy and economical way. Again, the variations in quality between home-made and bakers' bread call for an investigation of the conditions for producing any desired quality of bread on a large scale. Strange as it may seem, no use has yet been made of the microscope in studying bread and bread-making.

The change-over from the box to the cup method of tapping trees for turpentine resulted in an increased annual yield, but the flow diminished until after six or seven weekly chippings had been made. According to Tschirch, the wounding of a tree leads to the formation of numerous and much larger resin ducts, and it was at first thought that this might explain the temporarily diminished flow. It has, however, since been found that the secondary ducts are only formed in the summer wood, whereas the cups are made in the early spring. No explanation of the cause of the shortage of resin flow in the cups or of overcoming this shortage by making a preliminary chipping during the winter, has yet been found. It is quite possible that some other method of stimulating the tree might be more effective, both in regard to yield of turpentine and the length of the life of the tree. The tapping of rubber trees is somewhat similar in the phenomenon of wound response, and the yield of shellac is also due to resin exudation from trees pierced by certain insects.

According to the hypothesis advanced to explain the toxicity of "mustard gas" (*cf.* J., 1919, 7 R), the important factors concerned are the lipoid solubility, the water solubility, the volatility, and the rate of hydrolysis, and these considerations should prove fertile in elucidating the toxic action of other substances. No explanation has been offered of the action of lachrymatory gases, and why, for example, bromine compounds are more virulent than the corresponding chlorine compounds, and why one particular chlorine compound is as effective as any bromine compound. Such problems open the way to the biochemical study of blisters and burns and other chemotherapic problems.

The general belief among medical men that variations in the body weight depend directly upon variations in food and exercise appears to need revision. The evidence shows that at any given moment any given person has a definite or normal body weight which he tends to hold and which does not vary unless there are large variations in the amounts of food and exercise. Thus it is practically impossible to fatten a normally thin man and difficult to reduce the weight of a normally fat man. Such considerations lead to the conclusion that there is some regulatory mechanism tending to keep the body weight at normal value, corresponding to the mechanism which regulates the body temperature; and if it were possible to change the regulator voluntarily and easily the results would be of enormous importance medically.

The question of the plasticity of clay is still awaiting investigation. There seems to be no doubt that it is largely due to the presence of a gelatinous film around the clay particles, but nothing is known as to what prevents these films from losing their power to take up water after being dried in the sun. The problem of whether the kaolin which results from the weathering of felspars is a definite compound or not is still unsolved; and it is abundantly clear that the chemical, optical, catalytic, and adsorptive properties of clay need renewed and careful study with a view to their co-ordination.

The isolation and utilisation of the constituents of coal tar are dependent upon their preparation in a pure state and the determination of their properties. This is not so simple as it appears. Probably but few chemists in the United States know the correct melting-point of anthracene; that of carbazole, as given in the literature, is in error by 7°. The melting-points of mixtures of carbazole and anthracene are known to very few. Adequate tests for the purity of organic products should be worked out and more attention paid to physical tests, *e.g.*, the form of the melting-point or solubility curve, the magnetic rotation, dielectric constant, critical data, and the electric and magnetic birefringence. The spectrometer should be employed for standardising colours, and a spectrophotometer be devised for detecting commercial mixtures.

Among other problems described or referred to are structural colours, sedimentary rocks, and the origin and artificial preparation of dolomite, pressure phenomena inside the earth, surface colours, Brownian movements, quicksands, metallic lustre, etc.

NEWS FROM THE SECTIONS.

AMERICA.

At the first meeting of the new session, held in New York on October 8, Professor Marston T. Bogert presented the Grasselli Medal to Dr. Allen Rogers, the hon. local secretary.

In making the presentation, Professor Bogert explained that the medal had been instituted by the Grasselli Chemical Company, of Cleveland, Ohio, and was awarded annually to the author of the paper presented before the American Section of the Society of Chemical Industry which, in the opinion of the Medal Committee, contained the most useful suggestions in applied chemistry. The paper for which the present medal was given was "Industrial Uses for the Shark and Porpoise" (*cf.* J., 1920, 9 T), which contained, in addition to much original information, an account of some entirely new processes dealing with the production of fine leathers, fertilisers, and the recovery of oils from the skins, etc., of these animals. Professor Bogert then gave an outline of the career of the recipient, dealing with his work at the Universities of Maine and Pennsylvania, as a leather chemist with the Oakes Manufacturing Co., and as professor of industrial chemistry at the Pratt Institute, N.Y. During the war, Major Rogers was placed in charge of the Industrial Relations Branch of the Chemical Warfare Service.

Dr. Allen Rogers, in returning thanks for the award, stated that, in reference to the subject matter of his award, a fairly large plant was in operation at Morehead City, North Carolina, where the fish are caught, the skins removed, the livers rendered for oil, and the flesh converted into fertiliser stock. Another plant was located at Sanibal Island, Florida, and at the tannery in Newark, New Jersey, about 1000 skins were being treated weekly. Plans were now being prepared for establishing other stations at various points along the Atlantic and Pacific coasts, and existing plants were to be greatly enlarged. Specimens of the leather and oil were exhibited, and Dr. Rogers intimated that he hoped to be able to present further results of his investigations at an early date.

NEWCASTLE.

At the initial sessional meeting, held on October 20, Dr. J. H. Paterson, the chairman, delivered an address on the problem of fuel economy, concerning which, he said, there was an extraordinary lack of published information, especially in regard to the financial aspect, except in the case of gas production. Much attention had been paid to the boiler, but practically none to other furnaces, and the urgent need was to obtain data from manufacturers, guaranteed as to accuracy, and to correlate them. Research was particularly required on reheating and other metallurgical furnaces. More attention must be directed to the control and limitation of the amount of air passing through a furnace; and the fact that the bigger the coal the more air it required for combustion made out a case for the burning of fine coal. The question of using oxygen, not stored in cylinders, was worthy of consideration; in Canada such oxygen was being produced on a large scale at 3 cents per 100,000 cb. ft.

GLASGOW.

On October 26, Dr. John A. Cranston delivered a lecture at the Royal Technical College on "Modern Developments of the Atomic Theory," in which he traced the influence of the discoveries of radio-activity, X-rays, and of the electron theory upon the theory of the structure of the atom. The lecturer pointed out how the convergence of work in several fields of research had led to the establishment of the fundamental nature of atomic numbers, and he indicated aspects of the problem of atomic structure which resulted from work on light and mass spectra. Rutherford's work on artificial transmutation was also reviewed.

EDINBURGH AND EAST OF SCOTLAND.

The first ordinary meeting of the new session was held in the hall of the Pharmaceutical Society, Edinburgh, on October 26, Dr. H. E. Watt presiding. The chairman of the section, Dr. D. S. Jerdan, read two papers; the one on "The Evolution of the Industrial Chemist," and the other on "The Causes of Loss in Steam Boilers and Plant Using Steam."

(1) The speaker dealt with the desirability of applying, so far as possible, the principle of selection by those concerned in education, in order to secure that only the most suitable men should pass on to higher training in chemistry with a view to entering chemical industry. The present system of selection by written examination possesses well-known defects, which can be supplemented only by a careful study of the student's capacities by those in charge of his education, a responsibility which few teachers take upon themselves. It is of the greatest importance that the spirit of inquiry should be fostered during the period of home and school education. The opinion was expressed that specialised study in any particular branch of chemical industry should not begin during the university or college course, but should be deferred until the man enters the particular industry to which he intends to devote himself. The chief forms of capacity required in the industrial chemist are common sense, memory, an alert brain, resource in emergency, a mechanical turn of mind, power of applying his training to large-scale manufacture, and the habit of industry. Although most of these qualities may be cultivated, some are innate and cannot be acquired; hence the fundamental importance of an accurate estimation of the character of a man before he enters upon any course of chemical education. At every stage in the chemist's career it is his natural capacity which determines his progress far more than the equipment with which he is provided by his training. This is particularly noticeable when he comes to be placed in charge of manufacturing operations and given the management of men. The education of the industrial chemist is just beginning when he has completed his college course, a fact that is far too often completely overlooked. Social intercourse with men in similar occupations is an important factor in training, and this Society provides facilities for the interchange of ideas which the industrial chemist should on no account neglect.

(2) This paper discussed the chief defects in steam boilers and economisers from the points of view of plant and practice, and advocated the use of steam whenever possible in order that its latent heat may be utilised for heating and drying. For example, power should be obtained from high-pressure engines exhausting into steam mains at 50—60 lb. per sq. inch, from which it can be drawn off for heating purposes.

NOTTINGHAM.

The opening meeting of the session was held at the University College on October 27, when the chairman, Mr. J. H. Dunford, gave an address on "Animal By-products," the efficient utilisation of which played an important part in ensuring the national welfare during the war.

After explaining that the waste from a carcase, *i.e.*, the portion not directly edible, amounted to nearly half the total weight, the lecturer detailed the uses to which this material was put, ranging from extracts of physiological fluids, such as pancreatin, gall, thyroid, etc., to the large bulk products—blood and bone charcoal, glue, and fertilisers. From blood is obtained not only hæmoglobin and blood charcoal, which was found to be an extraordinarily effective absorbent for dusting gangrenous wounds, but also serum albumin for use in the light leather industry. The coagulated blood is drained on sieves, and to 100 lb. of the serum is added 1 lb. of turpentine, which forms a sediment with the mucilage and acts as a preservative. The serum is kept for some time at 122°, rising to 212° F., and finally at 100° F. The moist fibrin residue, oxidised with pyrolusite and sulphuric acid, gives butyric acid esters used in flavouring. To the Premier belongs the credit of having induced the War Office to enter into relations with the Bone Users' Trade in 1916, whereby the bone waste of camps was saved to the nation to such good effect that in 1917, £750,000 was paid over to the camp units for this material, which yielded 15,000 tons of grease and 1400 tons of glycerin, or sufficient to supply the propellant for over 14 million shells. The process of glue-making was then described in some detail, from the preliminary degreasing of the bones in the closed degreasers. The loss of solvent benzene in the author's works amounted to only 1¼ galls. per ton of matter degreased per year.

MANCHESTER.

Two papers were read at the meeting held on November 5, when Mr. John Allan presided.

Capt. F. S. Sinnatt, with Messrs. A. Grounds and F. Bayley, presented a paper on "The Inorganic Constituents of Lancashire Coals," containing an account of work on the white partings (ankerites) occurring in certain typical Lancashire coals. These partings consist of calcium carbonate in which the base is replaced by varying proportions of magnesium, ferrous iron, and manganese. The maximum content of ferrous carbonate found was 30 per cent., and that of manganese carbonate 1·8 per cent. The importance of a knowledge of these constituents was explained, and it was pointed out that the manganese may act as a catalyst when the ankerites, and perhaps also when the coal substance, undergo oxidation. Experiment has shown that the percentage of carbon dioxide found in coal cannot be accounted for entirely by the proportion of bases present in the inorganic constituents. The iron in coal appears to exist as iron pyrites, and the remainder entirely in the ferrous condition. The bearings of these observations on the storage, fusibility of the ash, and the heating of the coal in the goaf in coal mines, were also discussed.

The second paper was by Messrs. S. J. Peachey and A. Skipsey on " A New Process for the Vulcanisation of Rubber." The process consists in treating the rubber alternately with sulphur dioxide and hydrogen sulphide, which interact and produce a highly active (probably atomic) form of sulphur that directly combines with and vulcanises the rubber. As the process is a cold one and does not involve the use of sulphur chloride, it renders possible the use of a large variety of organic filling and colouring agents, most of which are unaffected by exposure to the gases named. Technically the process is of immediate importance in that rubber can be used as a binding agent for materials such as cork dust and wood meal, the mixings after being sheeted and vulcanised forming a cheap and excellent material for floor covering. Leather waste can similarly be converted into a re-formed leather suitable for use in the manufacture of boots, shoes, and upholstery. Shoddy waste yields a felt-like material which should find many uses. The new process applies also to the vulcanisation of dissolved rubber, and application of the gas-vulcanised solution gives very good results in repair work.

MEETINGS OF OTHER SOCIETIES.

FARADAY AND PHYSICAL SOCIETIES.

On various occasions the Faraday Society has rendered valuable service by arranging discussions on scientific topics which are of especial importance to those concerned in industry; and its latest meeting, held jointly with the Physical Society on October 25, afforded a very useful contribution to the subject of colloids and their industrial applications. The excellent attendance of about 300, many of whom had come from a distance, was significant of the general interest now being taken in physical and colloidal chemistry.

There was an embarassment of riches in the wide diversity of the topics presented, so that for the most part there was no time for discussion proper to develop, and the proceedings took the form of a symposium. This was emphasised by the value of the real discussion that did begin on nitro-cellulose and cellulose acetate. Hence although in some cases valuable information and expressions of opinion furnished material for harmonising conflicting views, in others the matter brought forward did not fructify into a consensus of opinion or bring out crucial differences in such a way as to serve as a guidance to the non-specialist.

Prof. T. Svedberg, one of the best known of the continental authorities, contributed an introductory review of some of the more important aspects of colloid chemistry.

Prof. F. G. Donnan followed with a brief account of emulsions, a subject which he regarded as being partly closed, although he went on to indicate some of the matters that require further study, such as the conditions under which reversal of phase takes place in concentrated emulsions, *i.e.*, the conversion of oil-in-water into water-in-oil, or *vice versâ*. He emphasised the value of the sharp change in conductivity, which, as Clayton suggested, indicates when reversal is effected. Mr. W. Clayton communicated a paper containing interesting details of the factors involved in the manufacture of margarine. This is an emulsion of the oil-in-water type containing about 4 parts of oil to 1 part of aqueous milk serum. Slight alterations in the mechanical treatment are sufficient to lead to an unintentional reversal of phase producing an emulsion which does not possess the properties of saleable margarine. Mr. S. Bhatnagar presented some quantitative data on emulsions, the reversal of which is caused by the addition of electrolytes. It appears that the effectiveness of electrolytes increases with valency, although the differences are by no means as striking as those to which we are accustomed in the study of colloids. Larger quantities are required to bring about reversal if the emulsions are dilute. The discussion was distinctly unfavourable to the view that the reversal of phase was directly due to the electrolyte, on account of the greater probability of its affecting the protective colloid or emulsifying agent.

Mr. E. Hatschek, in his introductory remarks, emphasised the importance of the study and consideration of non-aqueous gels. He then gave a brief but complete account of the work hitherto carried out on the mechanical, optical, and elastic properties of gels. He gave striking photographs showing that the optical anisotropy produced by stress shows no sign of relaxation long after the mechanical strain has disappeared. Finally, he urged the importance of a study of swelling in non-aqueous solvents in which ionisation does not occur. Prof. H. R. Proctor thereupon outlined his well-known explanation of the swelling of gelatine gels, which he ascribes entirely to ionisation effects.

Mr. S. Bradford's paper presented some of the evidence for the view that crystallisation phenomena can occur in aqueous gelatin, and he argued that gelatinisation could be called an extreme case of crystallisation. Dr. J. Barratt, from his work on fibrinogen hydrosol, supported a view which has been advanced independently during the last eight years by various workers, to the effect that gels have a fibrillary, filamentous, or streptococcic structure which is usually invisible under the ultramicroscope. Prof. J. W. McBain, in adducing experimental work upon soap systems in the three quite distinct states in which they can exist, viz., transparent fluid sols, transparent elastic gels, and opaque solid curds, supported the hypothesis that gels have this invisible filamentous structure. The identity of soap sols and gels in all save mechanical properties, in particular their identity in conductivity, appeared to be irreconcilable with any other hypothesis of gel structure. Moreover, the sharp line of distinction between the gels and curds indicates that only curds and coagula are formed by any process analogous to crystallisation. Prof. Svedberg mentioned a striking instance of a dilute alcosol of cadmium which repeatedly gelatinised, but reverted to sol whenever it was gently stirred.

Sir Herbert Jackson addressed the meeting on glass and pyrosols, mentioning interesting details ranging over a wide field. In connexion with the view that glass is not merely an undercooled liquid, but has a special gelatinous structure, Dr. M. Travers summarised measurements showing that its properties exhibit a discontinuity at a temperature about 70° below its softening point.

The evening session was opened by an address by Sir Robert Robertson on nitrocellulose, in which he dealt almost entirely with the empirical relationships that have been found in connexion with viscosity. Mr. F. Sproxton, speaking as a manufacturer, reviewed the chemical and physical notions that have been put forward in suggested explanation of the very numerous empirical observations. Dr. G. Barr and Mr. L. Bircumshaw contributed further experimental results upon the viscosities of cellulose acetate in mixtures of acetone with other solvents. This was followed by an animated discussion, in which it soon became evident that the most urgent practical need is purely theoretical work, in order to correlate by any kind of working hypothesis the vast amount of purely empirical information. Indeed, in the whole field of colloidal chemistry technical experience has far outdistanced scientific explanation. Another urgent need is the development of exact and unambiguous methods of study; the more distinctively colloidal the phenomenon the less tangible are the available methods of investigation.

The discussion on rubber, which was opened by Mr. B. D. Porritt, also brought out many facts of practical importance, particularly with regard to tackiness, perishing, and the effect of light upon the viscosity of the solutions. This was followed by Mr. J. N. Mukherjee's important paper embodying a quantitative study of the charges of colloidal particles as influenced by electrolytes. Mr. Clayton's paper dealt with the similar effects produced by non-electrolytes and emulsoids.

After Prof. A. W. Porter had briefly defined the nature of cataphoresis and endosmosis, and Prof. McBain had communicated some preliminary results, using a simplified theory of the latter, Dr. W. R. Ormandy summarised valuable information with regard to applications on the industrial scale to clay, peat, silica, tanning, ore separation, antidiphtheritic serum, gelatin, and the separation of oil and water from each other.

The full value of the discussion will only be realised by studying the printed report, which, most fortunately, is being made available at the low price of 2s. 6d. by the Department of Scientific and Industrial Research. The book will contain a number of additional papers, such as those of Pauli and Freundlich, as well as contributions to the discussions submitted in writing, and it will form an invaluable source of information for those interested in any of the extraordinarily large number of industrial topics considered.

CHEMICAL SOCIETY.

On October 28, Dr. M. O. Forster delivered the Emil Fischer Memorial Lecture to a very large audience gathered at the Institution of Mechanical Engineers, S.W. Sir James J. Dobbie, president, was in the chair.

In describing Fischer's personality, the lecturer referred to his unswerving singleness of purpose, his enthusiasm, his impatience of trivialities, and the goodness of heart which lay concealed beneath a somewhat severe manner. As a scientific investigator, Fischer was remarkable for his keen insight, unflagging energy, and extraordinary manipulative skill (*cf.* J., 1919, 322 R). In attempting to summarise the results of Fischer's investigations, the lecturer had no easy task, but he succeeded in giving a clear and logical exposition of his work on phenylhydrazine and derivatives, on the triphenylmethane colouring matters, the carbohydrates, glucosides and depsides, the synthesis of gallotannic acid, the purine derivatives, amino-acids, polypeptides, and proteins, the fundamental importance of his work to the science of biochemistry being duly emphasised. Lastly, his relations to chemical technology, in peace and in war (*cf.* J., 1920, 41 R), were described, and the opinion expressed that Fischer's greatest contribution in this direction was, probably, the stream of young chemists which passed regularly from his laboratory to the factories. The lecture is printed in full in the October issue of the *Journal of the Chemical Society*.

At the meeting held on November 4, at Burlington House, W., Sir J. J. Dobbie presiding, 113 certificates for admission to the Fellowship were read a first time, and of the 18 communications on the agenda 7 were read in abstract.

Sir W. J. Pope and collaborators presented three papers. The first dealt with the preparation of triphenylarsine and diphenylarsenious salts by new methods; the second described the interaction of ethylene and selenium monochloride and the isolation of the selenium analogue of "mustard gas"; and the third treated of the preparation and properties of carbonyl chloride. The combination of carbon monoxide and chlorine, in presence of suitably prepared charcoal as catalyst, was stated to proceed practically instantaneously at 14° C., whereas in technical manufacture the temperature rises to about 400° C., at which much of the product undergoes dissociation. The density, melting-point, and the vapour pressure curve have been determined within wide ranges of temperature.

Mr. G. van B. Gilmour outlined a new method of estimating certain sugars and polyatomic alcohols based upon the fact that varying but definite amounts of these substances are required to inhibit hydrolysis in the titration of boric acid with caustic alkali in aqueous solution. Prof. J. C. Irvine described investigations on the relationship of inulin to fructose; and on the conversion of cellulose into methylglucoside, a yield of about 85 per cent. being obtained by the method used. Prof. G. T. Morgan's paper dealt with the acetylacetones of selenium and tellurium, prepared by the interaction of acetylacetone with the respective tetrachlorides; and that by Dr. E. B. Maxted on the influence of lead on the catalytic activity of platinum showed that its action as a catalyst "poison" is strictly similar to that of hydrogen sulphide.

SOCIETY OF PUBLIC ANALYSTS.

The opening meeting of the session was held at Burlington House, W., on November 3. Mr. A. Smetham presided.

In a paper on "The Gravimetric Estimation of Bismuth as Phosphate and its Applications in Ore Analysis," Dr. W. R. Schoeller and Mr. E. F. Waterhouse described a modification of the method for the gravimetric estimation of bismuth as phosphate. Details were also given of a process for determining bismuth in ores, in which the lead is removed by iron wire, the copper, arsenic, and antimony are extracted as sulphides with sodium cyanide and sulphide, and the bismuth then converted into phosphate and weighed. The authors agree with Moser that the phosphate method is the best to use in the great majority of cases.

Mr. P. J. Fryer read a paper on "The Time Factor in Saponification" dealing with determinations of the rate of saponification of various oils and fats under specific conditions, with a view to ascertaining whether such differences in rate were sufficiently great to serve as the basis of an analytical method for identifying individual oils and fats.

An apparatus for collecting samples of water at great depths was described by Mr. W. T. Burgess. The device, which is suitable for collecting samples from very deep wells or borings of small diameter, consists of a stout glass vacuum tube protected by a cylindrical casing through which water can freely pass; at the required depth the upper end of the exhausted tube is broken by a plunger operated by a falling weight.

A paper on "The Position of Analytical Chemistry in France" was contributed by Mr. V. Cofman.

BRITISH ASSOCIATION OF CHEMISTS.

The third annual meeting of the British Association of Chemists was held on October 30, at Manchester, Mr. W. E. Kay presiding in the absence of the president, Prof. J. W. Hinchley. The total membership is now 1153, as compared with 759 at the beginning of the year, and ten sections have been organised in Great Britain. The Association was registered under the Trade Union Acts in August, and membership is open to both employers and employees.

The annual report of the Council refers to the growing appreciation of the market value of the chemist and to the recognition among chemists themselves of the economic value of a strong professional organisation. An Appointments Bureau has been established, legal advice given on general agreements and agreements with respect to patents, and in connexion with the Whitley Councils a committee has devoted much time to secure federated action by professional, technical, and scientific workers. Cases of inadequate remuneration have been investigated and action taken. In most cases the employers have met the Association sympathetically, and matters have been satisfactorily adjusted. The Council considers that the misapprehension in the public mind in regard to the term "chemist" should be cleared up by legal action, if necessary. A committee has been appointed to investigate the question and to suggest to the Council a specific line of action for securing the co-operation of the pharmaceutical and other scientific bodies with the object of defining the future legal position of the chemist and his profession, and of securing legislation to prevent unqualified men from practising.

Dr. H. Levinstein, presiding at the annual dinner, expressed his sympathy with the general objects of the Association. Chemistry was an honourable profession, but the chemist in this country did not obtain the status which other professional people enjoyed. With the principal object of the Association, viz., to raise the status of the properly qualified professional chemist, he was in the fullest agreement. In the effort to secure this status one suggestion was to form a close association with the Institute of Chemistry, which had performed great services for chemists in the past, but which by reason of its charter was unable to fulfil certain of the functions of the Association. This view had been substantiated by Mr. Justice Peterson's recent decision in the case of the Pharmaceutical Society (*cf.* i. and J., 1920, 361 R). Dealing with some points in the propaganda literature issued by the Association, Dr. Levinstein said it was against the interest of chemists to impose on their employers conditions which were not economically sound. Something had been said of the remuneration of research chemists. He did not remember any case in which chemists had not been remunerated for any invention for which they were responsible. It would be well to look at the other side. To-day it cost about £700 a year to employ one research chemist. Some works employed ten, which meant £35,000 for five years. The capital had been sunk, but there was no certainty of an invention in the period which would give an adequate return. If one resulted, then it would have to cover the cost of the researches which did not materialise. It was therefore only fair that the employer should be able to restrict a chemist from leaving him directly he had made a profitable discovery, or from making free use of information acquired by him in running plant or processes probably designed and worked out by others. Agreements should be fair both to employer and employee. In proposing the health of the Association, Dr. Levinstein expressed confidence that its members would not forget that they were a body of professional men, and that they would set a high example of what a trade union ought to be.

ROYAL SOCIETY.

The following papers, among others, were read at the meeting held on November 4:—"Dilation and Compression of Liquid Carbonic Acid": Prof. C. F. Jenkin; "Radiations in Explosions of Hydrogen and Air": Mr. W. T. David; "Photochemical Investigations of the Photographic Plate": Dr. R. E. Slade and Mr. G. I. Higson.

NEWS AND NOTES.

AUSTRALIA.

Industrial News Items.—Work at the Broken Hill mines is expected to be resumed at an early date.

In giving evidence at an inquiry relating to a 44-hour week, a witness stated that it was possible to earn £44 per fortnight at the Broken Hill Steel Works at Newcastle, N.S.W., yet the company was seriously short of labour.

The Commonwealth Government has guaranteed £6 per ton for standard flax grown in the season 1921. The Flax Committee hopes to declare a further substantial dividend on the 1918 crop, growers of which have already received £7 per ton.—(*Official*.)

Glass Bottle Manufacture in Tasmania.—The Melbourne Glass Bottle Works Co., Ltd., is to erect immediately a factory near Hobart, which it is hoped, will be brought to the production stage by the end of this year. It is intended to supply all the requirements of Tasmania and to export to New Zealand. Extensions to the company's works at Spotswood have been delayed by shortage of material, but this has now been remedied, and an increased output of 75 per cent. is foreshadowed. In consequence of the coal shortage the company has lately been refusing all export orders.—(*Ind. Austral., Sept.* 2, 1920.)

Discovery of Cobalt Ore in Queensland.—The Imperial Mineral Resources Bureau announces the recent receipt of a report by the Queensland Government Geologist on a deposit of high-grade cobalt ore which is of especial interest in view of the more extended use to which cobalt has been put during recent years. The deposit is located near Selwyn, in the Cloncurry district of Queensland. The cobalt ore, which occurs at the contact of diorite and schists, consists of cobaltite (sulpharsenide of cobalt) and erythrite or "cobalt bloom" (hydrous arsenate of cobalt). A picked sample of the cobaltite recently assayed for the Department of Mines gave the following composition:—Arsenic 40·2%, sulphur 15·8%, cobalt 33·1%, nickel *nil*, iron 2·1%, insoluble (chiefly SiO_2) 8·3%.

CANADA.

Saskatchewan's Bureau of Industries.—The province of Saskatchewan has instituted a bureau of industries, which has for its object the development of known resources within the province rather than the exploration of unknown ones. The practicability of every industry which might appear possible of development, because of the presence of raw material or other favourable conditions, will be investigated by the Bureau. The clay industry will be taken first, geological surveys having indicated that the province has some of the most valuable clay deposits in the world. Manufactured bricks have hitherto been imported in large quantities from Manitoba, Alberta, and the United States. Existing plants in the province cannot supply the demand, and it is held that the industry can be developed not only to supply home needs but also to engage in export. The lumber industry will also be considered. No advantage, for instance, has yet been taken of the immense possibilities of pulp manufacture, a question of prime importance in view of the universal shortage of newsprint. Coal-mining has possibilities of greater development notwithstanding there are 51 coal mines in the province producing 300,000 tons per year. The Dominion Government, in conjunction with the provincial governments of Manitoba and Saskatchewan, has erected a plant at Estevan, Saskatchewan, for the briquetting of provincial lignite, and this will be producing by the end of the year. The Bureau will also investigate the tremendous water powers of the northern rivers, and the more economical transmission of electrical power over long distances. Numerous indications of oil and natural gas, which have never been adequately surveyed, will receive full attention with a view to exploitation.—(*Agric. Ind. Prog. Canada, Oct.*, 1920.)

Denaturing Alcohol at the Distilleries.—By amendments made to the Inland Revenue Act, the denaturing of alcohol, which was formerly carried on only at the denaturing plant of the Inland Revenue Department at Ottawa, may now be done by the distiller. This is regarded by leading chemical manufacturers and by the Canadian Section of the Society of Chemical Industry as a decided advance in the development of industrial alcohol manufacture in Canada. It is hoped that under the new conditions the money saved in freight between Ottawa and the distilling plants will lead in time to a reduction in the price of alcohol, which is now very high.

Shipment from the distilleries to permit holders may be made only in respect of grade No. 1, consisting of 80% ethyl alcohol and 20% methyl alcohol; or of grade No. 1 benzine, consisting of 90% ethyl alcohol, 9% methyl alcohol, and 1% commercial benzine. Hospitals and universities holding permits to have grade No. 1 "special" in possession and use may receive denatured alcohol composed of 90% ethyl alcohol and 10% methyl alcohol. Grade No. 2, consisting of 70% ethyl and 30% methyl alcohol, may be shipped without restriction.

BRITISH INDIA.

The Oleo-resin Industry.—In a report on forest administration in the Punjab during 1918-19, the Conservator of Forests states that the Indian oleo-resin industry for the production of rosin and turpentine can now be accepted as an established source of supply of these articles, which not only meets the Indian demand, but has every prospect of rapidly building up a sound export business. A second Ropar's unit has been ordered for the Jallo factory, where, during the year 1918-19, 28,778 maunds of resin was distilled, yielding 18,734 maunds of rosin and 52,701 galls. of turpentine. A 3-unit factory is nearing completion at Bareilly, in the United Provinces, and these two factories will be able to handle 180,000 maunds of crude resin annually. Attention is also being paid to the standardisation of rosin and turpentine, whilst research has opened up new prospects for the distillation of rosin for the production of rosin oil, pinolene, pitch, and rosin gas. The demand for rosin oil appears to be considerable, and the prospects of this line of inquiry are promising (maund = 82·3 lb.).

Camphor Production in Burma.—A development of importance to celluloid manufacturers is reported from Burma, where a 650-acre camphor plantation has been established at Yatsauk, Southern Shan States, and is now producing on a commercial scale. It is stated that a distilling plant is in operation, and that a refining plant is being erected.—(*Oil, Paint and Drug Rep., Sept.* 27, 1920.)

SOUTH AFRICA.

Reported Mineral Discoveries.—The discovery of a series of gold-bearing reefs, one 12 ft. wide and carrying high values, is reported from the Heidelberg district. It is also stated that valuable deposits of iron, platinum, and coal have been located in the Cala district, Cape Colony, and that important firms are interested.—(*Official.*)

Manufacture of Chromium Compounds.—A factory for the manufacture of chromium compounds has been established at Viljoens Drift, Orange Free State. At present only sodium chromate and bichromate are being produced, but there is room for considerable expansion, as large supplies of chrome ore are available (*cf.* J., 1920, 237 R), and coal is very much cheaper than in Great Britain. The bichromate is used locally in the chrome tanning of leather, and there is a possibility of opening an export trade with Australia, a trial consignment having been sent.—(*Official*).

UNITED STATES.

Synthetic Methyl Alcohol.—An unusual demand for methyl alcohol for manufacturing organic accelerators used in vulcanising rubber and for making formaldehyde, coupled with a growing shortage of wood for distillation, is stimulating research on the synthesis of methyl alcohol. Natural methane is being used as the starting material, and good progress is recorded.

A New Colorimeter.—The first of the colorimeters devised in the research laboratory of the Eastman Kodak Company has been shown and has created a favourable impression. There are four standardised wedges (minus red, minus blue, minus green, and neutral) to measure intensity, and the position of each wedge is noted upon a numerical scale so that a simple, accurate record is possible. Various attachments make the instrument adaptable for liquids, solids, dyed materials, etc.

The Sixth National Exposition of Chemical Industries.—Four hundred and fifty-seven exhibitors and an attendance of more than 125,000 testify to the success of the recent exhibition, the most encouraging features of which were the improvement in the exhibits and the greater interest shown by the public. Models such as are used to depict the structure of organic compounds were made use of to emphasise the relationships between dyes, medicinals, explosives, and toxic gases. As on former occasions, natural resources of interest to chemists were attractively displayed by governments, railways, and cities. Next year the exhibition will be held in a building, one floor of which has a greater area than the four floors of the large building used hitherto, and new features are to be expected.

Fireproofing of Wood.—At the Forest Products Laboratory it has been found that the ordinary "calcimine" is as satisfactory as any other type of paint for decreasing the danger of fire spreading from such small sources as sparks, cigarettes, etc. Treatment with calcimine is best adapted for inside uses, and although not so efficient as methods involving impregnation of wood with chemicals under pressure, it is much less expensive and therefore applicable where small amounts of wood are involved. For outside application the laboratory has devised a coating with consists of zinc borate and chrome green ground in linseed oil. This material has retained its fire-resisting properties after three years of exposure out of doors.

Coffee Research.—The Joint Coffee Trade Publicity Committee has entered into an arrangement with the Massachusetts Institute of Technology whereby research will be conducted on coffee with respect to its influence upon health and nutrition. It is intended to determine the comparative amounts of caffeine and other constituents in beverages prepared by different methods, and the study will include the effect of water at different temperatures and of different degrees of hardness, and of water purified by the various standard methods. A study will also be made of the effect produced by the addition to prepared coffee of hot and cold milk, cream, sugar, salt, and other materials. Various volatile oils, tannin and other ingredients, especially astringent substances which give undesirable flavours, will be included in the research, as well as the effect of different degrees of roasting and of granulation of the bean.

Molasses.—The *brochure* on molasses compiled by C. J. West and published by Arthur D. Little, Inc. (*cf*. J., 1920, 322 R) contains a bibliography of the literature of the subject, which appears to be very complete save for the omission of certain recent patents, such as those for the utilisation of molasses for the production of glycerin. The bibliography is preceded by a short descriptive account of molasses from the chemical and industrial standpoints, together with some statistics of production and utilisation. In view of the interest now being taken in the subject of motor fuels, it may be noted that during the season 1918-19 the amount of "blackstrap," or low-grade cane molasses produced in the United States was 16,101,650 galls. (American); whilst 124,254,633 galls. was imported from Cuba, 15,118,678 from Porto Rico, 11,065,996 from Hawaii, and 5,820,054 from other countries. During 1919 the amount of molasses fermented was 123,498,693 galls., giving 75,407,357 galls. of Cologne spirit and 816,103 galls. of rum.

The Coal Industry.—H.M. Commercial Secretary at Washington reports that the coal production of the United States increased from 531·6 million short tons in 1915 to 544·3 million tons in 1919, the output in the latter year consisting of 86,200,000 t. of anthracite and 458,100,000 t. of bituminous coal. The output of anthracite more than doubled in the 28 years before 1917, since when it has remained stationary, and it seems that the production of anthracite has reached its maximum. During the same period, however, the output of bituminous coal increased fourfold and has since tended to keep pace with the country's industrial expansion. The chief factors limiting supplies are labour shortage and inadequate means of distribution. The aggregate exports of both anthracite and bituminous coal, which were never more than a very small proportion of the total output, have been maintained at a steady level. Exports of anthracite are practically confined to Canada, but during the last year exports of bituminous coal have been diverted to new fields. The subjoined table gives the exports of bituminous coal in millions of long tons for the fiscal years ended June 30, 1913, 1918, 1919, 1920:—

Exports of Bituminous Coal from the United States.

	1913	1918	1919	1920
Canada	11,981	16,693	14,198	10,470
Italy	925	201	228	2863
Cuba	1274	1494	1002	1243
Argentina ..	39	247	234	934
Brazil	234	625	733	540
Other Countries	1630	1792	1754	5642
Total ..	16,083	21,052	18,149	19,857

The average output in short tons per man employed in American mines for each year from 1912 to 1918 was:—For anthracite, 520, 505, 504, 548, 646, 672 tons; and for bituminous coal, 837, 724, 794, 896, 915, 942 tons. The total cost of bituminous coal at the pit was \$2.77 per ton, including a labour cost of \$2.07. The average export prices per ton in 1919 varied from \$7.22—\$8.80 for anthracite, and \$4.20—\$5.13 for bituminous coal.—(*Bd. of Trade J., Oct.* 7, 1920.)

JAPAN.

The Potassium Bichromate Industry.—The demand for potassium bichromate in Japan has been steadily increasing for some time past, and until recently this article was entirely derived from overseas, the importation in 1912 exceeding 625 long tons. The tremendous rise in price, however, from 0.17 to 2.00 yen per lb. (yen = 2s. 0½d.), caused the manufacture to be taken up in the country, and at present it is being made by eight important firms, which command a total capital of 900,000 yen and an output capacity of 1730 tons. The largest of these firms is the Nippon Seiren Co., of Tokyo, which is controlled by Dr. T. Tanahashi and which also produces sodium silicate and peroxide, potassium permanganate, aluminium sulphate, etc. There were formerly many small undertakings which converted imported sodium bichromate into the potassium salt, but these have been completely extinguished by the recent financial crises.

The main uses of this salt in Japan are for making matches, dyes, in tanning, and for electric cells. The official estimate of the country's demand is 1116 tons per annum. The cost of production is now so high that it is feared that unless protection be granted the home manufacture will cease.

Japan produces its own chrome iron ore, but it is of rather poor grade, ore containing 45—50 per cent. Cr_2O_3 being rarely found. The output in recent years has been (long tons):—1309 in 1913, 2080·4 in 1914, 2943·3 in 1915, 8139·2 in 1916, and 8791·7 in 1917.

Beet-Sugar Industry.—The Hokkaido Sugar Manufacturing Co., the pioneer beet-sugar company of Japan, owns 3500 acres of land, and obtains beets from an additional 12,500 acres on contracts with farmers, who are provided with seed and fertilisers and paid at the rate of 8 yen per 1000 kin (16s. 4d. per 1333 lb.). Seed is obtained from Utah, Idaho, and Holland, and the crop is dealt with by mechanical means. The factory has a capacity of 600 tons a day, and it is anticipated that beets will be obtained from an area of 22,500 acres in 1921.—(*U.S. Com. Rep., Sept.* 7, 1920.)

FRANCE.

Industrial Notes.—*Chemical Industry.*—Owing to difficulties in distributing the German chemical products due to France under the Peace Treaty, centres to regulate distribution, known as "comptoirs chimiques," have been established to ensure a fairer distribution than has hitherto been the case. One of these new centres is "Le comptoir d'approvisionnement des teintureries du Nord de la France," with headquarters at Roubaix.

Good progress is being made in the production of synthetic ammonia (*cf. i.*), and large sulphuric acid and superphosphate plants are about to be erected in Strasbourg by the Société de St. Gobain. The production of natural phosphate has been stimulated in Algeria and Tunisia, the "Société des Phosphates Tunisiens" reporting an output of 34,200 tons in September last, which compares wtih 12,100 t. in September, 1919.

Coal.—One of the first effects of the coal strike in Great Britain was a sudden rise in the price of American coal imported into France. Deliveries from Germany are regular, and about 97 per cent. of the coal, coke, and briquettes promised has been delivered, but the quality, especially that of the coke, is very unsatisfactory, and measures are being taken to effect an improvement. Production in the Sarre district continues to increase and, provided that the present rate is maintained, it is anticipated that the output for 1920 will total 10 million t., and 13 million t. for 1921, which was the figure reached in 1913. Supplies from Belgium are scanty, and only 54,000 t. was delivered during the first fortnight of September.

Petroleum.—The great difficulties experienced in transporting petroleum from the oilfields have led to the suggestion that it should be utilised *in situ* to drive powerful Diesel engines for generating electric current which could be conveyed at about 150,000 volts over wide tracts of country. It is thought that this would be a cheaper method of transport than the plan of laying pipe-lines for conveying *mazout* and heavy oils.

Water Transport.—The scheme of constructing a North-Eastern Canal to connect the North Sea ports with the coalfields and industrial centres is again attracting attention. The total length would be about 254 km., and the cost is estimated at about 400 million francs.

The Claude Synthetic-Ammonia Process.—At an extraordinary meeting of the "Société l'Air Liquide," held on October 8, M. Georges Claude presented a report on the progress of his work. Referring to the criticism made by members of the "Académie des Sciences" that the plant which they had inspected in January last for producing a daily yield of 100—150 litres of liquid ammonia was on a laboratory scale, M. Claude stated that within a few weeks he would invite the "Académie" to inspect a plant now producing 1 to 1·5 metric tons daily. The output had thus been increased tenfold, and further progress was anticipated.—(*Rev. Prod. Chim., Oct.* 15, 1920.)

GENERAL.

Register of Chemical Assistants.—The Institute of Chemistry has initiated a Register of Chemical Assistants to which only those who have matriculated or passed an approved preliminary examination will be admitted. Parents of assistants are required to testify that the youths are precluded from taking a systematic four years' day course at a recognised college, and to give an undertaking that they will attend evening classes with a view to obtaining a qualification. Members of the Institute are asked to assist by making known their requirements to the Registrar, by encouraging and promoting those of their registered assistants who diligently follow evening courses, and generally by doing all they can to remove the career of laboratory assistant from the list of "blind alley" occupations. The Register is divided into three grades:—A, youths who have passed an approved preliminary examination; B, those who have also completed studies of the standard of a first-year University course; and C, those whose studies have attained the standard of a completed second-year University course.

Chemical Industry Club.—The annual meeting was held in the Club Rooms on October 29, Dr. W. R. Ormandy presiding. The accounts were passed, the new committee elected, and various suggestions were put forward with a view to increasing the popularity of the club, more particularly in connexion with the monthly meetings. It was announced that the Rt. Hon. Lord Moulton, Sir William Pope, and Mr. Max Muspratt had accepted invitations and would speak at the annual dinner, to be held in the Connaught Rooms, W.C., on Friday, November 19. Applications for tickets should be sent, with remittance (15s.), as early as possible to the hon. secretary at 2, Whitehall Court, S.W. 1.

The Newcomen Society.—A new society bearing this title has been formed for the study of the history of engineering and technology. Local sections have been established in London and Birmingham, and it is proposed to make a card index of published information, and eventually to issue a journal. The inaugural meeting was held at the Patent Office, London, on November 6, when Mr. E. W. Hulme, late librarian, read a paper entitled "An Introduction to the Literature of Historical Engineering to the Year 1640." Mr. A. Titley, of Birmingham, is president, and Mr. H. W. Dickinson, of the Science Museum, South Kensington, hon. sec. and treasurer.

The Calorific Valuation of Coal Gas.—The Metropolitan Gas Referees, in a notification for the final quarter of 1920, applicable only to the South Metropolitan Gas Company, state that as the latter company has declared its intention under the new Parliamentary powers of supplying gas of a calorific value of 550 B.Th.U. gross per cubic foot, testings of the company's gas for illuminating power are to cease, and the calorific value testings substituted therefor are to be made thrice daily at intervals of not less than three hours. These testings are to be made with the Boys calorimeter, with which the testing places are already provided, as the Referees are not prepared at present to prescribe for official testings a continuously recording calorimeter. They will sanction the installation for observation only of recording calorimeters of any promising types.

Rubber-Seed Oil in the Federated Malay States.—In the Report of the Agricultural Department of the Federated Malay States for 1919, the Director of Agriculture states that the experimental hydraulic oil-expressing plant of the Department has been lent to the Malayan Oil Mills, Ltd., a local company formed primarily to manufacture rubber-seed oil. It has been ascertained that seed on storage deteriorates aud produces an oil containing up to about 25 per cent. free fatty acids, and that such oil is not generally suitable as a substitute for linseed oil. Further, this oil is not suitable for many purposes owing to its slower drying power compared with linseed oil, and it is necessary to prepare a "boiled" oil for commercial purposes. Considerable progress has been made in the work of refining the oil, but it is probable that the processes required can only be carried out in a factory under the supervision of a trained chemist. Experiments on the preparation of "boiled" oils have shown that a satisfactory product can be obtained from a raw oil free from fatty acids. A further problem, namely, the prevention of the deterioration of seed on storage, remains to be attacked. Freshly-collected seed yields an oil with very low acid content.

Cassava Industry in British Guiana.—The large-scale cultivation of the manioc, or cassava, is about to be initiated in British Guiana by the Emido Co., Ltd., of Liverpool. This firm imports large quantities of cassava into the United Kingdom for the purpose of starch manufacture, etc., and it now proposes to use it in the manufacture of soap (*cf.* J., 1920, 34 R).—(*Bull. Dept. Trade and Com., Canada, Sept.* 13, 1920.)

Sugar Production in Jugo-Slavia.—The output of refined sugar in Jugo-Slavia for 1920 is estimated at 35,000 metric tons, compared with 10,000 t. in 1919, and a normal production of 60,000 t. As 60,000 t. represents the local consumption, 25,000 t. will have to be imported. The shortage is due to lack of sugar beets, the area under the crop being 43,283 acres, against a normal acreage of 77,968.—(*U.S. Com. Rep., Sept.* 23, 1920.)

Cane-Sugar Production in Trinidad.—It is anticipated that the sugar-cane crop of Trinidad for the new crop year will be 25 to 30 per cent. greater than in 1919-20, when 58,416 tons of sugar was made, compared with 47,850 t. in 1918-19, and 70,891 t. in 1916-17. The high prices which have prevailed for sugar have caused a great increase in the area under cultivation, and there have also been improvements in the efficiency of local sugar factories and a considerable extension of factory facilities.—(*U.S. Com. Rep., Sept.* 22, 1920.)

Camphor in Foochow, China.—The position of camphor in Foochow has improved considerably since 1917 (*cf.* J., 1920, 185 R), as exports increased from 56,533 lb. in 1918 to 931,600 lb. in 1919, and to 427,066 lb. during the first quarter of 1920. Stocks of camphor and camphor oil at Foochow amounted to 80,000 lb. and 40,000 lb. respectively, not including 27,000 lb. held by the Government Camphor Bureau. Prices are unusually low owing to Government restrictions on production and distillation and to lack of demand. The camphor is initially distilled in the interior of the country, and the camphor oil is sent to Foochow for redistillation. —(*U.S. Com. Rep., Aug.* 18, 1920.)

Essential Oils in Southern Spain.—Most of the essential oils, viz., rosemary, lavender, pennyroyal, thyme, spike, sweet-fennel, bitter-fennel, sage, and marjoram, are extracted from the plants which grow wild in the uncultivated regions of the provinces of southern Spain. The total annual production, which might be much increased, is estimated as follows:—Rosemary, 150 metric tons; thyme, 100 t.; spike, 50—100 t., other essences, 50 t. Small quantities of the following are obtained from cultivated plants:—Rue, juniper, neroli bigarde, marjoram, Spanish eucalyptus, geranium, and Spanish rose. Production is intermittent, depending largely on prices; and in many cases the buyer has to furnish the producer with a still and equipment, make an advance payment, and guarantee a fixed price for the output.—(*U.S. Com. Rep. Suppl., Aug.* 17, 1920.

Cyanamide Production in Germany.—The output capacity of the German cyanamide factories amounts to about 600,000 metric tons per annum and is distributed as follows:—Mitteldeutsche Stickstoffwerke A.-G., Piesteritz, 175,000 t.; Oberschlesische Stickstoffwerke A.-G., Chorzow, 150,000 t.; A.-G. für Stickstoffdünger, Knapsack, Gross-Kayna, 140,000 t.; Bayerische Stickstoffwerke A.-G., Trostberg und Margaretenberg, 75,000 t.; Lonzawerke, Waldshut, 60,000 t. It is anticipated than only 300,000 t. will be produced in 1920, owing to lack of coal, which is likely to continue on account of the exports required under the Peace Treaty. Hence the urgent need for developing the water-power resources of the country.—(*Z. für Sauerstoff- und Stickstoff-Ind., Aug.,* 1920.)

Attendance at German Universities.—During the past summer a total of 89,000 students entered the German universities, whilst 18,686 attended the 11 "Technische Hochschulen." In addition, there were 12,000 students at the Higher Schools for Agriculture, Veterinary Science, and Commerce, and other institutions, making a grand total of 115,000 students, including about 7700 women at the universities and 280 at the technical institutions. The distribution of the students according to courses, compared with that in the summer of 1914, was:—Medicine, 19,534 (16,048); mathematics and natural science, 10,125 (8132); pharmacy, 952 (11,000); political science and agriculture, 10,335 (3876).—(*Chem.-Z., Sept.* 14, 1920.)

Dye Manufacture in Sweden.—The plans to build up a native dye industry in Sweden have apparently met with no success. The company—A.B. Svensk Färgämnesindustri—founded in 1917 to start the immediate manufacture of dyes and chemicals, based on various Swedish inventions and methods said to have been thoroughly proved in practice, has never got under way, and so far has only produced a few dye intermediates which are saleable as finished pharmaceutical products. The greater part of the 12 million kronor (krona= 1s. 1½d.) capital has been lost, and the directors have come to the conclusion that dye production on a large scale is only possible in Sweden with State aid. Attempts to raise more capital to keep the company in being have been futile, and early liquidation is anticipated.—(*Z. angew. Chem., Sept.* 8, 1920.)

The Italian Pumice Industry.—The seat of the Italian pumice industry is the volcanic island of Lipari, where 90 per cent. of the pumice mines belongs to the municipality. The mining methods employed are primitive, and drifts run into the hillsides are abandoned long before they are exhausted owing to caving in, no props being used. Three grades of pumice are produced, viz., chips, powder, and lump. The export consists mainly of powder, except to the United States, where the crude pumice is imported and converted into pure powder, Italian-ground pumice being considered of inferior quality. Lump pumice is used mainly by carriage and automobile makers, lithographers, platers, and manufacturers of patent leather and enamel. The pumice trade declined greatly during the war, but exports are now rapidly increasing. During 1919, 18,244 metric tons was exported from Lipari, including 3257 t. to France, 1451 t. to England, and 7532 t. to the United States.—(*U.S. Com. Rep., Aug.* 18, 1920.)

Cinchona Bark from East Africa and the Cameroons.—Samples of cinchona bark from East Africa were examined at the Imperial Institute, and the conclusion arrived at was that bark of good quality can be grown in East Africa, and that plantations of the *Cinchona Ledgeriana* type should be extended in preference to *Cinchona succirubra*, as bark from the latter has shown variation in its content of total alkaloid and quinine. Bark from experimental plantations established by the Germans in the Cameroons was found to yield more quinine sulphate than average cinchona bark from Java. It is possible, however, that when the trees are regularly stripped for the production of bark the yield of quinine may be diminished. The number of trees in this colony is reported to be insufficient to provide commercial quantities of the bark.—(*Bull. Imp. Inst.*, 18, No. 1, 1920.)

Minerals from Morocco.—In connexion with the investigations conducted by a Commission sent out by the Department of Overseas Trade as to the possibility and conditions of trade between Morocco and the United Kingdom, a number of minerals was forwarded to and examined by the Imperial Institute. Several of the minerals were of promising character. Four samples of iron ore, mostly hæmatite, collected near the Atlas Mountains, varied from good-quality to high-grade ore, and contained 54·6—68% of iron, 0·01—0·04% of phosphorus, and from nil to 0·062% of sulphur. A sample of manganiferous iron ore was pronounced to be of fairly good quality and suitable for the production of pig iron or low manganese spiegeleisen; it contained Fe 51·25%; MnO 4·99%; SiO_2 10·14%; P 0·03%; and S 0·09%. A pyrrhotite nickel ore from Seba Lowajit contained traces of monazite, and it is suggested that any heavy sands in the vicinity should be examined to ascertain if this mineral occurs in workable quantities; the sample contained Fe 38·9%, Ni 3·63%, and Cu 0·77%. Another mineral investigated gave Ni 24·60%, Fe 25·31, no copper, and As 14·95%. A sample of iron ore from Emerzokan contained the uranium mineral autunite. A good-quality lead ore from the Atlas Mountains contained 67·45% of lead and 8 oz. 10 dwt. of silver per ton; and another ore from the same district gave 1·54% of copper, 6 dwt. 3 gr. of gold, and 1 oz. 2 dwt. 21 gr. of silver per ton.—(*Bull. Imp. Inst.*, 18, No. 1, 1920.)

Rosario (Argentina) in 1919.—Considerable progress has been made in the recovery from the trade depression due to the war. Mining has revived, and the Corporacion Minera Famatina, which produced 733 metric tons of copper in seven months, is anticipating an output of 300 tons of metal per month. Activity is being shown in lead and borax mining, and developments are expected. The quebracho industry had a very good year, exports of extract reaching 172,588 metric tons, compared with 124,710 t. in 1918; 51,264 t. of quebracho logs was exported, but shipments are curtailed by high freights. The quebracho extract industry is dominated by the operations of the Forestal Land, Timber and Railways Co., Ltd., which has increased its authorised capital to £7,000,000. The sugar-cane plantations and mills were fully occupied, the production for the whole of Argentina, 270,000 t., being sufficient to cover home consumption, estimated at 234,222 t., for the first time.—(*U.S. Com. Rep., Suppl., June* 24, 1920.)

Mineral Resources of Far-Eastern Siberia.—Gold, iron, silver, lead, zinc, copper, coal, and petroleum are among the mineral resources of the Amur, Maritime and Anadyr provinces of Siberia. Gold has been mostly worked in placer deposits, a total of 13,305 lb. being produced in 1915, but it is hoped that reef gold will be found and that production will be intensified. Iron deposits have been known for over 75 years, but have been somewhat neglected in favour of gold. Magnetite deposits occur in various districts, the chief being at Hielaya Gora, where the total ore is estimated at 2,040,215 tons; the Sergievsk and Sudzukhe deposits are said to contain a further 243,745 tons. Hæmatite ores, with from 35 to 65 per cent. of iron, are found in the Little Khingan mountains. Some 2,708,250 tons are said to occur in the southern part of this region, the northern part having scarcely been explored as yet. Bog ore occurs at Nicolaievsk, where there is a deposit containing about 902,750 tons of ore, and in other areas of the Ussuri district. At present, iron ore is produced only in the Olginsk and Sergievsk districts, and it seems that a local iron industry has not great prospects.

Deposits of silver, lead and zinc ores extend from the Chukotsk peninsula to Korea, and from Transbaikalia to the Pacific. The total quantity of ore may reach 2 million tons containing an average of 12 per cent. lead, 17 per cent. zinc, and 280 g. of silver per metric ton. A mill at Tetiukhe can treat 50,000 t. of ore annually; its output could easily be raised to 63,000 t. lead, 7,200 t. zinc and 25,300 lb. silver, and sulphuric acid could be manufactured. Indications of copper are abundant, but so far the ore is mined only in two deposits in the Ussuri district, where the average metal content is 1·5%.

Deposits of antimony, arsenical ores, cinnabar, mica, etc., are also known, but little has been done to develop them. All kinds of coal are found in the Russian Far East, including brown, bituminous, long-flamed, and anthracite coals. The importance of the deposits on the mainland is purely local, but the coal on the island of Sakhalin, where the strata are similar to those in Japan, Canada and Alaska, might become of importance in the future as a source of freight and fuel for shipping. The estimated reserve of coal in the Russian Far East amounts to over 3000 million tons. Petroleum occurrences are known, but definite conclusions as to their value cannot be drawn until careful investigation has been made.—(*Mining Mag., Sept.* 1920.)

LEGAL INTELLIGENCE.

Alleged Infringement of Society's Charter.—*A. H. Jenkin* v. *The Pharmaceutical Society of Great Britain.*

In the Chancery Division, on October 27, Mr. Justice Peterson delivered his reserved judgment in the action brought by H. Jenkin against the Pharmaceutical Society of Great Britain to test the Society's right to embark upon certain projects which it was contended would convert the Society into an employers' trade union and not be for the benefit of the members as a whole (*cf.* J., 1920, 361 R).

His Lordship held that the Society's Charter, which mentioned as one of its objects the protection of members who carried on the business of chemists or pharmacists, did not justify the Society in undertaking all kinds of insurance business as might be done under the Society's proposals. Nor did the Charter justify the Society in regulating the hours of business, the wages and conditions of work in the industry, and the prices at which articles were to be sold. Such action would in fact convert it into a trade union, and such conversion was never contemplated when the Charter was granted. Similarly the Society was not entitled to spend money on promoting and maintaining an Industrial Council Committee to regulate the hours of business, wages and conditions of work in the industry, and there would be declarations to this effect.

PERSONALIA.

Sir J. J. Dobbie has retired from the post of Government Chemist.

Dr. V. Henri, of Paris, has been appointed professor of physical chemistry in the University of Zürich.

The degree of Master of Arts, *honoris causâ*, has been conferred on Prof. T. M. Lowry by the University of Cambridge.

Mr. C. A. Mitchell has been appointed to succeed Mr. Julian L. Baker, now editor of the *Journal of the Institute of Brewing*, as editor of *The Analyst*, as from January next.

The chair of physiology at the Anderson College of Medicine, Glasgow, has been filled by the appointment of Dr. W. Morris, assistant to the professor of physiology in the University of Glasgow.

Mr. F. J. Harlow, head of the department of mathematics and physics at the Sir John Cass Technical Institute, has been appointed to succeed Dr. R. H. Pickard as principal of the Municipal Technical College, Blackburn.

Following the appointment of Mr. P. J. Hartog to the vice-chancellorship of the University of Dacca, India, Dr. E. Deller, assistant secretary to the Royal Society, has been appointed academic registrar of the University of London.

Dr. F. V. Darbishire has succeeded Capt. H. J. Page as head of the chemical department at the Royal Horticultural Society's station at Wisley, Surrey. Capt. Page has received an appointment on the staff at Rothamsted.

Dr. F. Hofmeister, formerly professor of physiological chemistry at Strasbourg, has been made honorary professor in the University of Würzburg. Dr. H. Immendorf has been appointed professor of agricultural chemistry in the University of Jena.

The awards in the 1919-20 competition of the Crompton Memorial Prize Scheme of the Textile Institute for advanced students in design and structure of woven fabrics include the first prize to Mr. W. Smith, of Bolton (Manchester College of Technology), and the second and third prizes to Messrs. C. Nutter and R. Bailey, respectively, both of the Nelson Municipal Technical School.

Prof. C. S. Sherrington, Waynflete professor of physiology in the University of Oxford, has been recommended for election to the presidency of the Royal Society, in succession to Sir J. J. Thomson. The recommendations for election to the Council include, *inter alia*, Mr. J. Barcroft, Sir W. Bragg, Dr. A. W. Crossley, Prof. J. B. Farmer, Sir W. Fletcher, Sir R. Hadfield, Sir W. Leishman, Prof. J. W. Nicholson, and Prof. W. P. Wynne.

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Limitation of Rubber Output.

In answer to Mr. A. Parkinson, Sir P. Lloyd-Greame stated that he was aware of the proposed reduction of 25 per cent. in the output of plantation rubber consequent on the present and prospective surplus and the difficulty of carrying large stocks, but he had no power to prevent such action being taken.—(Oct. 25.)

Overseas Trade Credits.

Mr. Kellaway, answering Major Barnes and Mr. A. M. Samuel, stated that the total advances made under the Overseas Trade (Credit and Insurance) Act up to October 13 amounted to £75,457 in respect of Finland, Rumania, Poland, Czecho-Slovakia, and Jugo-Slavia. Credits had been granted up to £451,000, but some had lapsed or had not been fully used. Since the credit advance on the value of the goods exported had been increased from 80 to 100 per cent., the Department of Overseas Trade had received many applications for very large sums.—(Oct. 26.)

Motor Spirit Duties.

Mr. Chamberlain stated, in answer to Mr. Jesson, that imported "Natalite" would pay the same duty as other spirit mixtures, irrespective of the denaturant used; but plain spirits could be imported duty-free when used as a source of power, provided the differential duty had been paid, and on condition that after importation the spirits were denatured as power methylated spirits in an approved manner. The question of the denaturants to be used for this purpose was under consideration. In the Finance Act of this year provision was made for the payment in respect of spirits (imported or home-made) denatured in this country of an allowance which would have the effect of cheapening production. Further legislative proposals were being considered regarding the modification of the existing restrictions on the conditions of transport and distribution of spirits intended for use in making power methylated spirits, as far as this could be done without affecting the revenue.—(Oct. 27, Nov. 1.)

Nationalisation of Mineral Royalties.

The Prime Minister informed Major Barnes and Mr. Kiley that the Government intended to introduce a Bill providing for the nationalisation of mineral royalties early next session.—(Nov. 1.)

Railway Rates.

Sir E. Geddes, answering Mr. Higham, said that owing to the loss of revenue occasioned by the miners' strike—estimated at from £2,000,000 to £3,000,000 per week—and the operation of the sliding scale for wages, there was no prospect of any reduction in railway charges in the near future; but the position would be carefully reviewed before the Government gave up possession, in order to see that the charges were not unduly high.—(Nov. 1.)

Women and Young Persons (Employment in Lead Processes) Bill.

This Bill was read a second time on November 1. As explained by the Home Secretary, it provides for the carrying out of the full recommendations made by the International Labour Conference at Washington (*cf.* J., 1920, 4 R). The provisions scarcely affect this country, because our standard is higher than the minimum standard which the Bill prescribes, but this country is under an obligation to put the said recommendations upon its Statute Book. The Bill was read the third time and passed on November 5.

Imports from Germany.

Sir R. Horne, replying to Mr. G. Terrell, said that the imports of German goods into this country during the nine months ended September 30, 1920, amounted in value to £17,190,793 and included:—Glassware, domestic and fancy, 69,983 cwt., worth £386,139, and bottles and jars, 158,844 cwt., worth £235,136; coal-tar dyestuffs, 31,487 cwt., worth £1,399,027; and dressed leather (box and willow calf), 2394 cwt. worth £311,087.—(Nov. 1.)

The Dyestuff and Other Key Industries.

In reply to questions put by Mr. E. Cecil and Mr. Doyle, Sir R. Horne stated that the imports of dyestuffs and intermediates into this country had increased very substantially during the last few months, and a large proportion of them had come from Germany. Proposals to protect the synthetic dye-making industry for a time were to be embodied in a Bill relating to key industries, which would be introduced as soon as possible. The system of controlling imports of foreign dystuffs by means of licences had not been put in force, and it would be advisable to deal with all the key industries together. Owing to foreign competition, other key industries were in a more serious condition than the dye industry.—(Nov. 1.)

Exports of Cement.

Replying to Major Prescott, Sir R. Horne said that the exports from the United Kingdom of cement for building and engineering purposes during 1913, 1919 and the first three quarters of this year were as follows:—

	Quantity. Tons.	Value. F.o.b. £	Average Value. Per ton. s. d.
1913	747,736	1,273,080	34 6
1919	385,526	2,050,336	106 4
1920:—			
Jan.—March ...	130,771	713,370	109 1
April—June ...	149,770	848,547	113 4
July—Sept. ...	174,055	1,078,847	124 0

The increase in exports had been accompanied by a very substantial increase in output.—(Nov. 1.)

Pithead Values of Coal.

In a written answer to Capt. Bagley, the Secretary for Mines gave the following data showing the percentage distribution between capital, labour, and royalties of the total pithead values of the coal sold in 1913, and during the first six months of 1920:—

	1913.	1920. (Jan.-June)
Owners' profits ...	15 ...	6
Labour	63 ...	68
Royalties	4 ...	2

—(Nov. 3.)

Unemployment Statistics.

The Minister of Labour, in answer to Capt. Terrell, has published in the Official Report a statistical table dealing with unemployment as at January and July of this year. During this period the number of male workers in the chemical industries fell from 200,000 to 195,000, and that of the female workers from 75,000 to 70,000; in the metal industries the corresponding figures are 1,994,000 to 2,104,000 and 306,000 to 303,000. At July, 1920, there were 6,520,000 males and 2,456,000 females engaged in private and municipal establishments.—(Nov. 3.)

REPORTS.

Report on the General Economic and Financial Conditions of Brazil, 1919. *By* E. Hambloch, *Commercial Secretary to H.M. Embassy, Rio de Janeiro. Pp.* 63. *H.M. Stationery Office.* 1920. [*Cmd.* 840. 6*d.*]

Although Brazil is a country with enormous natural resources, its development is very backward. Adequate transport facilities are lacking; the country is sparsely populated, and 70 per cent. of the people is illiterate; primary and technical education are but little developed; the country suffers under heavy taxation and from the absence of credit facilities; and the northern districts are subjected to severe droughts. The cost of living is exceptionally high owing to the very heavy traffic.

Prior to 1914 the chief products were coffee, rubber, cotton, sugar, cacao, tobacco, *herva matte*, and hides and skins, but more recently attention has been directed to the exploitation of manganese and iron ores, and to some extent to coal. No country is richer in all kinds of timber than Brazil, where 59 per cent. of the area is forest land. The chief timbers exported are pine, massaranduba, cedar, sebastiao de aruda, and acapu, the total value of which increased from £80,000 in 1912 to £230,000 in 1917. Cotton has been cultivated for more than 200 years, and although the annual production is over 80,000 tons per annum, thus making Brazil the fifth largest cotton producer in the world, only some 20,000 tons is exported, mainly to the United Kingdom, the bulk being utilised by the local mills (202, employing 78,186 workpeople). The fibre is of very best quality, but selection, improved cultivation, and proper grading are badly needed. Attempts were made to introduce Sea Island cotton in 1915, but although the experimental planting was successful, the attempt was abandoned owing mainly to lack of adequate and competent labour. Numerous cottonseed-oil factories exist, but are for the most part poorly equipped; about 20,000 t. of cotton seed is exported annually.

Brazil is almost entirely dependent on foreign coal, of which some two million tons are imported yearly. It was formerly supplied almost exclusively by Great Britain, but latterly by the United States. The somewhat inaccessible Candiota coal-field, in the Rio Grande do Sul, contains very large deposits, but the better situated Sao Jeronymo field, near Porto Alegre, is the most abundant producer, with a daily output of about 300 tons.

Iron ore occurs in abundance in Minas Geraes, Sao Paulo, Santa Catharina, Bahia, Espirito Santos, Matto Grasso, Goyaz, and Rio Grande do Sul (*cf.* J., 1920, 115 R), and as various plans are under way for the development of the deposits, the industry will probably become one of the most important in the country. Large quantities of manganese ore were exported during the war, the amount shipped in 1917 being 500,000 t. (*cf.* J., 1920, 288 R). The question of treating the iron and manganese ores in the country, instead of exporting them, is being examined, but the enormous capital outlay that would be required, the fact that coal is not found in the proximity of the ore deposits, and the vast distances to be covered, constitute weighty obstacles to such a proposal.

The deposits of petroleum in the States of Bahia, Pernambuco, and especially Alagoas, are now under investigation. The estimated area of the fields is 200,000 sq. km., and they are reported to lie close to the sea shore and to yield oil of low sulphur content. In 1919, 120,000 tons of mineral oil was imported, chiefly from Mexico and the United States. Before the war a German syndicate purchased tin mines at Sao Joao Baptista (Minas Geraes), and is reported to be prepared to spend £6,000,000 in installing smelting plant, etc., and in equipping a port at Angra dos Reis, near Rio de Janeiro.

In recent years the import statistics have shown a continuous reduction in volume, but an increase in value; thus in 1914 the imports were 3,300,000 t., worth £25,500,000, and in 1919, 2,779,000 t., valued at £78,184,000. The export figures for these years are:—1,300,000 t., worth £46,800,000; and 1,908,000 t., worth £130,000,000 respectively. Exports of the following commodities have recently increased:—Cotton, cacao, coffee, meat, tobacco, hides, and oil-fruits; and the following have decreased:—Manganese ore, sugar, potatoes, manioc flour, and beans. In 1919 Great Britain and France took 80 per cent. of the raw cotton exported; France took 24, the United States 30, and the United Kingdom 20 per cent. of the sugar; and the United States took 70 per cent. and the United Kingdom 20 per cent. of the rubber exported. Great Britain supplied 15, and the United States 50 per cent. of the imports, which compares with 30 and 13 per cent. respectively in 1910. At present British trade is facing severe competition from American manufacturers, who have enormously increased their hold on the market and are sparing no efforts to maintain and increase it, though hampered by the high exchange rate of the dollar. The Japanese are devoting considerable attention to the Brazilian market, but it is considered unlikely that they will gain a permanent footing. Prospects of increasing trade between Brazil and Canada are held to be very favourable. British Dyestuffs Corporation, Ltd., is well represented in Brazil, and future trade in coal-tar colours with Great Britain should assume important proportions.

Report on Compulsory Adoption of the Metric System in the United Kingdom. *Submitted by the Metric Committee of the Conjoint Board of Scientific Societies. Published on the authority of the Committee. Price* 1*s.*

The committee selected by the Conjoint Board to report upon the advisability of a compulsory metric system of weights and measures was appointed in 1916, and the present report was first prepared in June, 1917, but not published until quite recently. Sir J. J. Thompson was chairman, and the members included M. le Duc de Broglie, Sir R. Hadfield, Sir P. Magnus, Prof. J. Perry, W. C. Unwin, W. W. Watts, and Messrs. H. Wilson-Fox, A. R. Hinks, and C. P. Sparks. The subject was considered not only from the standpoint of science but also from that of technical manufactures and industries. The recommendations, fourteen in number, may be briefly summarised as follows:—

The British system of units should be retained for general purposes, without attempting to improve their inter-relation, and no new fundamental unit should be established; the whole-hearted adoption of the metric system would be preferable to any such alteration.

A definite movement should be set on foot to secure the use of the metric units as well as of the British in compiling statistics, particularly when British and foreign data have to be compared.

Quantities should be expressed in terms of a single unit and/or in decimal parts of it, those units which are not readily decimalised being discarded. The pole, furlong, and league should be done away with, and the link and chain should be used only in determining areas. Apothecaries' Weight should be completely abolished, and likewise the grain, dram, stone, quarter, and hundredweight of 112 lb. As general standard of capacity, the gallon, with its subdivision into quarts and pints for retail use, is recommended; the peck, bushel, quarter, chaldron, and barrel are unwanted; and weight should be substituted for dry measure.

Square rod or perch and the rood should be abolished, and all areas given in acres or square feet.

The names of many of the multiples and sub-multiples in the metric system should be omitted, and the French proposal to reject the use of units of capacity as distinct from units of volume should be followed. Some of the names of the proposed new French units (*e.g.*, the *sthène* for the unit of force) are inconvenient, but the word *centesimal* might be adopted for the centigrade scale of temperature.

The adoption of the metric system in the fine chemical and drug trade should be made compulsory forthwith.

No change is proposed in the existing system of British coinage; and various suggestions are put forward for making the above proposals legally effective.

Sir J. J. Thomson, M. le Duc de Broglie, and Mr. C. P. Sparks did not sign the report.

Communications were received from 35 constituent societies of the Conjoint Board with reference to the recommendations, and a rough classification of these shows that 18 societies are in general agreement with the Committee's views; 3 are not adverse (Electrical Engineers, Faraday Society, and the Institute of Chemistry), and 3 are unsympathetic (Physical and Royal Meteorological Societies, Royal Society of Edinburgh), all of these favouring a more thorough acceptance of the metric system; and 11 gave non-committal or incomplete replies.

COMPANY NEWS.

Sulphate of Ammonia Association.—At the sixth and last annual general meeting, held in London on October 20, it was resolved unanimously to wind up the Association and to transfer any available assets to the British Sulphate of Ammonia Federation, Ltd. (*cf.* J., 1920, 209 R), on the understanding that the Federation shall expend the money so received on the propaganda work hitherto carried out by the Association. The balance-sheet shows that at the close of the financial year, ended June 30, 1920, there was an accumulated fund of about £13,000. The total quantity of ammonium sulphate delivered for home consumption during this period was 233,500 tons, compared with 269,000 t. in 1918, when, however, nitrate was not plentiful. There is a growing demand for neutral sulphate, the production of which now amounts to about 30,000 t. per annum.

Brimsdown Lead Co., Ltd.—The chief interest of the meeting, held on October 29, lay in the proposals put forward to compensate the holders of cumulative preference shares for many years' lack of dividends, by capitalising £62,000 of the reserve fund (£166,019) and allotting to them two ordinary shares of 5s. each for every preference share held. These proposals were carried unanimously at an extraordinary meeting, after Sir J. Brunner had explained the reasons which had led the committee of shareholders, appointed last year, to recommend them. As set out by the chairman, Dr. S. Miall, at the preceding annual meeting, and shown by the accounts, the company has taken advantage of the improved demand for white lead and related products during the past 18 months, and has much improved its financial position. After allocating £24,045 to meet taxation, the net profit for the year ended December 31, 1919, was about £15,000; and after ratification of the new scheme, it is proposed to pay the full dividend on the preference shares for the current year.

TRADE NOTES.

BRITISH.

Canadian Starch and Glucose in 1918.—The Dominion Bureau of Statistics reports that in 1918 there were 12 Canadian plants producing starch and glucose with a total asset value of $3,784,664. The value of the materials used in the industry was $4,992,705, of which maize alone accounted for $3,858,312 (62,489 long tons). Chemicals, the chief of which was hydrochloric acid, were used to the value of $44,763. The total value of the products of the starch and glucose industry was $7,620,864, of which the main items were glucose (including all syrups), valued at $4,191,098, and corn starch, valued at $1,445,324. During the period Canada exported 369·5 t. of starch, valued at *26,790 and 10,153 t. went to meet the home demand.

Gilbert and Ellice Islands in 1918—1919.—The chief products of these islands are phosphates and copra, the exports of which amounted to 78,683 tons, worth £78,683, and 5000 t., worth £60,000, respectively. It is believed that a coconut-fibre industry might be profitably established if proper plant were provided for combing and cleaning. The question of freight, however, would present a difficulty, as there is barely enough for the copra industry alone, and the development of the islands in general is hindered by lack of communications. The group has largely recovered from the serious drought of 1915–18, and the replanting of desolated areas has begun. The yield of copra is improving, and a revival took place in the phosphate industry of Ocean Island.—(*Col. Rep.—Ann., No.* 1038, *July*, 1920.)

FOREIGN.

Chemical Trade of the United States in 1919–20.—The exports of dyes and dyestuffs from the United States during the fiscal year ended June 30, 1920, were valued at £5,158,513 (assuming £1=$5), as against £3,573,073 and £3,384,377 in the two previous years. The total value of chemicals, drugs, dyes, medicines, and acid exported was £39,801,985, compared with £29,610,706 in 1918–19, the increase being mainly due to larger exports of dyestuffs. Of the dyestuffs Japan took £1,333,301 worth, British India £666,708, China £610,653, Canada £557,899, and the United Kingdom £384,488. The total imports of drugs, dyes, and medicines amounted to £35,593,905 (£30,045,037 in 1918–19), and included coal-tar products worth £1,424,054 (£1,405,470 in 1918–19.—(*Oil, Paint, Drug Rep., Aug.* 16, 1920.)

Cinchona Trade of the Dutch East Indies.—The cultivation of the cinchona tree in the Dutch East Indies dates from the middle of the nineteenth century, and has given rise to an important trade. There is only one quinine factory—the Bandongsche Kinniefabriek, Bandoeng, Java—but the chief Dutch buyers, representing some eight factories in Holland, have contracted to take an annual quantity of bark corresponding to 525 tons of quinine sulphate at a minimum price of 5 cents (=2 cents U.S.A.) per unit per cent. The exports of quinine and cinchona bark by countries of destination in 1913 and 1919 were as follows (metric tons):—

Country.	1913. Quinine.	1913. Cinchona bark.	1919. Quinine.	1919. Cinchona bark.
Netherlands	37	7829	202	679
United States	3	—	66	1743
Great Britain	—	262	163	2313
Italy	15	—	1	37
Belgium	—	36	—	—
British India	5	—	74	223
Japan	—	—	45	409
Other Countries	2	—	89	—
Totals	62	8127	640	5404

Exportation of quinine is increasing, but that of cinchona bark decreasing.—(*U.S. Com. Rep., Sept.* 22, 1920.)

OFFICIAL TRADE INTELLIGENCE.

(From the Board of Trade Journal for October 28 and November 4.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number:—

Locality of firm or agent.	Materials.	Reference number.
Belgium	White lead ground in oil, powdered antimony..	578
"	Dyes, oxides of cobalt and manganese, sodium and potassium bichromates, sal ammoniac ..	621
"	Petroleum derivatives, vegetable oils, essences	623
France	Oil-seeds, cotton oil	626
Italy	Fats, grease	627
"	Chemicals, pharmaceutical products	628
"	Drugs, dyes	629
Latvia	Steel	585
"	Oil, grease	586
Spain	Chemicals, drugs	632
Turkey	Paint, varnish (catalogues of) ..	590
Argentina ..	Glass, porcelain, earthenware ..	597
Uruguay	Chemicals, tinplate	639
Venezuela ..	Chemicals, drugs	640
Australia	Glass, china, earthenware ..	556
"	Paint, varnish	598
"	Tinplate, tinfoil, steel sheets, wire rope	599
British East Africa	Window glass	572
Canada	Patent medicines, stainless steel..	561
"	Liquid and powdered soap ..	563
"	Crucible steel, high speed steel ..	603
"	Pig iron, cold-rolled strip steel, brass sheets, rods and tubes, tin, copper, spelter	605
"	China, crockery	606
"	China, disinfectants, imitation leather	608
"	Malt extract, malt flour, malt sugar	610
"	Iron, steel, zinc, zinc white, lithopone, glass	614
"	Leather	*
Ceylon	Explosives for mining purposes..	617
Hongkong.. ..	Leather, paper, metals, window glass, chemicals, soap	574

* The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

Market Sought.—An agent in Algeria wishes to sell a kieselguhr quarry in that country. [593.]

TARIFF. CUSTOMS. EXCISE.

Austria.—The pre-war "conventional" tariff rates apply to goods of any origin until January 16, 1921.

Brunei (State of).—The customs duties on aerated water, spirits, and dyes have been amended.

Candles, coconut oil, gambier, groundnuts, spices, sugar, confectionery, and preserved foods are now admitted duty free.

Canada.—No person may import margarine without a licence from the Minister of Agriculture.

The revised regulations affecting the import of hides, skins, and animal waste are set out in the issue for November 4.

Chile.—It is proposed to increase the existing customs duties by 30 per cent., except in the case of sugar, oil, cocoa, and certain other foods.

Cyprus.—Among the articles that may be imported duty free are fertilisers, pig iron, disinfectants, resin, petrol, benzine, and crude petroleum for fuel.

France and Algeria.—The prohibition of the import of newsprint paper is extended to include all paper on rolls as from November 1.

Among the articles the export of which is still prohibited are turpentine, bauxite, and iron and steel scrap.

The export prohibition on cast iron is revoked as from October 24.

Germany.—The surtax when customs duties are paid in paper money is fixed at 900 per cent. as from November 10.

Greece.—Newsprint paper is admitted duty free until December 31.

Hungary.—Export duties have been levied on, *inter alia*, certain seeds, hides, skins, vegetable oils, spirits, glue, cement, broken glass, and degreased bones.

Italy.—Among the articles that pay increased import duties as from September 26 are paper, pasteboard, antimony, certain wares of iron, steel or zinc, copper and brass gauze, scientific instruments, porcelain, pottery, glassware, mineral waters, benzol and other coal-tar oils, turpentine, many metallic ores and salts, glycerin, ceresin, quinine, grease, dyes, colours, varnish, printing ink, and vegetable fibres.

Jamaica.—The restrictions on the import of foreign dyes have been temporarily suspended as from August 23.

Luxemburg.—The export taxes on cast iron, semi-manufactured iron and steel, iron ore, and iron and steel scrap have been amended as from November 1.

Netherlands.—Paper of all kinds except old paper and waste paper may now be exported without licence.

Portugal.—The import duty on certain kinds of paper has been reduced.

Do. (Angola).—The export duties on hides, skins, palm oil, palm kernels, rubber, oil-seeds, and wax have been amended.

St. Lucia.—The revised schedule of export duties may be seen at the Department.

St. Vincent.—The export of raw hides and skins is prohibited as from August 18.

Salvador.—Gasoline and gasoline oil pay import duty at the rate of 5 centavos (gold) per kg. as from September 16.

Sweden.—The import of scrap iron and copper is prohibited, except by permission of the Board of Explosives, as from October 12.

Tanganyika Territory.—The import of prepared opium is absolutely prohibited and of any opium except by sea. All imported opium must be deposited in an approved store and not removed therefrom without written authority.

Tunis.—The export and re-export of methyl alcohol and acetone are prohibited as from September 14.

Importation of cellulose pulp and newsprint paper is prohibited as from September 9.

Turkey.—The export of olive oil soap is now permitted.

GOVERNMENT ORDERS AND NOTICES.

Manufacture of White Lead, etc.—A notice has been issued by the Home Secretary stating that he proposes to make regulations dealing with the manufacture of white compounds of lead (including lead carbonate, sulphate, nitrate, and acetate) in accordance with a draft which may be obtained on application to the Factory Department, Home Office, London, S.W. 1; and that any objections to the draft regulations must be sent to him within 30 days from October 22 last.

OBITUARY.

BERTRAM JAMES SMART.

We record with very great regret the death, on September 4, of Mr. B. J. Smart at Sydney, N.S.W., at the age of 38.

Smart was educated in England and began his career as a chemist at Guy's Hospital, London, where he served as assistant to Sir Thomas Stevenson and to the late Dr. John Wade. He graduated as B.Sc. in the University of London, and in 1901 obtained an appointment at Woolwich Arsenal under Dr. O. Silberrad, with whom he investigated the constitution of nitrogen iodide, the preparation of *p*-bistriazobenzene, and the removal of nitrous acid from concentrated nitric and sulphuric acid. In 1910, jointly with Sir Robert Robertson, he published an important paper on the significance of the Abel heat-test of guncotton and nitroglycerin. He then left England for an extended tour in the Far East to inspect explosives stores, and shortly after his return was appointed by the Government of New South Wales to organise and inspect the manufacture of iron and steel then developing in that State. After serving two years in this capacity, the same Government placed him at the head of the Testing Branch of the Department of Public Works (1915), which he very successfully developed. In 1914 he read, with J. T. Philpot, a paper before the Sydney Section of this Society on the volatilisation of arsenious acid from aqueous solutions containing hydrochloric acid; in 1917 he published papers on the microscopy of steel, the permeability of concrete, and on heat-insulating materials; in 1918 he contributed a paper, with P. Pecover, to the Sydney Section on the nitration of posidonia fibre, and in the current year one on the analysis of Fibro-Cement.

As a scientific worker, Smart possessed all the qualities which make for success, and he seldom took up a problem without bringing to its solution some new method of attack. He was held in high esteem by all who came in contact with him, and his work for this Society, particularly as chairman of the Sydney Section in 1918—1920, will long be remembered with appreciation and gratitude by his fellow members.

REVIEW.

THE PHYSICAL CHEMISTRY OF THE METALS. *By* RUDOLPH SCHENCK. *Translated and annotated by* R. S DEAN. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1919.) *Price* 17*s.* 6*d. net.*

Physical chemists are well aware of the fact that some of the most fascinating applications of their subject are to be found in the science of metallurgy, and they have not been slow to make use of the material thus provided to illustrate such problems as those of the crystalline and amorphous states, the crystallisation of liquid mixtures, and the physical properties of solid solutions. The endeavour to follow up the problems suggested by these applications of physical chemistry is, however, constantly thwarted by the difficulty of extracting from the large and scattered literature of metallurgy just those details that are required to furnish a solution. In many instances, indeed, the information that is needed may be in the possession of scientific metallurgists, but has never yet found its way into the literature. For this reason every teacher of physical chemistry will welcome the appearance of a translation of Prof. Schenck's book, supplemented as it is by additions and alterations which bridge over the gap of eleven years between the original German text and the new American edition of the book.

Much of the contents of this volume is necessarily on familiar lines, but the author appears to have developed a novel line of thought in recognising the existence of a distinct group of quasi-metallic compounds (including the oxides, sulphides, phosphides, carbides, and arsenides of many heavy metals), which simulate the metals in possessing metallic lustre and some degree of metallic conductivity, as well as in dissolving in liquid metals and frequently forming solid solutions in crystalline metals. These quasi-metallic compounds play a part in practical metallurgy which is but little, if at all, less important than that played by the alloys of two or more metals. They also possess many points of interest to the physical chemist, and it is instructive to notice how the well-known laws of solutions which were extended to alloys by the work of Heycock and others have now been applied to the mixed sulphides; these have been known for many years as important intermediate products in the metallurgy of copper, nickel, etc., but which have only recently been studied in the same way as the alloys of pure metals. Much information in reference to these mixtures has been collected and presented in a convenient form in one of the chapters of this volume.

The authors of the book are to be congratulated especially on their success in finding suitable illustrations to make clear to the reader the reality of the structures which they assign to various alloys. The micrographs are inferior in beauty and in technical excellence to those which have appeared in some English books and journals, but it is doubtful if an equally complete series, illustrating almost every conceivable combination of phases that can appear in simple alloys has been given previously.

The book may be heartily commended not only to the student of chemistry in general, but to metallurgists who are interested in the scientific problems arising from their technical practice, and to physical chemists who are anxious to know how the subject is being applied in other branches of science.

T. M. LOWRY.

PUBLICATIONS RECEIVED.

THE DETERMINATION OF HYDROGEN IONS. *By* W. MANSFIELD CLARK. *Pp.* 317. (*Baltimore: Williams and Wilkins Co.* 1920.) *Price, with postage: U.S.A.* $5, *Canada* $5.25, *other countries* $5.50.

RECENT ADVANCES IN PHYSICAL AND INORGANIC CHEMISTRY. *By* DR. A. W. STEWART. *Fourth edition. Pp.* 286. (*London: Longmans, Green and Co.* 1920.) *Price* 18*s.*

THE VOLATILE OILS. *By* E. GILDEMEISTER and F. HOFFMANN. *Second edition. Translated by* E. KREMERS. *Vol. II. Pp.* 686. (*London: Longmans, Green and Co. Printed in* 1916, *published in* 1920.) *Price* 32*s.*

HANDBOOK OF PATENT LAW OF ALL COUNTRIES. *By* W. P. THOMPSON. *Eighteenth edition. Pp.* 157. (*London: Stevens and Sons, Ltd.* 1920.) *Price* 6*s.*

THE PRODUCTION OF PLATINUM FOR 1919. *Pp.* 18. THE PRODUCTION OF PRECIOUS STONES FOR 1919. *Pp.* 29. *By* G. F. KUNZ. *Reprints from Mineral Industry, Vol. XXVIII.* (*New York: McGraw-Hill Book Co., Inc.,* 1920.)

THE DYESTUFF SITUATION.

When early in the war there arose an imperative need for enormous supplies of exposives and Lord Moulton was called in to organise and secure their production, he found that the country was practically destitute of the factories, the plant, and the trained organic chemists and chemical engineers necessary to produce them; and that supplies of essential commodities like dyes, drugs, scientific glass- and porcelain-ware were hopelessly deficient by reason of our previous economic dependence upon the Central Powers.

On the other hand, Germany was able to provide herself with all the necessary munitions by rapidly converting and extending her great dye establishments into arsenals of war; moreover, she had a very large number of trained chemists to fall back upon, who were promptly sent back from duty in the field. Further, the perfected condition of her industrial chemical organisation rendered easy the development of a new form of chemical warfare, and enabled her to meet the menace of the blockade by the production of synthetic nitrates and synthetic rubber, and to provide a substitute for cotton in the manufacture of nitrocotton. It is now a matter of history, and one of the achievements of which we are most proud, how Lord Moulton and his advisers collected the necessary scientific talent, mapped out a plan of production, put it into execution, and succeeded in a wonderfully short time, considering the magnitude of the task, in supplying our armies with the war chemicals they required, thereby contributing very materially to the ultimate ascendancy of the Allied arms. The manufacture of dyes and intermediates had also been taken in hand, but owing to the superior claims of the fighting forces, the development of this branch of national effort had, perforce, to take a subordinate place, and hence at the conclusion of hostilities the dye-making establishments were not in a position to meet the country's requirements either in regard to quantity or range of colours. Moreover, the demand for the required type of chemist still remained unsatisfied; the trained organic chemist, unlike Minerva, did not spring out of Jupiter's head.

In these circumstances, the country and the Government rightfully came to the conclusion that the dyestuff and other "key" industries had to be protected until such time when they could stand on their own feet; and promises of support culminated in a statement made in Parliament, on May 15, 1918, by the then President of the Board of Trade to the effect that the importation of all foreign dyestuffs would be put under a system of licences for a period of not less than ten years after the war. The system of prohibition except under licence was introduced by Order-in-Council, and every effort was made by the dye manufacturers to put their house in order and to meet the country's requirements. In July, 1919, the great dye establishments at Huddersfield and Blackley were brought under a unified control, in which the Government was represented; and on the faith of the promise of State assistance embodied in the prospectus, the new company—British Dyestuffs Corporation, Ltd.—appealed to the public for a subscription of £5,000,000, a large part of which was duly forthcoming. In December, 1919, by the now famous Sankey judgment, the method of prohibiting importations by Order-in-Council was held to be illegal, and thereupon, amidst Ministerial promises of immediate legislation to restore the *status quo*, the gates were flung open for the unimpeded ingress of German dyes and chemicals, Bohemian and German glass, porcelain-ware, and other "key" commodities. Favoured by the very depreciated value of German currency, and assisted by the gradual improvement in fuel supply and labour conditions, Germany, bent upon regaining her pre-war domination in this market, has been steadily increasing her exports to this country, and it is stated that at the present moment German dyes to the value of £4,500,000 are lying in store at Liverpool, and that workers are being dismissed from the dye factories in large numbers. The position has, therefore, become one of great urgency.

Since December last, when the abortive Imports and Export Regulation Bill was withddrawn, and until a few weeks ago, the Government has on countless occasions expressed its intention to bring in a new Bill at the earliest possible moment. On November 1, the Home Secretary stated that the dye industry would have to await a general measure covering all "key" industries; and ten days later, the Prime Minister intimated that the projected Bill could not be introduced before next Session, although he held out some hope that this decision might be reversed if a non-contentious measure were agreed upon.

This brings us to a consideration of the respective claims of the dye-manufacturers and dye-consumers. Both dye-makers and dye-users are agreed that national safety demands the development of home production, and that the dye-making industry must receive some measure of support for a term of years. They differ in regard to the method of assistance to be adopted. The textile manufacturers, or an important proportion of them, would prefer a State subsidy, together with unrestricted importation; the licensing system of 1919 they found to be cumbersome, irritating, uncertain, to involve delay, at times to be unfair, and they would, naturally, prefer to have a majority on the licensing board. Although admitting that the dye industry has made substantial progress, they still maintain that their requirements cannot be met in full by home producers, more particularly in regard to the supply of some of the essential specialised colours. Owing to the uncertainty in the delivery of these, they cannot accept orders for goods which they may be unable to supply.

The dye-makers', and we may say the national, point of view has been well expressed by Mr. W. J. U. Woolcock before the Commercial Committee of the House of Commons. In dealing with the question of national safety, Mr. Woolcock said that the loss of £2,000,000 per annum, the annual value of our dye trade, did not in itself constitute a reason for the special treatment of the industry; but if we lost the trade, we should also lose the plant, the machinery, and the organic chemists. In time, too, we should lose the textile trade, valued at £240,000,000 per annum, for with their half-century's experience and their elaborate selling organisation, the German manufacturers would not hesitate to strangle the British industry, and once this had been accomplished, they would hold our textile industry in the hollow of their hands; they could charge any prices they liked for their dyewares, and when occasion required they would cut off the entire supply. Mr. Woolcock also reviewed the alternative systems of licensing. The idea of a tariff is at once put out of court by reason of the greatly depreciated German exchange; to be effective the tariff would have to be of the order of several hundred per cent. State subsidies are being withdrawn, and they have an enervating effect. The proposal that important dyes should be bought and sold by a central bureau staffed by representatives of the Government and by commercial and technical experts would be costly, and would be killed by the fact that we have no experts independent of trade and technical connexions. Free importation plus a subscription fee based upon the difference in price between the home-made and foreign-made dyewares would be merely a tariff system in disguise; no Parliament would entrust an outside body with the right to fix and vary a tariff. The only feasible, and the least objectionable form of assistance is prohibition, except under licence, with the proviso that licences should be freely granted, as of right, unless the British manufacturer could show cause why the dye in question should not be admitted in unrestricted quantities.

This brief epitome of the origin and nature of the present dye problem is given less in the interests of our readers in this country, who should be already familiar with it, than of those of our members and subscribers—about one-third of the total—who live beyond the seas. From it they will gather that the re-born British dye-industry is threatened with disaster, mainly owing to the supineness of the Government and its failure to fulfil the oft-repeated promise to protect those industries that are vital to the country's safety in time of war, and essential for its prosperity in time of peace. Chemists and other scientific workers will need no convincing; the public has been kept well-informed by the daily press and given the opportunity of re-learning the lesson which we fondly hoped it had taken to heart during the war; it only remains to impress the Government with the urgency of the situation and to compel it to act promptly. As experience has shown on more than one occasion, some Governments lead best when they are simultaneously pulled from the front and driven from behind.

STAINLESS STEEL.

J. H. G. MONYPENNY.

The commercial utilisation of the non-corrodible properties of steel containing about 12 per cent. of chromium may be regarded as one of the outstanding events in the metallurgical world during the past decade. Steel, the most widely-used metal, unfortunately corrodes rather easily, and great precautions have to be taken to protect it, especially in exposed positions. This is particularly noticeable in such large engineering structures as the great railway bridges over the Forth and Tay, where painting is going on practically continuously. The production of a type of steel possessing great resistance to corrosion has obviously a great future, and one may safely say that, as yet, only the fringe of the possibilities has been touched.

Stainless* steel contains essentially 11 to 14 per cent. of chromium and, for most purposes, not more than about 0·45 per cent. of carbon. It frequently contains small amounts of nickel, say up to one per cent., but this element has no beneficial effect on the non-corrodible properties, whilst its presence, if unsuspected, may cause trouble in the heat treatment of the steel, since it has quite a considerable effect on the position of the critical ranges of the steel.

From a microscopic point of view, high-chromium steels, such as stainless, have a great deal of interest. Chromium has the effect of lowering the eutectoid composition in steel to a considerable extent. Whereas in ordinary steel about 0·9 per cent. carbon is required to produce a structure consisting entirely of pearlite, with 12 per cent. chromium the same effect is produced with approximately 0·3 per cent. carbon. Free carbide or cementite appears when the carbon exceeds this amount. In these steels, also, only part of the carbide forming the pearlite goes into solution at the lower critical temperature change on heating (Ac1), the rest dissolving progressively over a range of some two hundred degrees.

The state of combination of the sulphur in these steels requires further investigation. This element is only evolved to a very small extent as sulphuretted hydrogen on dissolving the steel in acids. The evolution method cannot be applied for its estimation, neither can one obtain an ordinary sulphur print on bromide paper. For example, a steel containing 0·07 per cent. sulphur only gave a very faint print even after 15 minutes' contact with bromide paper soaked in 10 per cent. hydrochloric acid or 15 per cent. sulphuric acid. The print obtained was different in type from an ordinary sulphur print in that the impression did not consist of a series of dots but rather of a uniform stain. Evidently the sulphur does not exist as separate particles of either iron or manganese sulphide disseminated through the mass of the steel; apparently it exists in solid solution.

Thermally, the effect of the chromium is to raise the temperature at which the critical ranges occur. The Ac1 point occurs in the range 800°—830° C., and on cooling sufficiently slowly to prevent any hardening effects, the critical temperature change on cooling (Ar1) is found at about 750° C.

Stainless steel possesses notable air-hardening properties. A sample one inch or so in diameter, if allowed to cool freely in the air from 900° C., will have a Brinell hardness number of the order of 500. The capacity of the steel to harden increases with the temperature to which it is heated. In other words, the speed of cooling necessary to harden the steel becomes slower as the temperature to which it is heated rises (providing the latter is, of course, above the carbon change-point); also, slower rates of cooling are necessary to soften or anneal the steel when cooled from progressively higher temperatures.

The property of air-hardening is very useful in a steel. Apart from the obvious fact that less drastic methods of quenching are required (with the attendant lessened danger of cracks, warping, or other undesirable attributes of water-quenching), the slower rate of cooling necessary to harden the steel permits samples of large section to be hardened throughout. It also lessens the danger of soft spots due to retarded quenching. Anyone who has had experience in producing a glass-hard surface over a considerable area in an article made of ordinary carbon steel will appreciate the meaning of the last sentence. Owing to its air-hardening properties, however, the steel requires care during the course of manufacture. Billets, bars, forgings or stampings are usually heated to at least 1000° C. before any operations are carried out, and if the material after being worked is allowed to cool down on the shop floor it will, when cold, be in the hardened condition and will be quite as liable to crack if rapidly or unevenly heated again as any hardened piece of tool steel. Being hard, it will require softening before any chipping, filing or machining can be done. These troubles, however, may be avoided by allowing the forged, rolled or stamped article to cool slowly over the range 800°—600° C. in order that the carbon change may take place and the steel thus becomes soft.

Stainless steels which contain more carbon than that indicated above, if quenched or air-cooled from high temperatures, are comparatively soft to the Brinell test owing to the production of austenite. Such steels, though soft, are unmachinable, the material becoming hard when stressed. Austenitic samples also harden when tempered at about 600° C.; for

* [The word "stainless" has been retained because it is in general use; "unstainable" is, of course, the correct term.—Ed.]

instance, an actual sample had a Brinell hardness number of 270 when water-quenched, and one of 444 after being tempered at 600° C. Such hardening after tempering has been noticed by several cutlery manufacturers who have, by accident or otherwise, hardened their knife blades from too high a temperature. Such a practice, however, is not to be recommended, as a coarse grain is thereby produced in the blade.

Stainless steel is tempered in the same way as ordinary steel, but higher temperatures are required. A corresponding series of temper colours are formed at the higher temperatures necessary to soften the steel. For example, the following colours were obtained, at the temperatures indicated, on a hardened sample of the steel:—

Straw	300° C.
Brown	400° C.
Reddish purple	500° C.
Light blue	600° C.
Bluish violet	650° C.
Greyish violet	700° C.
Grey	750° C.

Stainless steel has its maximum resistance to corrosion when in the hardened condition. It is then practically unaffected by exposure to moist air, fresh or salt water, or to such organic acids as occur in fruits. Samples buried in soil for three months have retained their original polish, and others have been immersed in vinegar or salt water for days without showing the slightest signs of attack. Tempering the hardened sample up to about 500° C. does not affect its resistance appreciably. Such tempering has also little effect on its hardness. Tempering at higher temperatures lowers the resistance to corrosion, but even in the soft condition the metal is only slowly attacked. Such soft material, for example, is stained by vinegar, but a sample weighing 60 grms. only lost 0·004 g. after 3 weeks' immersion. A sample of nickel-chrome steel hardened and tempered so as to give the same tensile strength lost during the same time 25 times as much.

Nitric acid, strong or weak, does not dissolve stainless steel either in the hard or soft condition, nor is the steel attacked by concentrated or dilute solutions of ammonia, nor in a moist atmosphere containing ammonia fumes. Sulphuric and hydrochloric acids attack it readily; a ten per cent. solution of the latter in alcohol forms a convenient etching reagent for microscopic work. Dilute solutions of sulphuric acid, at ordinary temperatures, attack stainless steel considerably faster than ordinary mild steel.

The opinion has been held that the non-corrosible properties of stainless steel are only obtained when it is highly polished and that they are then confined to the surface. This is not correct. It is well known that metals in general have an increased tendency to corrode after they have been cold-worked. Stainless steel is no exception. Turnings of this steel are in a highly distorted condition and hence will rust. Similarly, the surface of a bar from which heavy cuts have been taken is distorted and is more likely to rust than one from which a fine finishing cut has been taken. A ground or polished surface will be still more immune. That polish, however, is not essential is shown by the resistance to corrosion of a fractured surface which has been obtained without distortion.

In addition to its resistance to corroding influences, stainless steel does not scale to any extent when heated at any temperature up to 800°—850° C. A sample heated for 7 days in the range 700°—825° C. lost 0·7 per cent. of its weight, whereas a piece of ordinary steel heated with it lost 17 per cent.

The suitability of any new type of steel for use in engineering work of any description is largely judged by its behaviour under mechanical tests. A short description of the results of such tests on stainless steel will be of interest. After oil- or air-hardening from a temperature of 900° C., followed preferably by slight tempering at 200°—400° C., stainless steel has mechanical properties comparable with those of the well-known "100-ton" air-hardening nickel-chrome steel. When tempered in the range 650°—750° C., it gives tests highly suitable for many engineering purposes. The values obtained depend on the composition of the steel, but in general are in the following ranges:—

Yield point ...	30—55 tons per square inch.
Maximum stress ...	45—65 ,, ,, ,, ,,
Elongation	15—28 per cent.
Reduction of area	35—65 ,, ,,
Izod impact ...	25—70 foot-lb.

Tempering in this range of temperature (650°—750° C.) is also interesting commercially in that the hardness, and therefore the tensile strength, only falls very slightly as the temperature increases. When a number of articles has to be tempered to produce a given tensile strength, quite a wide range tempering temperature is permissible—obviously a desirable thing commercially. On the other hand the hardness falls very rapidly in the range 550°—650° C., and the difficulties of tempering in this range are correspondingly great.

During the war the great bulk of the stainless steel produced was used for aeroplane valves. Its value for this purpose lay, apart from its non-scaling property, in its superior strength at a red heat. The exhaust valves, especially of some of the large aero engines, frequently reach a temperature of 750° or 800° C., or even higher, and it is necessary that the valve should have sufficient strength at such a temperature to secure that the stem does not elongate during running. Actual tests obtained on testing mild steel and stainless steel at high temperatures gave the following figures:—

Tensile strength at	Mild steel.	Stainless steel.
600° C.	11·84	24·24
700° C.	6·8	12·08
800° C.	5·04	6·64
850° C.	4·12	6·64

By increasing the carbon content of stainless steel, still higher values may be obtained, *e.g.*, 15—17 tons at 700° C. and 7·5—8·5 tons at 800° C.

The development of the uses of stainless steel was very largely held up during the war, since practically the whole of the steel made was used for war purposes. It may be confidently expected, however, that the near future will bring about a very noticeable development in the number and variety of its applications. It will also be found that stainless steel is not one steel but a group of steels. Just as in the far-off days "steel" was regarded as a hard product of iron, and little or no attempt was made to grade it into harder or softer varieties, so at present stainless steel is to most people a product having only one distinct set of properties, many regarding it solely as a special type of cutlery steel. In times gone by, as the use of steel became more general, it was realised that by varying the content of carbon or manganese, steels of widely different intrinsic hardness could be produced, and for each purpose some definite "temper" of steel was best suited. In the same way, as the use of stainless steel becomes more general, it will be found that products of different intrinsic hardness (corresponding to the varieties of ordinary steel) can be produced, all of them having the distinguishing property of great resistance to corrosion, but varying among themselves as soft or mild steel differs from file steel. For each use of stainless steel there will be an optimum "temper."

THE CASTOR OIL INDUSTRY.

Under the above title a monograph by J. H. Shrader has been issued by the U.S. Department of Agriculture (Bulletin 867. Professional paper, Sept. 3, 1920).

The normal annual consumption of castor oil in the United States is over 2 million gallons, nearly all of which is manufactured locally from imported seed. The average imports of castor seed amounted annually to about 834,000 bushels (46 lb.) during the five years ending June, 1917. In 1917-18, owing to the great demand for castor oil for the lubrication of aircraft engines, the imports rose to over 1¼ million bushels, of which 60 per cent. came from India, 19 per cent. from South America, and 8 per cent. from the West Indies. Castor seed was grown locally in the United States, chiefly in Oklahoma, Kansas, Missouri and Illinois. until about 1900, when successful foreign competition appears to have rendered cultivation unprofitable; and although the activities of the Bureau of Aircraft Production resulted in 1918 in the production of 5750 tons (250,000 bushels) of American castor seed, the cessation of the war and the increased world production of seed render the prospects of castor seed as a permanent American crop somewhat doubtful.

In America, castor seed is bought on a standard form of contract of the Linseed Oil Association of New York City; 5 per cent. of the bags of a consignment is sampled, and allowances are made for impurities (stones, husks, etc.) exceeding 3 per cent., and also for excessive amounts of broken, decorticated or "black" seed (*i.e.*, seed discoloured by contact with water) which increase the acidity of the oil; the maximum allowance being about 5 per cent. At present it is not customary to value the beans on their oil-content as ascertained by analysis.

The treatment of castor seed in the manufacture of oil differs somewhat from that of other oil-seeds, owing largely to the soft non-fibrous nature of the seed-kernels; and although decorticated seed produces oil of paler colour and causes less wear to machinery than whole seed, the majority of the oil manufactured is now produced from whole seed.

The seed is not ground before crushing, as the soft kernels make grinding difficult, or even unnecessary, and the active lipase present renders rapidity of working desirable. After the usual preliminary removal of impurities by screening, the seed is heated to about 110° F., with the object of rendering more mobile the heavy viscous oil. This is conveniently effected in a grain-dryer, in which the seed is exposed on a series of steel shelves to a current of hot air (with the introduction of steam when desirable), and from which the seed can be discharged continuously or intermittently. After heating, the seed is pressed immediately in cage presses, such as are now commonly used for various oil-seeds of high oil-content; pressures on the ram of 4000 to 6000 lb. per square inch are employed, and some mills are being constructed for pressures of 8000 lb. per sq. in.

In good practice, 46 lb. (1 bushel) of seed, containing 45 per cent. of oil, yields about 15·6 lb. of No. 1 cold pressed oil, leaving in the press-cake 4·3 lb. of oil which can only be extracted by means of solvents. Castor seed is now treated successfully in Anderson oil-expellers, and the unsatisfactory results obtained in early attempts to use these machines for castor-oil manufacture are attributed to excessive wear caused by the hard seed-coats on the cast steel used in the construction of early machines. The cast steel has now been replaced by case-hardened steel.

Expellers, such as are used for copra, having three worm-flights on the pressing screw are satisfactory. Comparatively low pressures are used for castor seed, as high pressures lead to overheating of the oil and contamination with meal. In practice a cake about 7-16 inch in thickness and containing 12—15 per cent. of oil is obtained. In the battery of 15 oil-expellers at the Government oil-mill at Gainsville (Florida), each machine has worked regularly about 800 lb. of seed per hour when set to produce 15 lb. of oil per bushel (46 lb). After several months work on castor seed, the machines showed even less wear than is observed when working groundnuts, and out of a possible "take-up" for wear of cones of 2¼ inches, only ½ inch was necessary. Experiment showed that it was possible to produce a good yield of oil by the treatment in an oil-expeller of seed in the pod, but that the oil was of green colour and therefore unacceptable in ordinary trade, though suitable for lubrication and capable of being bleached. Decorticated seed was too soft to be worked in an oil-expeller without the addition of some fibrous binder such as groundnut husks. As there is a considerable amount of oil (12—15 per cent.) in the cakes obtained from cage presses or expellers, the material is treated with solvents in either stationary or rotating extractors. The types of extractors, solvent-recovery stills, etc., and the methods of working are similar to those used for other oil-bearing materials, but rotary extractors are increasing in favour, as they obviate imperfect extraction due to channelling and packing of the charge, are easy to work, and are less costly in labour than stationary extractors. In the latter there is a tendency for packing to occur owing to the fine non-fibrous albuminous matter of the kernels. This may be obviated by introducing the solvent from below and placing a layer of hulls (seed coat) on the floor of the extractor after covering the floor with burlap between wire-netting. Although castor oil is not soluble in petroleum spirit (gasoline) at ordinary temperatures, gentle heating effects solution readily. This solvent is used in practice, and the residue after extraction only contains up to 2 per cent. of oil. Solvent-extracted oil obtained from press cakes has a green colour and is of No. 3 grade, but experiment indicated that oil of apparently No. 1 grade could be produced by bleaching the oil directly extracted from castor seed.

No. 1 castor oil, obtained by pressing or expelling, is of pale colour and is generally sufficiently low in acid content to be suitable for industrial purposes without refining by means of alkali; passing a current of live steam into the oil coagulates albuminous matter which can be filtered off. No. 3 oil is of dark colour and high acidity (generally 5—7 per cent. as oleic acid); the refining of such oil with alkali is troublesome, as the soaps do not break and settle readily, but only do so partly as they tend to dissolve in the oil.

Bleaching of castor oil is usually effected by agitation of the dry oil at about 200° F. with 2—4 per cent. of fullers earth for about ½ hour, followed by agitation with 0·2—1·5 per cent. of decolorising carbon and subsequent filtration. No satisfactory method was found for bleaching commercial No. 3 oil, and this is attributed to the fixation of the colour by heat and to the presence of iron salts in the oil.

Engine tests of No. 1 hydraulic-pressed oil, No. 1 expeller oil, and No. 3 refined oil showed no differences in the lubricating values; and the physical and chemical constants were practically identical, colour being the only distinguishing feature.

On account of its intrinsic difference from any other commercial vegetable oil, or by reason of its relative cheapness, castor oil finds application in many industries and manufactures, such as leather-dressing, Turkey-red dyeing, artificial leather, rubber substitute, linoleum, etc. Although largely replaced by less expensive mineral oil as a lubricant, castor oil is still employed in the tropics for heavy machinery, and is essential for the lubrication of rotary types of internal combustion engines. The causes of its superiority for the latter purposes appear still to be somewhat uncertain.

THE CHEMICAL INDUSTRY CLUB.

The second annual dinner was held at the Connaught Rooms, London, W.C., on November 19, Sir William J. Pope presiding.

After the loyal toast had been honoured, Lord Moulton, proposing "The Profession and Industry of Chemistry," said that this was one of the most admirably expressed toasts he had ever known, as it indicated that the most valuable movement in recent years had been towards destroying the chasm formerly supposed to exist between the professional chemist and the chemical industry. The chemical industry was founded on the work of the research chemist, and there was really no separation between the two. So far as the chemical industry as a whole was concerned we were at a crisis in our history, and if England did not realise that it must become a great chemical nation its future was gone. Unlike most other nations, it was needful for England to make large quantities of the substances required to produce its food, for we might again have to stand alone and satisfy our own food requirements. We had just passed through such a period, and few would realise, as he did, how we had then to rely upon transport over thousands of miles of submarine-haunted seas for the materials necessary to food production. Germany, through the development of chemistry, was able to manufacture unlimited quantities of nitrates. It was during that time that he most felt the necessity for providing against succour being cut off; and the principal question to-day was whether we would begin in earnest to manufacture nitrates from the atmosphere. It was not mere knowledge that was wanted, but sufficient manufacturers to bear the burden should war again befall us. Next to the ammonia industry, the development of the dye industry was of the utmost importance if our country was to maintain the position which it had hitherto occupied.

Mr. W. J. U. Woolcock, M.P., responded and said that a striking example of the interdenpendence of the profession and the industry of chemistry had been afforded a short time ago, when a learned society approached the Association of British Chemical Manufacturers for information with regard to its plans for ensuring supplies of research chemicals. The profession was accordingly asked to furnish a scheme and, as a result, a list was prepared containing from 800 to 1000 research chemicals, of which about 600 could now be supplied through the Association. He asked that the utmost use should be made of these facilities. Makers of chemical plant in this country were convinced that the chemical manufacturer and chemical engineer did not trouble to inquire for chemical plant in this country and bought abroad, under the impression that the plant available here was unreliable. Progress had, however, been made, as the newly established Association of British Chemical Plant Manufacturers and the chemical manufacturers had met to ascertain each other's requirements. Mr. Woolcock then reviewed the present dyestuff situation and the various methods that had been proposed for fostering the industry. The only stumbling block at the moment was the textile industry, and he believed that the opposition from this source had been exaggerated. It was a mistake to suppose that all textile manufacturers objected to the system of prohibition except under licence. There was no hope for a Government measure of a contentious nature, but the position would be changed if an agreed Bill were introduced. We had reached a stage at which it was necessary to begin to educate the members of the House of Commons, as they were really anxious for information with regard to the chemical industry. It was the duty of the industry to supply this information, especially because it was generally agreed that some sort of Government assistance was necessary for the dye and fine chemical industries and because those called in to advise on the form of assistance to be given did not entirely agree.

Dr. M. O. Forster, in proposing "The Chemical Industry Club" spoke of the remarkable and unique attractions which it offered to its members, and he then dealt at length with the dye industry and said he believed it would collapse very shortly if Government help were not given. The textile industry would run a serious risk of extinction once the German dye industry had recovered its world-wide monopoly. He had been informed, on good authority, that German dyes valued at £4,500,000, equivalent to roughly one year's supplies at pre-war rates, had been imported since the armistice and were now stored in Liverpool. The dye industry was at a standstill; last week the British Dyestuffs Corporation had to dismiss 600 men, and the National Dyes Co. had closed down its three factories. The situation was due to Government inaction since the Sankey judgment. As far as the Chemical Industry Club was concerned, he hoped that ere long chemistry in this country would have a home which would give accommodation to our numerous chemical societies and also offer facilities comparable to those of the Chemists' Club in New York. The Chemical Industry Club had done invaluable service in filling the gap until the new home was established.

In replying to the toast, Sir William Pope said that the social needs of the chemical industry were very large, and every chemist in the country should associate himself with the club. Its membership was now 700, and last year there was a balance to the good, an achievement which very few clubs in London could show. During the war the public had been given a lesson on the national value of the chemical industry, but the teachers had not driven that lesson home The disadvantages under which chemists believed they had suffered in the past were entirely due to their own misapprehension as to what was needed in educating the public. He hoped the club would be the beginning of the larger organisation of which Dr. Forster had spoken. A great appeal was being launched for funds to establish such a chemical home, where the scientific, technical, and social aspects of industry would be catered for, and which would provide the facilities essential to the great publication schemes in connexion with chemical literature which had to be undertaken in the near future. About £500,000 was needed for this purpose, and an appeal, now being made privately, would no doubt shortly be made publicly. When the magnitude of the capital involved in the chemical industries of the Empire was considered, the sum required seemed ridiculously small, and it devolved upon every member of the profession to do everything possible to ensure the success of the appeal.

The toast of "The Guests," proposed by Prof. W. R. Hodgkinson, was replied to by Dr. E. J. Russell and Dr. H. J. Johnson, Worshipful Master of the Company of Tallow Chandlers; and Prof. F. G. Donnan gave the toast of "The Chairman."

NEWS FROM THE SECTIONS.

CANADIAN PACIFIC.

A joint meeting of the Canadian Pacific Section and the British Columbia Technical Association was held on October 25, in the Board of Trade Auditorium, Vancouver, B.C., Mr. Noble W. Pirrie and Mr. A. S. Wootton presiding in turn. Mr. J. A. Dawson, Dominion Government Chemist, reported on the recent Banff meeting of the Engineering Institute of Canada, at which the relationships between chemists and other technical workers and the need of extending the organisation to other provinces of Canada were discussed.

A symposium on "Chemistry in the Community" was opened by Dr. R. H. Clark, of the University of British Columbia, with a paper on "Academic Chemical Research," in which he emphasised the fact that chemical discoveries have been made largely by university chemists, and that they have frequently provided the germ from which great industries have sprung. Mr. G. S. Eldridge, in discussing the relationships of "Chemistry and Metallurgy," laid stress upon the importance of chemical analysis and control, with particular reference to the discoveries of Bessemer, Siemens, and others, and described recent developments in the manufacture of ferro-alloys and the electro-chemical separation of metals at Trail, B.C. Under the heading "Chemistry and Alloys," Mr. W. S. Barwick discussed various types of brass and bronze, the use of manganese bronze (better described as manganese brass) for propeller blades of ships, pumps, etc., and alloys containing aluminium, calcium, magnesium, etc., in aeroplane manufacture. The subject of "Chemistry and Agriculture" was dealt with by Mr. W. H. Hill, Dominion Agricultural Chemist, and that of "Chemistry and Biology" by Mr. C. J. Berkeley, Biochemist at Departure Bay Biological Station. The latter described his recent work on the respiration of clams in the absence of air, and indicated the importance of the problem as affecting existing ideas about this fundamental chemical process.

Mr. H. Freeman, Secretary of the British Columbia Committee of the Advisory Council for Scientific and Industrial Research in Canada, briefly referred to his discovery, while resident in Vancouver, of the electrochemical process of making cyanide from calcium cyanamide, and to its subsequent development on an industrial scale at the works of the American Cyanamide Company at Niagara Falls, Ontario. Mr. Freeman then reviewed opportunities in the lumber, fish, and mining industries of British Columbia, to which the judicious application of chemical knowledge is essential for economic success. Much interest was aroused by the announcement that the Canadian Advisory Council for Scientific and Industrial Research had granted a sum of money towards the cost of investigating a promising electrochemical process for treating the complex zinc-lead ores of British Columbia.

BRISTOL AND SOUTH WALES.

On November 4, at Bristol, Mr. J. Arthur Reavell, chairman of the Chemical Engineering Group, read a paper on "Evaporation Problems." Mr. E. Walls presided and 39 members attended.

The lecturer passed in critical review a large number of forms of apparatus, the earliest of which dated from 1630. The defects of the earlier methods of evaporating liquids in bulk, either in direct heated or steam-heated pans, *e.g.*, large cooling effects, waste of vapour, etc., were pointed out. The vacuum pan, said the lecturer, seemed to fascinate many manufacturers who regarded the vacuum as essential, but actually efficiency depended entirely on the temperature difference between the heating steam and the vapours in the condenser. High-pressure steam in most cases gave better results without the necessity of a vacuum. Frothing was a serious difficulty in vacuum evaporation, whether single or multiple effect be used. The division of effort in the case of a multiple-effect vacuum evaporator was explained and various difficulties described. The great advantages of film evaporation were detailed and comparative figures of efficiency were given for different types of evaporators. The lecturer also discussed the utilisation of waste vapours, at atmospheric pressure, from non-vacuum evaporation and from other sources and by re-compressing in rotary or direct acting compressors; and he gave figures indicating the economy obtained by using injector compressors, in which a small quantity of high-pressure steam raises the pressure and temperature of low-pressure vapour.

The Section also held a meeting at Cardiff on November 5, when Mr. A. Brennan read a paper on "The Geology of the Mexican Oilfields." Prof. C. M. Thompson presided. Geological investigation of these fields is hampered by the extensive floods, and the best method consists in digging pits with a view to finding the anticlinals where the oil always accumulates. Theories of the mode of formation of the oil and asphalt deposits were described, and evoked an interesting discussion.

YORKSHIRE.

The first meeting of the session was held in Leeds on November 8, Dr. L. L. Lloyd presiding in the absence, through illness, of the chairman, Mr. S. H. Davies. The main item on the agenda was a paper on "Ochre Streams of the Valley of the Don and Loxley," by Messrs. J. Hawarth and J. Evans.

The two valleys mentioned are situated in the Sheffield district and lie between ridges upon which outcrops of carboniferous strata are worked for coal, fireclay, and ganister; and the effluents from the adit workings give rise to the ochre streams under consideration. Although analyses of the waters of the twelve streams examined showed considerable variations, the samples were invariably acid in reaction and contained large amounts (up to 130 parts per 100,000) of dissolved iron. Water issuing from the immediate vicinity of the mines contains a large proportion of the iron as basic ferrous sulphate, which subsequently undergoes oxidation and leads to deposition of ochre (ferric oxide containing basic sulphate), so that the water running into the main river contains less dissolved iron. The iron in solution emanates from the pyrites and marcasite contained in the coal seams. The deposition of the ochre is mainly brought about by "iron bacteria," which decompose the sulphate, forming ferric oxide and free acid. These bacteria are remarkable in that they require only most minute traces of organic matter for their sustenance (*cf.* J., 1919, 486 R). The authors, in pointing out the importance of the phenomenon, stated that a pure-water supply some two miles distant was rendered practically useless for industrial purposes; and that the pollution was permitted to continue as the effluents from mines were specially excluded from the control of the Rivers Board. The discussion which followed centred around the following points:—Iron bacteria; the determination of acidity in the presence of iron; the removal of iron from ferruginous waters to render them suitable for dyeing and tanning purposes; the prevention of bacterial deposits in water mains; and acidity in relation to "soap hardness."

MEETINGS OF OTHER SOCIETIES.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At the meeting of the Institution held in the rooms of the Royal Society of Arts on November 16, papers on Colloidal Fuel were read by Mr. Lindon W. Bates and Mr. Haylett O'Neill. Colloidal fuel, as defined by Mr. Bates, is "A stable mobile atomisable fuel displaying colloidal characteristics, comprising particles of solids, droplets of liquids or minute bubbles of gases, or combinations thereof, suspended in one or more varieties of liquid hydrocarbons."

The particular colloidal fuel which was discussed at the meeting consists of a suspension of coal in petroleum residuum, the stability of the suspension being maintained (1) by means of a "fixateur," which may be soap solution or lime-rosin greases; or (2) by peptising the mixture by adding to it a definite proportion of coal distillates, such as tars and the middle fractions; or (3) by grinding the solid substances so that about 97 per cent. will pass through a 100-mesh and at least 85 per cent. through a 200-mesh screen. The authors claim that by one of these methods it is possible to suspend 55 per cent. of solid material in the liquid ingredient, samples of the fuel containing 42 per cent. of mixed coal and coke having remained perfectly stable after 8 months' storage. According to them, the addition of carbonaceous particles to an oil, and the proper association of these components, tend to raise materially the flash-point of the oil, and reduce evaporation, and that owing to this property the U.S. National Board of Fire Underwriters gives colloidal fuel preferential rating over plain fuel oil. It is further claimed that colloidal fuel has a higher calorific power than either of its principal constituents separately. For example, using 65 per cent. of oil of 18,500 B.Th.U. per lb. (equivalent to 177,600 B.Th.U. per imperial gallon), and of sp. gr. 0·96, together with coal of 14,000 B.Th.U. per lb. and of sp. gr. 1·4, the resulting colloidal fuel has a calorific power of 182,800 B.Th.U. per imperial gallon, and is heavier than water.

On the lecturers' assumption that Navy oil fuel loses from 0·5—1 per cent. per month on storage, then in 12 months there will be a loss on a million tons of 60,000 to 120,000 tons of fuel oil. If, however, fuel oil is incorporated as colloidal fuel with 35 per cent. of coal, the amount of available fuel would be 1,350,000 tons, and on this evaporation losses would be entirely saved, thereby assisting in the conservation of oil supplies.

The apparatus required for making colloidal fuel is of a standard type, being somewhat similar to a modern cement plant in its simplicity and arrangement. At the present time the Smidth, Marcy, or Newell combination tube-mills are used for the liquid grinding of the coal in the oil. A demonstration plant is in course of erection at Stone Court on the Thames, which, it is hoped, will become the centre for the testing of coals for the production of colloidal fuel. A further advantage claimed is that the fuel can be kept under a water-seal for fire prevention without risk of deterioration.

The discussion on these papers was deferred to a meeting to be held on November 23.

ROYAL PHOTOGRAPHIC SOCIETY.

At the meeting on November 16, arranged by the Scientific and Technical Group, the first paper was a short description by Mr. E. L. Turner, of the L.C.C. School of Photo-engraving at Bolt Court, of various time-saving devices in half-tone process work. This was followed by a short paper by Mr. F. F. Renwick on the method of obtaining the first derivative of the plate characteristic curve; he discussed the meaning of the curve and its possible use in elucidating photographic problems.

Mr. Renwick, assisted by Mr. O. Bloch, then gave an account with demonstrations of the processes of white-light development and direct production of positives as previously given by him before the Liverpool Section of the Society of Chemical Industry in May this year. He explained also the so-called fogging action of very weak solutions of iodides on photographic plates as being in reality due to colour sensitising of the emulsion followed by fogging by the dark-room lamp. This is apparently the first time that colour-sensitising has been noticed as produced by a colourless mineral salt. A spectrograph was given showing the position of the added sensitiveness. Considerable interest was shown by the members in these accounts of the action of iodides on photographic emulsions.

FARADAY SOCIETY AND INSTITUTE OF METALS.

A successful meeting of the Faraday Society, conjointly with the Sheffield Section of the Institute of Metals, was held on November 19 in the Mappin Hall of the University of Sheffield, to discuss problems connected with the electroplating industry. At the afternoon session, presided over by Prof. C. H. Desch, several papers relating to metals other than silver were read, whilst the evening session, over which Mr. E. A. Smith presided, was devoted to silver plating. Dr. L. Aitchison described the properties of electrolytic coatings for the prevention of corrosion, and Capt. W. A. Thain gave an account of several applications of electro-deposition in the construction of aircraft, the most interesting being the formation of the water jacket of an aeroplane-engine cylinder by depositing copper on a temporary mould of fusible metal built up around the cylinder. Mr. Byron Carr described experiments on the deposition of cobalt at high current densities, and showed excellent deposits of this metal, which is highly resistant to atmospheric corrosion. Mr. S. Field contributed two papers, dealing respectively with the electrolytic refining of zinc, and with the conditions under which alloys of gold and silver are deposited from the mixed electrolytes.

There was a large attendance at the evening session, which was opened by Mr. W. R. Barclay with a general paper, in which attention was called to some early papers which are too little known, and to the conditions which prevail in old silver baths, the conductivity of which has been raised by the accumulation of potassium carbonate and other salts. The same conclusion was reached by Messrs. G. B. Brook and L. W. Holmes as the result of a large number of analyses and conductivity determinations. Mr. F. Mason urged the adoption of higher current densities in silver-plating, thus shortening the time of immersion in the bath, but differences of opinion appeared among the members as to the saving of time to be effected in the factory by such a procedure. Mr. Brook also advanced an explanation of the red patches sometimes seen on plated goods after polishing with rouge, attributing them to the formation of feathery crystals of silver, which became folded over, so entangling the rouge. The discussion showed, however, that although such an action might occur in some cases, the explanation could not be a general one, since the red patches will appear on an article polished by one worker, and not on an exactly similar object polished by another hand; moreover, similar patches are found on articles of solid silver which have not been plated.

The keenest interest was shown in the discussion by an audience which included a large number of practical silver platers, and the results are likely to be of great benefit to the industry, and to increase the interest of platers in the scientific study of electro-metallurgy, for which a department exists, well equipped for teaching and research, in the University of Sheffield.

NATIONAL UNION OF SCIENTIFIC WORKERS.

At the annual meeting of the council, held at King's College, W.C., on November 13, the retiring president, Dr. J. W. Evans, gave an address on "Research at the Universities," in the course of which he expressed dissatisfaction with the present attitude of the Department of Scientific and Industrial Research towards the scientific and technical faculties of our universities.

Since the publication of its first report, the Department appeared to have abandoned the more fruitful policy of encouraging to the utmost the research workers at the universities. The restrictive character of the present grants to individual workers at such institutions tended to divorce research from teaching. In his opinion this was a fundamental error, since the best results in research could only be achieved by those who devoted some time to teaching. Apparently, the Department looked to the universities and technical colleges to maintain a supply of competent research workers for the State-aided research associations rather than to undertake industrial research for themselves. He urged that training in research should play an important part in every university science course, and he embodied this in a resolution which was supported by Prof. F. Soddy, who stated that Prof. W. H. Perkin had applied this principle to the chemistry courses at Oxford University with very gratifying results. Prof. Soddy also stated that since the president had prepared his address, a complication had been brought about by a request from the War Office that the universities should undertake research connected with chemical warfare, both for offensive and defensive purposes; he was glad that the Union had decided to appoint a committee to investigate this matter.

Three resolutions were passed relating to the Department of Scientific and Industrial Research, the first of which condemned its policy in so far as, by establishing and financing Research Associations, it was handing over to the private use of "profit-seeking monopolies" valuable knowledge obtained at the expense of the whole community, and placing the Associations in a position to exploit the scientific workers of the country for their own benefit. Another resolution, which was also adopted unanimously, proposed the following scale of salaries, based on pre-war cost of living:—At commencement of professional career, £180 per annum; after five years' satisfactory service, £350 p.a.; for posts of professional standing, £800 p.a. These salaries to be raised proportionately to increased cost of living, and also in cases of exceptional ability, or where restrictive conditions in regard to the publication and patenting of results were imposed. Resolutions were also carried affirming that scientific workers in Government departments should receive status and remuneration not lower than that of officials of the highest class in the Civil Service; and that all possible steps should be taken to bring before the Government the necessity for rendering financial assistance to learned societies.

Prof. L. Bairstow, professor of aero-dynamics at the Imperial College, was elected president for the ensuing year, and Prof. F. Soddy, president of the research council.

PERSONALIA.

Sir William Pope and Prof. H. Louis have been elected honorary members of the Société de Chimie Industrielle. The roll of honorary members of this society also includes the following—MM. A. Carnot, J. Giliet, A. Haller, H. le Chatelier, L. Lindet, M. Prud'homme, E. Reumaux, P. Sabatier, E. Schneider, E. Solvay, and T. Schloesing.

Mr. C. S. Gibson, of Cambridge University, has been appointed to the vacant chair of chemistry at Guy's Hospital Medical School, University of London.

Dr. C. E. Guillaume, director of the International Bureau of Weights and Measures at Sèvres, has been awarded the Nobel Prize for physics for 1920.

Mr. G. Scott Robertson, of the East Anglian Institute of Agriculture at Chelmsford, has been appointed lecturer in agricultural chemistry in Queen's University, Belfast.

The degree of D.Sc. in physics has been conferred by the Senate of London University upon Mr. J. S. G. Thomas, head of the physical department of the South Metropolitan Gas Co.

Appointments to the Advisory Board of Industry and Science of the Union of South Africa include that of Mr. K. B. Quinan to represent chemical industries, and Dr. W. A. Caldecott and Prof. G. H. Stanley, representing metallurgy.

Through the initiative of Prof. P. A. Guye, of Geneva, a Ramsay Memorial Fellowship of £300 for three years has been founded by subscriptions received from the Swiss Government and by private donations. The first fellowship has been awarded to M. Etienne Roux of Vich (Vaud), who has begun work at Oxford under Prof. W. H. Perkin.

The gold medal of the Institution of Mining and Metallurgy has been awarded to Sir T. K. Rose for his contributions to metallurgical science, with special reference to the metallurgy of gold. The gold medal and premium of forty guineas of the Consolidated Goldfields of South Africa, Ltd., have been awarded to Mr. H. L. Sulman for his paper on "A Contribution to the Study of Froth Flotation."

The following appointments, etc., are announced from the United States:—Dr. G. H. Cartledge, to be professor of chemistry in the Johns Hopkins University; Dr. A. Matthes, pharmacist, to be professor of chemistry and pharmacy at the Washington University. Dr. E. F. Northrup has resigned the chair of chemistry at Princetown University, and Dr. H. E. Patten the post of research chemist to the U.S. Bureau of Chemistry, Agricultural Division; both of these have accepted appointments in the industry.

The following awards have been made by the President and Council of the Royal Society:—The Copley Medal to Mr. Horace T. Brown, for his work on the chemistry of carbohydrates, on the assimilation of atmospheric carbon dioxide by leaves, and on gaseous diffusion through small apertures; the Rumford Medal to Lord Rayleigh, for researches on the properties of gases at high vacua; the Davy Medal to Mr. C. T. Heycock, for his work in physical chemistry, especially on the composition and constitution of alloys; the Darwin Medal to Prof. R. H. Biffin, for his work on scientific principles applied to the breeding of plants; and the Hughes Medal to Prof. O. W. Richardson, for his work in experimental physics, especially thermionics. The Royal Medals have been awarded to Mr. Bateson (biology) and to Prof. G. H. Hardy (mathematics).

The death is announced of G. von Bunge, professor of physiological chemistry in the University of Basle.

NEWS AND NOTES.

UNITED STATES.

Lignite.—The Bureau of Mines is to undertake experiments in North Dakota on the briquetting of lignite. The cost of the investigation will be borne by private interests.

Carbon Tetrachloride as Fire-Extinguisher.—Owing to the occurrence of fatal accidents due to the use of carbon tetrachloride for extinguishing fires, the Bureau of Mines has investigated the decomposition products of this substance, and found that they contain phosgene, chlorine, and hydrogen chloride. Hence it is recommended that persons using it for this purpose in confined spaces should be protected with gas-masks or other device.—(*J. Franklin Inst., Oct.*, 1920.)

The Coal-Tar Industry in 1919.—The preliminary report on the progress of the American coal-tar industry during 1919 testifies to the success achieved in extending the industry and in readjusting it to peace conditions. This readjustment is clearly traceable in the heavy decline in output of products required mainly for military purposes, *e.g.*, the explosives intermediates, phenol and chloro-benzene, and the khaki-dye intermediates, meta-nitraniline and meta-tolylenediamine; and in the greatly increased production of benzoic acid, ortho- and para-toluidines, and other toluene derivatives, following the release of restrictions on the use of this parent substance.

Technical expansion is clearly discernible in the appearance of new colours and drugs, and more especially in the output of many new and more complicated intermediates. The increase in the number of intermediates, from approximately 140 in 1918 to 225 in 1919, included many substances of which the manufacture is comparatively difficult, the most striking example being, perhaps, the nine new sulphonic-acid derivatives of the naphthols and naphthylamines which became available during the year. There was also a notable augmentation in output of several of the older materials of this class, *e.g.*, of gamma acid, which was used mainly for the production of Oxamine Black and Diamine Fast Red F; and of H-acid, the bulk of which was probably employed for Direct Deep Black E W. In the anthracene series, the production of anthraquinone increased tenfold, and five anthraquinone derivatives were produced for the first time. As indicative of the future supply of raw material, it may be noted that an increase of 17 per cent. in the productive capacity of the by-product coke ovens is recorded. The position with regard to the availability of anthracene is, however, a cause of anxiety, although a solution of present difficulties is being sought both in modification of the tar-extraction processes and in the synthesis of anthracene or anthraquinone from readily available materials.

A very notable increase took place in the production of indigo, the amount of the home product being now well in advance of that imported during 1914. There was also a marked increase of output in the classes of basic, acid, and direct dyes, accompanied, however, by a fall in the output of mordant dyes and sulphur colours. Increased production of the better types of dyes, at the expense of cheaper varieties, improved the average quality, although the average price remained the same as in 1918.

The total production of dyes amounted to 63 million lb., representing an increase of about 8 per cent. compared with that in 1918, the value being about $67,000,000. In general, the recorded statistics of the industry during a year of transition justify American belief in the future of the industry.—(*Chem and Met. Eng., Oct.* 6, 1920.)

Organic Reagents.—The following organic compounds are now available in quantity and in a pure state for research purposes:—Amyl alcohol, isobutyl and normal propyl alcohols, ethyl aceto-acetate, and anhydrous ethyl and methyl acetates.

Barytes and Barium Products in 1918.—The total quantity of crude barytes marketed in the United States in 1918 was 155,368 short tons, valued at £208,981. This represented a decrease of 25 per cent. in quantity compared with 1917, which was due to the scarcity and high cost of labour rather than to a falling off in demand for barium products. Imports of barytes declined from 35,810 t. in 1913 to nil in 1918, the cause being the cessation of exports from Germany. The known and accessible deposits of barytes in the United States are smaller than those of Germany and more costly to mine; when trade is resumed it is probable that the German product will be cheaper than the American. The chief of the producing States are Georgia and Missouri. About one-third of the barytes was ground, refined and sold to manufacturers of paint, etc., nearly half was made into lithopone, and the rest was converted into chemical products. As regards foreign production, Germany has large deposits of high-grade barytes, much of which used to be exported, whilst England has fairly large deposits of barytes and workable deposits of witherite, but in the past has mainly relied upon importation. Deposits are found in many other countries, but exports from these sources to the United States have been small. Large deposits of barytes are reported at Bueveite, in eastern Cuba, and it is anticipated that they will prove an important new source.—(*U.S. Geol. Surv., June* 28, 1920.)

FRANCE.

Industrial Notes.—*Metallurgy.*—Thanks to the regular supply of German coke, metallurgical production remains satisfactory and able to meet present market requirements. The revocation of the decree issued in July, which prohibited the export of pig iron, will have an important effect on the trade balance of the country. The Comité des Forges is now considering the possibility of establishing uniform prices for metallurgical fuels so that all French steelworks may enjoy equal advantages. The first reconstructed blast furnace of the Cie. des Forges et Aciéries de la Marine et d'Homécourt, at Homécourt, has been blown in.

Coal and Water Power.—According to an estimate of the Ministry of Public Works, the power obtainable by harnessing the various watercourses of France, including the Alsatian portion of the Rhine, would be 3,230,000 h.-p., and if the power derived from waterfalls be added to this, a total of 9 million h.-p. would be obtained; of this quantity only 800,000 h.-p. was utilised prior to the war. If the iron and steel industry is to develop to the fullest extent, about 35 million tons of coal will be required in excess of the 65 million t. now consumed, of which some 41 million t. are produced in France. The destruction of the collieries in Northern France has entailed a loss of 20 million t., and hence the total new requirements will be 79 million t., which will be reduced to 50 million t. when the devastated collieries have been restored. Were the available water power to be utilised fully and efficiently, it is officially estimated that 42 million t. of coal would be saved, thus reducing the deficit to 8 million t.

Chemical Industry.—German competition becomes more marked every day, especially in regard to plastic materials and celluloid, which are now being offered on the French market at prices below the cost of production in France. The low price of German celluloid is due to the fact that the German chemists are using a camphor substitute which renders them independent of the Japanese product. The high price of natural perfumes in France has greatly curtailed their exportation and stimulated the home manufacture of synthetic perfumes, which are now competing successfully with the German, Belgian, and British products.

Petroleum.—Petroleum has been discovered at La Poix, near Clermont Ferrand, by the Société des Mines de Blanzy. This company is also prospecting for petroleum in the Ambutrix district.

Sugar.—The production of sugar in France is now 75 per cent. below the pre-war figures. Of the 210 sugar factories which existed in 1914, 170 were situated in the war zone and of these 135 were either partly or wholly destroyed. It is estimated that only 60 or 70 of the devastated factories will be rebuilt and that their output will be about 250,000 tons. If the 290,000 tons obtainable from non-devastated factories be added to this, the total sugar production will be about 540,000 t. The reconstruction of the sugar industry is retarded by the difficulty in obtaining plant, manufacturers being already fully occupied with orders, many of which are from cane-sugar manufacturers in the colonies. Other difficulties include the shortage of beets, the scarcity of labour, and the uncertainty of obtaining State assistance.

BRITISH INDIA.

The Indigo Industry.—The total area in India sown to indigo in 1920–21 is estimated at 181,400 acres (233,800 acres in 1919–20), the distribution being as follows:—Madras 54·3%, United Provinces 20%, Bihar and Orissa 14·7%, Punjab 9·3%, Bengal 1%, Bombay and Sind 0·6%. The total yield of dye (excluding that from Bombay and Sind, for which no estimate is available) is estimated at 24,600 cwt., or 4 per cent. less than the estimate for 1919–20, when the actual production reached 35,700 cwt. Weather conditions at sowing time were favourable and the general state of the crop is reported to be fair. The average yield per acre is expected to be a little higher than that of last year. The appended chart shows the estimated and actual acreage under indigo during the last ten years:—

CANADA.

Pulp and Paper Industry.—It is announced that the Provincial Government of Ontario has decided to erect a pulp and paper mill near Ontario. The reserves around Lake Nipigon, which cover an area of 8480 sq. miles, will be drawn upon for supplies of raw materials, and power will be obtained from the Government hydro-electric plant at Cameron Falls.—(*U.S. Com. Rep.*, *Oct.* 19, 1920.)

SOUTH AFRICA.

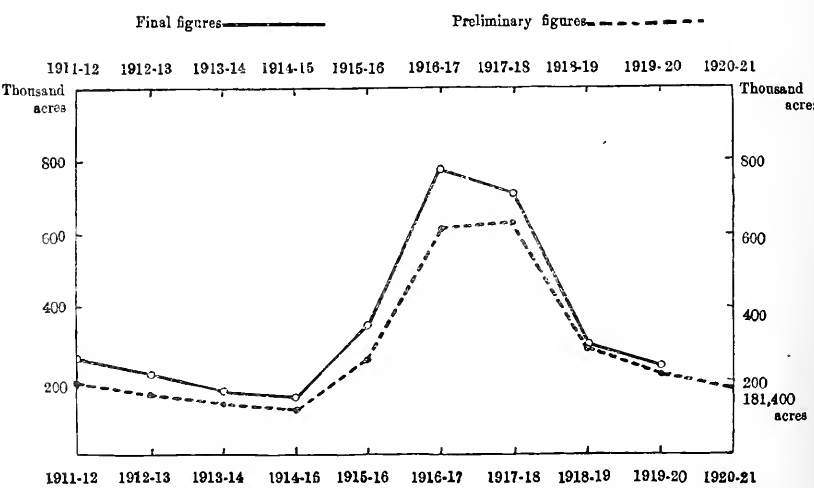
Industrial News Items.—On account of the increasing demand for industrial alcohol, another large distillery has been established at Durban.

In consequence of the prosperous condition of the glass industry in Durban, the acquisition of larger premises and more efficient plant is contemplated.

The manufacture of paper from spent wattle bark is under consideration, and the Department of Mines and Industries, Pretoria, is seeking information on the types of paper-making machinery most suitable for treating this material.—(*Official.*)

Development of Oil-shale Deposits.—Oil-shale has been known for some time past to occur in the Ermelo, Wakkerstroom, Utrecht, and Impendible districts (*cf.* J., 1918, 299 R), but it is only recently that anything has been done to work the deposits, some of which are now being developed by a private company. These deposits are situated on the northern slopes of the Castrol Nek Berg escarpment, which forms the boundary between Natal and the Transvaal, and the individual beds outcrop nearly horizontally along the contour lines of the mountain. The amount of oil-shale present is considered to be more than sufficient to justify the erection of a modern plant. As the working conditions are ideal, the cost of winning should not exceed 12s. per ton. Distillation costs are placed at the same figure, and on the assumption that the yield would be 25 galls. of crude oil per ton, the profit should be approximately 50s. per ton. Similar shales stretch intermittently over 200 miles along the outcrop, and should the company prove successful, a large industry will probably be developed.—(*S. African J. Ind.*, *Aug.*, 1920.)

TOTAL AREA OF INDIGO



—(*Indian Trade J.*, *Oct.* 22, 1920.)

GENERAL.

November Meeting of Council.—At the ordinary meeting of Council held on November 12, sympathy was expressed with the relatives of the late Mr. Leonard P. Wilson, chairman of the Birmingham Section. Sir John Brunner, Bart., was elected to fill the vacancy in the list of vice-presidents and was also nominated a member of the Government and Parliamentary Committee. Thirty-three new members were elected, 29 home, 1 colonial, and 3 foreign; there were 7 applicants for the special concession to young men under 25 years. In response to a request from the British Engineering Standards Association that the Society should nominate two representatives to serve on a sectional committee on engineering, the Council asked the Chemical Engineering Group to submit names for this purpose. The report of the Publications Committee stated that the separate sub-committees that formerly controlled the Transactions and Abstracts, the Review, and the Annual Reports had now been amalgamated with the Publications Committee; that new procedure had been adopted with a view to expediting business; and that 7 members, who are not members of the Council, had been co-opted. The President submitted a statement which he had prepared on behalf of the Federal Council for Pure and Applied Chemistry embodying suggestions to promote closer co-operation between this Society and the Chemical Society in the matter of chemical publications, in order thereby to effect greater economy and increased efficiency.

Chrome Ore and Chromium (1913—1919). (*Imperial Mineral Resources Bureau. Pp.* 29. *Price* 1*s*.)—Chrome iron ore (chromite) is used in chemical industry for the manufacture of potassium and sodium chromates and bichromates, which are employed for tanning, dyeing, and other purposes. The ore is used largely for making ferro-chromium, which enters into the composition of alloy steels used in the manufacture of armour plates, armour-piercing projectiles, guns, the jaws of rock-crushing machinery, etc. High-speed steels contain from 3 to 5 per cent. of the metal, and the yearly consumption in the United Kingdom for this purpose alone is estimated at about 1500 tons.

A variety of chromium-iron alloy, containing from 12—15 per cent. chromium is now extensively used as a stainless and rustless steel capable of resisting attack by fruit acids, sea air, and salt water; it is also used in making cutlery, motor car parts, etc., and its application is likely to extend. Another alloy, "stellite," consisting essentially of cobalt and chromium, usually with small amounts of various other metals, notably tungsten and molybdenum, has found application in high-speed cutting tools, and, being resistant to nitric acid, its use has been suggested as a platinum substitute. Chromite finds another important application in the manufacture of chromite bricks for metallurgical use as refractory material for lining furnaces. When used in this way a high degree of purity is less essential, since the serpentine (magnesium silicate) which is frequently present as a matrix of the chromite or scattered interstitially among the chromite grains, is itself fairly refractory and serves as a ready-made bond. It should be remarked, however, that high percentages of silica and iron oxide are not desired in chrome refractories.

Chromite is usually required in normal times to contain about 50 per cent. of chromic oxide. During the war the demand was so great that material containing as little as 25 per cent. found a market, and low-grade ore containing only 8 per cent. of chromite was concentrated in Canada and sold at a profit.

Prior to the war, Rhodesia with 57,000 and New Caledonia with 63,000 tons, together contributed from 80 to 90 per cent. of the world's production. Rhodesia, Canada, and New Caledonia each produced from 20,000 to 30,000 t. in 1918. India had a production of about 60,000 t., and the United States over 80,000 t. of ore, but this last was of low grade and produced at a cost which would probably prove unremunerative in normal times. Quite interesting was the production of a few hundred tons of ore in the Island of Unst, in the Shetlands.

The relative amounts of chromium ore used in the United Kingdom for the different purposes is not given, and is probably not the same in times of peace as in war times. It is noteworthy that in the United States, which is a large consumer, the following was the War Trade Board's estimate of that country's requirements for 1918:—For ferro-chrome, 52 per cent.; chemicals, 31 per cent.; refractories, 17 per cent.

The exports from the United Kingdom of the potassium salts of the metal fell from 55,846 cwt. in 1913 to 4334 cwt. in 1918, whilst those of the sodium salts rose from a total of 48,527 to 81,693 cwt.

Electro-deposited Iron.—A correspondent, writing in the *Engineer* of November 12, states that works are being erected in England for the manufacture of electrolytic-iron tubes. Although the process originated in this country (Eng. Pat. 21,974, Oct. 19, 1898), it was first worked on an industrial scale at Grenoble, where it is stated to have been very successful.

Development of the German Chemical Industry in 1919.—The following table, which has been compiled from official statistics, gives the number of registered chemical plants in Germany during 1919, the total number of employees, and the percentage decrease in the number of full-time workers compared with 1918:—

Section.	Plants.	Employees.	Full-time Workers. Decrease %
Berlin	2518	68,393	7·31
Breslau	1235	26,377	20·84
Hamburg	2043	72,859	27·89
Cologne	2562	121,537	31·85
Leipzig	2648	125,559	12·04
Mannheim	1325	50,615	12·80
Frankfort a. M.	1081	51,198	2·70
Nürnberg	1648	27,623	13·35
Totals	15,060	544,161	(avg.) 16·10

[The number of plants in the United Kingdom inspected under the Alkali, etc., Act in 1919 was 2228 (*cf.* J., 1920, 276 R), and the number of workers in the chemical industry during the first six months of 1920 was 265,000 (*cf.* J., 1920, 384 R).]

In 1918 there were 15,204 plants, and the decrease of 1·95 per cent. in 1919 is ascribed mainly to the loss of Alsace-Lorraine. The appended table gives statistics covering the period 1913—1919:—

Year.	No. of Plants.	No. of Full-time Workers.	Wages earned. mk.	Average yearly wage of full-time worker. mk.
1913	15,042	277,629	351,520,206	1266
1914	15,014	245,980	313,508,108	1274
1915	14,914	219,646	295,217,251	1344
1916	14,993	256,420	382,783,261	1493
1917	15,129	334,851	652,877,501	1950
1918	15,204	360,256	889,141,025	2468
1919	15,060	294,766	1,064,782,786	3612

—(*Z. angew. Chem., Oct.* 6, 1920.)

Synthetic Ammonia Works in Germany.—The synthetic ammonia works at Oppau and Leuna are to be transferred from the Badische Anilin- und Soda-fabrik and brought into a new company with a capital of 500 million marks, which will be held by the firms comprising the "Interessengemeinschaft."—(*Z. angew. Chem., Nov.* 12, 1920.)

The Swedish Iron Industry.—The Swedish iron and steel industry was very prosperous throughout the war, but depression set in after the armistice, the production of pig iron falling from 720,000 metric tons in 1918 to 528,000 tons in the following year, and the exports of pig iron from 181,000 to 81,000 tons during the same period. The production of various grades of iron and steel showed a corresponding decrease, and exports, which previously averaged 40,000 tons per annum, diminished to 18,000 tons in 1919. The market showed more activity at the beginning of 1920, rising exports indicating a better future.—(*Techn. Mod., Oct.*, 1920.)

Paper Production in Czecho-Slovakia.—According to the Czecho-Slovakian Ministry of Commerce and Industry, there are 234 paper and pulp mills in Czecho-Slovakia, of which 85 make special grades of paper, 54 cardboard, and 76 pulp (9 manufacture chemical pulp). In 1913 these mills supplied 44·4 per cent. of the paper produced in what was then the Austro-Hungarian Empire, and it is estimated that Czecho-Slovakia should, after supplying home needs, be able to export 50,000 metric tons of paper annually.

From April 15 to June 30, 1920, despite heavy domestic demands, with a consequent restriction of exports, paper held the first place among Czecho-Slovakian exports, with a value of 163 million Czecho-Slovakian crowns (1 crown was equivalent to about 2 U.S.A. cents during this period). In 1919 paper exports totalled 181,148,385 crowns, imports for the same year being valued at 75,468,706 crowns. During January, February, and March, 1920, 19,300 tons was exported, comprising 7100 tons of printings, 6500 tons of wrappings, 3400 tons of cardboard, and 437 tons of cigarette paper. Imports for this period amounted to 4450 tons.

As regards raw materials, Czecho-Slovakia has an abundant supply of wood, but the available supply of rags is insufficient to meet the demand. Rosin and sulphur are imported, the latter mainly from Spain, Serbia, Greece, and Italy. The further expansion of the Czecho-Slovak paper industry is considerably hampered by the shortage of coal.—(*U.S. Com. Rep., Sept.* 9, 1920.)

The Potash Industry in Poland.—It is highly probable that when the frontiers of new Poland are definitely determined, the salt and potash-bearing districts of Steppenitz and Kalusz in eastern Galicia will be allotted to that country. Hitherto potash has only been mined at Kalusz, and expert opinion is anything but unanimous in regard to the industrial value of the occurrence. In 1910 a private company put down two bore-holes with unsatisfactory results, and it is very unlikely that the district will be subjected to the thorough geological examination which it deserves. The salt deposits at Kalusz contain chlorides and sulphates of potassium and magnesium, in the upper portion of which sylvinite and kainite are present. The kainite has a thickness of from 10 to 12 metres, and in places 16 metres; its composition is as follows:—

	1st Stratum. Per cent.	2nd Stratum Per cent.
Potassium sulphate	20.23	19 52
Potassium magnesium sulphate	14 45	15 09
Sodium chloride	27.24	27.53
Magnesium chloride	11 03	10.64
Calcium sulphate, water, and insoluble	26 95	27.22

There are, or have been, four distinct layers of potassium salts. The uppermost sylvinite layer is on the average about 2 metres thick, and its content of potassium chloride varies between 25 and 60 per cent.; the second layer, 1·5 m. thick, contains about 12 per cent. potassium chloride, and occurs 30 m. below the kainite deposit. A third deposit of sylvinite containing 42 per cent. potassium chloride, constituted of two strata, and of a total thickness of 12·5 m., was found at a depth of 80 m. below the principal deposit. No figures of production are available after 1912; in that year 20,566 metric tons was produced, compared with 16,500 in 1910, 8300 in 1907, 17,360 in 1905, and 6899 t. in 1900. It is improbable that the output of potash from eastern Galicia will be of any consequence in competitive foreign markets, and the output from the mines at Kalusz, which are to a great extent exhausted, can have only local significance.—(*Chem. Ind., Oct.* 6, 1920).

Discovery of Pyrites in Norway.—Rich deposits of pyrites have been found in Kongsvold Hjerkinn in West Norway, which extend over 1500 metres and are estimated to contain about 8 million tons of good ore.—(*Z. angew. Chem., Nov.* 5, 1920.)

Discovery of Cinnabar in Chile.—H.M. Consul at Antofagasta reports the discovery of cinnabar in the Aguas Blancas district, about 90 km. from Antofagasta and adjacent to the railway. Claims have been taken out over an area of one square mile, and mining experts are making investigations.—(*Official.*)

The Mineral Output of Mexico.—According to the "Iniciativa de la Ley de Ingresos" for 1920, the mineral production of Mexico for the period January—September in 1917, 1918, and 1919, was as follows:—

Metals.	1917. metric tons	1918. metric tons	1919. metric tons
Gold	23·54	25.31	22.94
Silver	1306·99	1944·51	1949·67
Copper	50,985 92	70,223·45	50,893·61
Lead	64,124·75	98,837·15	67,378·35
Zinc	14,757·33	20,699·00	8665·41
Antimooy	2646·54	3268·55	627·70
Tin	9·21	13·54	2·12
Tungsten	187·61	149·49	29·29
Molybdenum	—	27·37	2·36
Manganese	73·39	2878·38	2849·98
Mercury	33·13	163·60	113·87
Arsenic	1284·82	1881·01	2188·33
Amorphous Graphite	420·05	6190·82	5011·62

—(*U.S. Com. Rep., Aug.* 20, 1920.)

Proposed State Chemical Works in Uruguay.—A Bill has been submitted to the Uruguayan National Administrative Council with the object of extending the activities of the Institute of Industrial Chemistry to the production of chemicals required in peace time and indispensable for war purposes (*cf.* J., 1919, 114 R). The proposals include the erection of a sulphuric acid works with a capacity of 25 metric tons a day, as it is thought that 20 tons a day will be required when the (bone) superphosphate industry is fully developed. Concerning the large deposits of iron pyrites said to occur in various areas, sufficient sulphur for a year's production of acid will be stocked until more definite information is available. At present the daily production of sulphuric acid amounts to 4 t., and largely suffices for requirements. Other works to be established include:—A nitric-acid plant, with a daily capacity of 10—15 t.; a works for the production of crude benzol, xylene, and phenol; an electrolytic caustic soda plant with a capacity of 1 t. a day (one-third of the requirements) and yielding chlorine and hydrogen as by-products; a factory to produce 5 t. of sulphuric ether a day, a quantity far in excess of the home consumption; and works for the production of gunpowder and explosives, acetic acid, glycerin, and for the preparation of cotton. The total cost of the various works is estimated at £463,000 (peso = 4s. 3d.), and five foreign technical experts will be engaged for three years at a total cost of £5812 per annum. The money required will be provided by an import tax of 1 per cent. *ad valorem* on all articles not of prime necessity, excluding the plant and materials required for the different factories, which will be admitted duty free. In this way some £74,375 would be raised annually and utilised for developing the scheme.—(*Bd. of Comm. J., Nov.* 19, 1920.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Foreign Imports.

Sir R. Horne stated, in reply to several questions, that the effect of exchange fluctuations on the dyestuff, glass, gas mantle, and other industries was being examined, and the introduction of a Bill to remedy the situation was under consideration. There was no reason to suppose that French textile manufacturers were placed in any unduly favourable position in respect of dyestuff supplies from Germany. The total quantity of synthetic dyestuffs and intermediate products imported into the United Kingdom from Holland, Belgium and Germany in the first nine months of the year was 2986 tons. It was assumed that dyestuffs imported from Belgium and Holland were of German origin, but in the case of Swiss exports it was not possible to estimate the proportion derived from Germany. The Government had no information as to the extent to which German manufacturers were obtaining monazite sand from India for the manufacture of gas mantles. The value of the imports of glass and glass manufactures from British Possessions and foreign countries for the first six months of 1920 was £4,354,704, which compared with imports from foreign countries worth £3,488,983 during the year 1913, but the depreciated value of currency at the present time should be taken into account in comparing these values. —(Nov. 8.)

Employment in the Glass Industry.

Replying to Capt. Terrell, Dr. Macnamara gave the number of persons employed in the glass trade as 40,000 in July, 1914, 39,100 in July, 1919, and 45,400 at July 31, 1920.—(Nov. 8.)

Miners' Strike.

In a written answer to Sir J. Cory, Mr. Bridgeman estimated the loss in coal output through the coal strike at 13,000,000 to 15,000,000 tons, and the loss in wages at £14,000,000 to £15,000,000. The total number of unemployed receiving out-of-work pay rose by about 270,000 between October 8 and November 4, and it was probable that the total increase in the number of unemployed (excluding those employed at the coal mines) was at least 350,000.—(Nov. 8.)

Chemical and Colour Supplies.

Sir P. Lloyd-Graeme informed Sir W. Barton that no useful purpose would be served by setting up a commission to examine the whole question of the internal production and supply of chemicals and colours and of the extent to which we are still dependent on foreign supplies for the finer colours and chemicals required for our export trade in textiles, as the essential facts of the situation were well known to the Government.—(Nov. 9.)

British Dyestuffs Corporation, Ltd.

In answer to Sir W. Barton, Sir P. Lloyd-Greame said that the British Dyestuffs Corporation was not, and would not be for some time, able to produce the whole range of dyestuffs required in this country; in view of the obstacles which had to be overcome, there was no ground for dissatisfaction with the progress made. Apart from two representatives on the board of directors, the Government had no control beyond that of other shareholders over the internal management of the company.—(Nov. 9.)

The Prime Minister informed Mr. Doyle that the prospectus issued by the British Dyestuffs Corporation in July, 1919, quoted a statement made by the President of the Board of Trade to the effect that the importation of dyestuffs, except under licence, was prohibited by Proclamation on February 24, 1919; this Proclamation, however, was rendered void by the Sankey judgment. There was therefore at present no restriction on importation, and the imports had increased during the current year. The Government fully recognised its obligations and would introduce suitable legislation at the earliest possible moment, but no promise could be given to deal with the matter during the present session. In reply to further questions, Mr. Lloyd George said that the Government might reconsider its decision if a non-contentious measure could be introduced; in any case, it was proposed to deal with this matter at the earliest possible moment next Session.—(Nov. 11.)

Electricity Schemes.

Answering Mr. Seddon, Mr. A. Neal stated that the Electricity Commissioners had provisionally determined electricity districts for the chief industrial areas of England and Wales, but, except in the case of the Severn district, no scheme had yet been submitted, as the time fixed for that purpose had not expired, save in respect of the Mid-Lancashire district. Inquiries would be held as soon as schemes were submitted. A large number of loans for electricity works had been sanctioned, and these works were being actively proceeded with in various places.—(Nov. 11.)

Chemical Warfare.

The Prime Minister stated, in reply to several questions, that the subject of chemical warfare had been under consideration by the Cabinet during the past year, and that it would be raised at the Council of the League of Nations. As other countries had been developing this method of warfare, it was decided that our fighting services should continue their researches and experiments, pending a pronouncement on the subject by the League. This country could take no unnecessary risks; there were other powerful countries not in the League, and in one of these experiments were certainly going on at the present time.—(Nov. 15.)

Parys Copper Mine, Anglesey.

Replying to Sir O. Thomas, Sir P. Lloyd-Greame said that the Parys copper mine, Anglesey, had been frequently examined by experts, but that although wide bodies of low-grade ore had been found, the results obtained did not warrant further expenditure for pumping out the water below adit level, and for sampling the lodes at the bottom; consequently the Government was not prepared to take action under the Mines Act, 1920.—(Nov. 17.)

Prices of Imported Chemicals.

In reply to Capt. Terrell, Sir P. Lloyd-Greame inserted in the Official Report a statistical statement giving the average prices of certain imported articles for the periods Jan.-Sept., 1913, and Jan.-Sept., 1920, which included those of the following chemical commodities:—

Article.		Jan.-Sept., 1920. Value per unit. £	Inc. in value compared with 1913 %
Chemicals:—			
Alizarin	cwt	48·2	978·3
Cream of tartar	"	12·2	194·0
Ingido, synthetic	"	24·0	640·7
Indigo, natural	"	58·0	332·8
Other sorts	"	39·7	631·1
Petroleum:—			
Motor spirit	1000 galls.	109·6	189·2
Fuel oil	" "	34·9	631·1
Basic slag	ton	6·51	233·8
Barytes, gound	cwt.	0·474	246·0
Cement, calcareous	ton	7·41	461·4

—(Nov. 18.)

REPORTS.

REPORT ON THE TRADE OF THE DOMINION OF NEW ZEALAND. *By* R. W. DALTON, *H.M. Trade Commissioner in New Zealand. Pp.* 44. *H.M. Stationery Office*, 1920. [*Cmd.* 1008. 4*d.*]

The present prosperity of New Zealand is due very largely to the conditions created by the war, and although it is foreseen that these conditions will not last indefinitely, it seems probable that the country will have time to readjust itself before a slump occurs. For the last few years exports from the Dominion have greatly exceeded imports, and the accumulated wealth has put the country in a strong purchasing position. The exports have risen in value from 23 million sterling in 1913 up to 52½ million in 1919, the increase being largely due to high prices and the stimulus to production caused by the Imperial Government's purchase of the whole of the main products. The import returns are divided into two clauses:—(1) Those in which United Kingdom manufacturers can compete. (2) Those which for natural causes cannot be produced in Britain. In 1919, of a total import valued at £30,671,698, about 80 per cent. consisted of goods in the competitive class, and it has been in this class that the bulk of recent increases has taken place.

The import trade held by the United Kingdom since 1914 has fallen from 67 to 45 per cent. of the total, and during the same period American trade has increased from 11 to 27 per cent. There still remains a distinct preference for goods of English manufacture, and if the home producers will take active steps, especially in the direction of more personal touch with the markets and of sending up-to-date catalogues and literature, they should be able to recover their pre-war position. Manufacturers should also make themselves familiar with the various systems of shipping adopted by the buying houses, and should realise the loyalty that has been shown by their agents during the very difficult period of the war. The detailed appendix of imports by classes shows that the British exporter has been gaining ground in the supply of photographic materials (sensitised surfaces and cameras).

Public utility schemes, which have been in abeyance since 1914, will be pursued extensively during the next few years; they should offer good opportunities to British firms. The important Government scheme of electrical development in the North Island is to be proceeded with almost immediately; and much-needed improvements in transport are to be taken in hand.

The following table shows the comparative values of imported drugs, chemicals, and druggists' wares in the years 1918 and 1919:—

	1918.			1919.		
Origin.	Total. £	Competitive %	Non-Competitive %	Total. £	Competitive %	Non-Competitive %
U.K.	415,788	98	2	488,376	99	1
Australia	181,568	93	7	201,948	93	7
Canada	4688	52	48	19,703	20	80
U.S.	243,575	64	36	280,075	78	22
Japan	82,764	31	69	47,243	15	85
Other C'tries	65,790	57	43	61,945	72	28
Total	994,173	80	20	1,099,290	86	14

Dyes are included in the competitive class of imports, and the following details refer to them:—

1918. Total, £49.284. U.K. 57%, U.S.A. 20%, Australia 11%.
1919. Total, £66,177. U.K. 50%, U.S.A. 32%, Australia 11%.

The total value of fertilisers imported during 1919 was £319,620, divided almost equally between phosphates from Egypt and superphosphates from Australia.

REPORT ON THE ECONOMIC AND INDUSTRIAL SITUATION OF THE ARGENTINE REPUBLIC IN 1919. *By* H. O. CHALKLEY, *Commercial Secretary to H.M. Legation, Buenos Ayres. Pp.* 62. *London : H.M. Stationery Office*, 1920. (*Cmd.* 895. 6*d.*)

Argentina still retains its essentially agricultural character, for its industrial development has been retarded by lack of coal, iron, and water power, by scarcity of skilled labour, and by the remunerative returns afforded by capital invested in land. Nevertheless, industrial enterprise is by no means negligible; meat refrigeration, flour milling, sugar and wine production, dairying, brewing, lumbering, and the production of quebracho extract are all of considerable importance. The last-named industry, the manufacture of glassware, soap, candles, vegetable oils, chemicals, and firebrick made notable progress during the war. Statistical returns show that the sugar industry has fluctuated considerably during recent years; in 1919 the estimated output was 261,000 tons, which compares with 84,406 t. in 1916, 335,067 t. in 1914, and 146,303 t. in 1912. The wine industry, which is centred in the provinces of Mendoza and San Juan, produces from 450 to 500 million litres annually. Minerals are widely distributed, but mainly in sparsely populated districts, and only wolfram, mica, and copper are, or have recently been, worked. Petroleum is known to occur in the districts of Jujuy, Salta, Mendoza, and Neuquen; the production from the oilfields of Comodoro Rivadavia, in Chubut, is stated to be about 200,000 cb. m. per annum.

Capital invested in Argentine undertakings is distributed as follows:—Argentine, £64,489,393 in railways and commerce and £26,482,943 in industry; British, £272,249,601 and £16,190,948; other foreign capital, £23,134,045 and £3,090,747 respectively. The effect of the war was to suspend the influx of foreign capital and to retard public utility schemes, but otherwise the country experienced great prosperity, the foreign debt being largely liquidated and a very favourable trade balance built up. Owing to labour unrest and other causes, economic conditions were not satisfactory in the first half of 1919, but the situation improved in the second half, and the year 1920 opened with very satisfactory prospects.

The Argentine import trade is valued at about £100,000,000, 31 per cent. of which was held by the United Kingdom before the war, and 15 per cent. by the United States; in fact, of all the Central and South American markets, that of Argentina is by far the most valuable to British manufacturers. At the end of 1919 the share of the United States had risen to 33 per cent., and that of the United Kingdom had fallen to 20 per cent. Spain has 8 per cent., and Japan 6 per cent. of the import trade, other European countries scarcely competing at all. German manufacturers of industrial machinery, hardware, heavy chemicals, and coal-tar dyes are offering their wares at prices below those now obtaining, but fixed dates for delivery are not guaranteed. British trade is enjoying a preference of about 30 per cent. owing to the depreciated value of sterling in Argentina, an advantage of little avail if British firms cannot execute orders within reasonable periods and at competitive prices. Detailed reports may be consulted at the Department of Overseas Trade that should be valuable to manufacturers of, *inter alia*, coal-tar dyes, blacking, candles, cement, chemicals and drugs, plate and sheet glass, ink, paints, colours and varnishes, sheep dips, and tinplate.

As the Argentine export trade consists mainly of raw materials of prime necessity (animal, agricultural, and forestal products), it experienced but little inconvenience during the war, and new markets were found in Japan and South Africa. The increased value of the exports during the war period (about £100,000,000 in 1914, £114,000,000 in 1916, and £160,000,000 in 1918) was due more to high prices than to increased quantities. (*Cf.* J., 1920, 120 R, 221 R, 249 R.)

LEGAL INTELLIGENCE.

DONATIONS FOR SCIENTIFIC RESEARCH. *W. Wynn Evans v. Brunner, Mond and Co., Ltd.*

The motion to restrain the directors of Brunner, Mond and Co. from carrying out a resolution to give £100,000 for scientific education and research was heard before Mr. Justice Eve in the Chancery Court on November 17, and decided in favour of the company (*cf.* J., 1920, 361 R).

Plaintiff's contention was that the resolution was *ultra vires*. If it had been proposed to confine the expenditure to chemical science it would have been a different matter. If the resolution were justified it would be allowable to promote anything of political expediency for the benefit of the community generally. Counsel for the defence read an affidavit from Mr. Roscoe Brunner, chairman, stating that the operations of the company were closely bound up with the advancement of science, and there was the greatest difficulty in finding men sufficiently equipped in pure science to undertake research work. The proposed expenditure would be as profitable to the company as any that could be undertaken. Counsel also read a letter to the Press by Lord Moulton strongly advocating the expenditure, and affidavits by all the directors justifying the proposal. The reason they did not specify chemical science was that they did not want men trained with a narrow, specialised knowledge. They wanted men with wide scientific grounding, for the company would give them all the specialised knowledge they required. The company also at times sought the help of university laboratories in the solution of problems.

His Lordship, in giving judgment, said defendants had established that the resolution was not too general, and that the expenditure would be likely to lead to the direct advantage of the company; therefore he refused to make any order.

DISALLOWANCE CLAIM AGAINST USELESS PLANT. *Keeling and Walker, Ltd. v. The Sturtevant Engineering Co., Ltd.*

In the High Court, on November 13, Messrs. Keeling and Walker, of Stoke-on-Trent, brought an action against the Sturtevant Engineering Co., of London, claiming damages in respect of a zinc-oxide recovery plant supplied by the defendants and alleged to be useless.

On behalf of the plaintiffs it was stated that the defendants agreed to supply and erect, at plaintiffs' works, a plant claimed to be the best on the market and to recover oxide fumes at the rate of 250 lb. per hour. The plant was an utter failure and was accordingly removed. Plaintiffs claimed the return of £2187 paid on account and £5040 for loss of profits. The defence contended that the terms of the contract precluded any claim for damages, and that defendants would have made good any defects in the plant if they had been given an opportunity to do so.

In giving judgment, the Official Referee said that the plant was to be regarded as goods supplied and not as real property; therefore the transaction came under the provisions of the Sale of Goods Act and the conditions of the contract. Judgment was given for the defendants.

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for November 11 and 18.*)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W. 1, from firms, agents or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
Canada ..	Galvanised and black sheets, tin plate, firebrick, fireclay, glue ..	643
" ..	Heavy chemicals	*
New Zealand ..	Paint, oil, druggists' sundries ..	646
Belgium ..	Paper, cardboard	651
France.. ..	Chemicals, raw materials for manufacture of soap and perfumery ..	684
Hungary ..	Iron, steel, fertilisers	685
Rumania ..	Hides, skins, quebracho, dyes, fish oil, bone oil, egg and blood albumin	657
Spain	Ammonium sulphate, oil-seeds, oil, grease	658
Sweden ..	Acetone, methyl and amyl alcohols, pure alcohol, chemicals for paper factories	688
Switzerland ..	Chemicals, drugs	660
" ..	Pharmaceutical chemicals	692
Japan	Paper, pulp, chemicals, dyes ..	694
Persia	Glass, crockery	695
Philippine Is...	Paint, oil, rolling mill products ..	703
Peru	Cement, leather	667
United States..	Galalith substitute, horn, ivory nuts	666
" ..	Chemicals, vegetable oils	697
" ..	Paper of all kinds	699

* The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

MARKET SOUGHT.—A Canadian company invites inquiries for 5000 tons of edible corn starch.

Inquiries to the Canadian Government Trade Commissioner.

TARIFF. CUSTOMS. EXCISE.

Austria.—Customs duties when paid in bank notes have to paid at 33⅓ times the rate prescribed by the tariff, as from October 26.

Belgium.—Among the articles under the control of the Ministry of Economic Affairs that require export licences are semi-manufactured steel, flasks and cylinders for compressed and liquefied gases, bottles, cement, sodium carbonate, undressed hides and skins, fertilisers, oil-seeds, precious metals, metal scrap, newsprint paper, natural phosphate, coal-tar distillates, coal tar, pitch, pyrites cinder, and basic slag.

Import licences are required for ether and German dyes.

Chile.—It is proposed to increase by 60 per cent. the customs duty on beverages and perfumery. The proposed increase on all other goods is 30 per cent., except on condensed milk, edible oils, lard, cocoa, sugar, petrol, and mineral illuminating oil on which the duty remains unchanged.

Crimea.—The export of drugs and scientific instruments is prohibited except under licence.

Egypt.—The import tariff valuations for iron and steel manufactures are given in the issue for November 11. The valuations have effect from October 16 to December 15, or until denunciation.

France.—The customs duties on compound medicines, not specified in the tariff, have been increased.

France and Algeria.—The export prohibition of and the export duty on spirits of turpentine are postponed until March 1, 1921.

French Equatorial Africa.—The customs duty on spirits (distilled beverages) has been increased to 800 francs per hectolitre of pure alcohol.

Latvia.—Among the articles considered to be of prime importance, the import of which will be assisted by the Government, are salt, drugs, metals, oils, naphtha, sole leather, belting, and chemicals.

Mexico.—Import duties have been modified on condensed milk, opium, alcoholic beverages, cocaine, heroin, morphine, mineral waters, vinegar, soap.

Export duty amendments affect lard, coconuts, copra, certain woods, platinum, sodium chloride.

Montserrat.—The import of cotton seed is prohibited as from September 23.

Norway.—Completely dried or well-salted hides and skins may be imported subject to inspection by the municipal authority.

Portugal.—The complete text of the export regulations and surtaxes is given in the issue for Nov. 11.

Among the articles subject to export surtaxes are alcohol, chemicals, medicines, pharmaceutical specialties, chocolate, coal tar, rosin, copper precipitate, glue, gum resin, hides, skins, horns, kaolin, medicinal plants, metals, metal scrap, molasses, oil-cake, certain oils, ores, paper, rubber, balata, gutta-percha, copper sulphate, tartar, tartaric acid, tin, turpentine, vegetable fibres, vinegar, wax, and wool.

Rumania.—As from October 6, the export and import duties have been modified, but in some cases, *e.g.*, the duty on vegetable oils, the former remain unchanged.

Sarawak.—The import duty has been amended on alcoholic beverages, kerosene, salt, etc.

Export duties are now leviable at the rates in force prior to February 26.

Spain.—Cement may be imported duty free as from December 1.

Sweden.—Export prohibitions have been withdrawn from certain oils and fatty acids, bees' wax, vegetable wax, oil varnish, soft soap, Turkey-red oil, hydrochloric acid, nitric acid, boric acid, citric acid, tartaric acid, tartrates, iodine, iodides, oxides of baryta, bleaching powder, calcium sulphate, potassium and ammonium nitrates, acetates of iron and chromium, arsenites of potash and soda, thorium nitrate, tungstic acid, salts of zinc, copper, nickel and lead, mercury, silver nitrate, chlorides of sulphur and phosphorus, chromium sulphate, red lead, cobalt oxide, and colours.

Trinidad.—The Customs Ordinance came into force on Nov. 6. British foodstuffs, cattle foods, cotton, and machinery are admitted duty free.

Turkey.—Export prohibitions have been removed from zinc, lead, iron and tin.

GOVERNMENT ORDERS AND NOTICES.

Orders Cancelled.—The Coal Emergency Order, the Lighting, Heating and Power Emergency Order, the Gas and Coal Emergency Order, and the Coal and Fuel Emergency Order, all of 1920, have been revoked as from November 4.

Prohibited Exports.—Suet has been added to the list of prohibited exports, and milk (sweetened, condensed, or preserved), and fruit pulp have been removed from it.

Licences for the export of the following goods, granted prior to August, 1920, have been revoked as from November 18, but applications may be made for new licences:—Cocaine and its salts and preparations; opium and its preparations; opium alkaloids and their salts and preparations.

An open general licence has been issued for the export of soap, ointment, tooth powder, and disinfectant (powder or liquid) not containing more than 20 per cent. of coal-tar derivatives.

TRADE NOTES.

Canada's Exports and Imports.—For the twelve months ending July, 1920, the value of Canadian exports was $1,253,191,735, and that of the imports was $1,264,463,537, of which $24,250,000 represented chemicals.

St. Vincent in 1918-19.—All the Sea Island cotton produced in this colony since 1917 has been bought by the local Government on behalf of the Imperial Government, and the ready and remunerative market thus provided, together with successful control of the cotton-stainer pest, has led to the planting of 4583 acres, which compares with 3458 acres planted in 1917-18. The Government cotton ginnery and granary continued to buy seed cotton and maize on profit-sharing terms, a total of 386,431 lb. of Sea Island and 117,588 lb. of Marie Galante seed cotton having been purchased. The sugar and syrup industries, though small, have been well maintained, and the groundnut crop is becoming more important. The value of the imports was £134,699, as against £122,114 in 1917; the percentage proportions furnished by the different countries in 1918 and 1917 were, respectively:—United Kingdom, 39.4, 29.9; United States, 28.7, 31.5; and Canada, 20.3, 22.9. The exports were valued at £195,205 (£99,734 in 1917), and included:—Arrowroot, £95,828; cotton, £60,922; cocoa, £6021; muscovado sugar, £3296; syrup and molasses, £4796; and cassava starch, £3821. Of the total exports, the United Kingdom took produce worth £144,619, British West Indies £29,171, Canada £11,751, and the United States £4122.—(*Col. Rep.-Ann., No.* 1037, *July*, 1920.)

FOREIGN.

The Dutch Colour Trade.—The condition of the lake, varnish and colour industry is very favourable and the export trade is satisfactory, owing more particularly to activity in the building trade in areas devastated by the war. The imports of colours and lakes in metric tons during January-June, 1920, were as follows, the chief source being given in parenthesis:—White lead 573 (Germany 276, America 85); zinc white 1969 (Germany 1636); red lead 525; ochre 565 (France 199, Germany 192); other colours 1247; coal-tar colours 581 (Germany 456); ground colours 278; lakes 52 (Germany 35); dryers and varnish 102 (England 6, United States 26). The exports for the same period and their destinations were:—White lead 19; zinc white 1062 (Belgium 494, France 365); lithopone 3566 (Belgium 2793); ground colours 683; red lead 105; other colours 1183; coal-tar colours 44; dryers and varnish 110 tons.—(*Rev. Prod. Chim., Oct.* 15, 1920.)

Foreign Company News.—*France.*—Among the new companies that have recently been established are:—"Les Distilleries d'Alsace," with a capital of 5,000,000 fr., to exploit and treat wood and cellulose materials, more particularly for the production of ethyl alcohol, etc., by hydrolysis; "Société pour l'Industrie des Parfums Chimiques" (capital 1,000,000 fr.) for the manufacture of synthetic and natural perfumes, particularly by the processes of M. P. Otto; "Cie. Générale des Graisses Alimentaires" (capital 12,000,000 fr.) for the preparation of oils, fats, and derivatives.

The capital of the "Manufacture des Glaces et Produits Chimiques de Saint-Gobain, Chauny et Cirey" is to be raised from 60 to 120 million francs, to provide for further expansion. The company has interests in the following undertakings:—Carl Tiesch in Silesia; Enghels in Bohemia; Bichoux Lambotte in Germany; Glaceries Néerlandaises in Holland; and La Cristalleria Espanola in Spain. The company also owns branch glass-works in France, Germany (Mannheim and Stolberg), Italy

(Pisa), Belgium (Franière), and 21 chemical works in France, as well as deposits of pyrites and phosphates in North Africa, salt deposits at Ars-sur-Meurthe, and deposits of pyrites in Spain.—(*Rev. Prod. Chim., Oct.* 15, 1920.)

United States.—It is announced that the Pittsburgh Plate Glass Co. is about to amalgamate with the Columbia Chemical Co. (capital $5,966,000), and the Patton-Pitcairn Co. (capital $2,317,500), in pursuance of its policy to acquire interests in or control of plants producing materials which it handles or desires to handle. The consolidated company will have a capital of $37,500,000, of which $30,734,000 will be issued immediately.—(*Oil, Paint and Drug Rep., Sept.* 27, 1920.)

Belgium.—The "Société Générale des Minerais," of Liége, has increased its capital from 10 to 25 million francs.

Germany.—An amalgamation has been effected between the Chemische Fabrik Rhenania, in Aachen, and the Verein Chemischer Fabriken, in Mannheim. The title of the new company is "Rhenania, Verein Chemischer Fabriken, Aachen-Mannheim," and its headquarters will be located at Aachen.—(*Z. angew. Chem., Oct.* 22, 1920.)

COMPANY NEWS.

MAGADI SODA CO, LTD.

The ninth ordinary general meeting was held on November 17 in London, Mr. S. Samuel presiding.

The chairman referred to the debit balance of £96,832 in respect of the year ended December 31 last, and stated that the total amount now provisionally put to trading loss was £197,731, the largest items in which sum had been interest on loans and debentures, and loss on exchange. Production at Magadi had been delayed owing to non-delivery of machinery due to strikes in this country, but it had definitely begun on November 11 last. An engineer's report spoke most favourably of the new plant. The mechanical appliances for getting the soda out of the lake were all in working order and, if required, 1600 tons per day could be won with the present outfit. Many inquiries had been received for soda ash, and forward sales had been made. Soda products still commanded high prices, and new markets were continually being opened up. The company's plant in Calcutta had been producing caustic soda of the best quality that had found a ready sale, and it was proposed to extend it. Mr. Samuel added that he hoped that the company would be able to finance the business without raising further capital; it possessed unlimited supplies of natural soda, and if the machinery came up to expectations, its future should be secure.

Explosives Trades, Ltd.—At an extra-ordinary meeting held on November 24 it was resolved to change the name of the company to that of "Nobel Industries, Limited."

Courtaulds, Ltd.—The directors have decided to place a value of £7,806,087 upon the company's American assets, to capitalise this sum together with the existing capital reserve of £193,913, and to distribute a bonus of two shares in respect of each share now held.

British Oxygen Co., Ltd.—The report for the year ended March 31, 1920, states that after deducting £37,500 for the final dividend of 2s. per share and a bonus of 6d. per share (making 17½ per cent. for the year, free of tax), there remains a balance of £132,044. It is proposed to alter the memorandum of association in order to effect the purchase of shares in the Sparklets and General Manufacturing Co.

REVIEWS.

Plantation Rubber and the Testing of Rubber. *By* G. Stafford Whitby. *Pp. xvi*+559. *With* 8 *plates and* 48 *diagrams.* (*London: Longmans, Green and Co.* 1920.) *Price* 28*s. net.*

This volume forms one of the series of Monographs on Industrial Chemistry edited by Sir Edward Thorpe, and if the standard of the series can be judged by the present publication, it may be confidently asserted that these monographs will occupy a prominent position in technical chemical literature. Dr. Whitby, now assistant professor at McGill University, Montreal, was for a number of years chief chemist to one of the more important groups of plantation rubber producers in Malaya, and he is therefore particularly well qualified to deal with the production, chemistry and general technology of the rubber industry's raw material, especially if we bear in mind the fact that at the present time cultivated rubber forms some 90 per cent. of the total output. The author, it may be said at once, has made the best use of his great experience, and has handled the subject not only with skilful discrimination, but also in a sober, scholarly and scientific fashion.

During the past ten years great strides have been made in the methods of growing and preparing plantation rubber, and many researches, some of a fundamental character, some dealing with technological or purely scientific detail, have been published, and one aim of the author has obviously been to collate and set forth the mass of this work in an orderly and comprehensive manner. The work, however, is by no means a mere compilation; it is a critical review illuminated by the author's own experience and knowledge, and embodies, in addition, an account of much original research carried out by him. The first part of the work—The Preparation of Plantation Rubber—deals with the rubber tree and the extraction, properties and coagulation of latex; with the resin and protein; with the various factory operations employed on the plantation in the production of the different crepe, sheet and other grades; and finally with the important and interesting subjects of maturation and variation. This (first) part of the volume forms substantially a technical and scientific handbook of the plantation rubber industry. Although many other works have dealt with the same material, none is so up-to-date, concise and comprehensive as the one under review. In the second part of his book, on "The Testing of Rubber," Dr. Whitby breaks new ground so far as book literature is concerned. We here find an account of practically all the researches of any moment on the physical and mechanical properties of rubber from the work of Gough (published in the Manchester Philosophical Memoirs in 1805) on thermal properties and elasticity, down to the present day. One is astonished at their number, but those who are not familiar with the subject will be still more astonished at what remains to be done. As the author indicates in the preface, the value of many of the researches carried out by physicists or engineers is sadly discounted because, apparently, they regard "rubber" as a stable entity, oblivious of the fact that the properties of the vulcanised material may be varied at will and within the widest ranges. As often as not there is very little information to guide us as to the nature of the rubber experimented on, and, as a result, much laborious and ingenious work while remaining suggestive is, so far, unfruitful. A prominent feature of Dr. Whitby's book is the excellent bibliography, which alone should render it worth the purchase price to the rubber chemist or technologist. Here and there a few typographical errors are apparent, for instance in the bibliography we find "Alexrod" for Axelrod, and "Bohiloff" for Bobilioff, but on the whole the work has been carefully edited and produced, and is a credit to the general editor of the series and to the publishers.

PHILIP SCHIDROWITZ.

THE CHEMICAL ANALYSIS OF STEEL-WORKS' MATERIALS. *By* F. IBBOTSON. *Pp.* viii+296. (*London: Longmans, Green and Co.* 1920.) *Price* 21*s. net.*

The reappearance of this classic work on the analysis of steel-works' materials and products will be heartily welcomed by everyone interested in the analytical side of ferrous metallurgy. For reasons stated in the preface, the voluminous bibliography and sections on pyrometry and microscopy, which were included in the earlier edition, have been omitted in the new. The author is to be congratulated on the manner in which he has arranged the subject matter; the introductory chapter dealing with general processes is followed by sections on the analysis of steel and pig iron, steel-making alloys, ores, refractories, slags, fuels, and boiler water, scales, etc. The various problems treated are first discussed from the theoretical point of view, and then the practical details of the various methods are given in the section following. Procedure is expressed concisely yet without the omission of essential detail, full reference is made to the influence of other elements, and almost all well-known methods are mentioned, including those for the determination of uranium, zirconium, etc.

In view of its great importance, sampling should have received greater attention; very few sections of iron or steel are entirely homogeneous, and not enough stress has been laid upon the care needed in taking representative samples. In the determination of carbon (p. 29) it is not good laboratory practice to use only drillings caught between 30- and 60-mesh sieves and to reject the remainder. Nor can the volumetric method for determining sulphur in pig iron and alloy steels (pp. 74, 75) be termed "quite satisfactory" without qualification. The passage on p. 67 dealing with the acidity of the ferric solution in the gravimetric estimation of sulphur is badly expressed and would be clearer if carefully paraphrased.

The author has a peculiar liking for the "acetate" separation of iron, and also the "lead molybdate" precipitation, these procedures being recommended wherever possible. An alternative method might have been given for the determination of cobalt, *e.g.*, the separation of nickel and cobalt from iron by Rothe's method, with the subsequent separation of cobalt from chromium by caustic soda and bromine; or the precipitation of iron from sulphate solution by pouring into a large excess of ammonia. The section on ferro-alloys is extremely valuable. Arsenic, copper and zinc are neither rare nor unimportant impurities in iron ores (p. 221), and bichromate is preferably standardised against pure iron and against an ore of known iron content. Such well-known and frequently used methods for the determination of manganese as those of Volhard and Pattinson are omitted, and, contrary to the experience of many chemists, the author regards as satisfactory the determination of tin by iodine, after reduction with powdered antimony. The very accurate gas-testing apparatus of Bone and Wheeler, and that of Hempel, are described in detail, but no mention is made of the Orsat apparatus, or of that of Stead which is used in most ironworks. The position of the delivery tube in the determination of nitrogen in coal (p. 271) calls for comment; and "ferric chloride" should read "ferrous" on p. 230, line 4.

Apart from the comparatively unimportant points referred to, it is not possible to praise this work too highly. Very great care has been taken in selecting and correlating the really important methods of analysis from a huge mass of material, and the arrangement of the book as a whole is excellent. It is far ahead of any published work dealing with the analysis of steel-works' materials, and should be in the possession of every iron- and steel-works' chemist.

ERNEST W. JACKSON.

PUBLICATIONS RECEIVED.

THE APPLICATION OF DYESTUFFS. *By* DR. J. M. MATTHEWS. *Pp.* 768. (*New York: John Wiley and Sons, Inc.; London: C*[illegible]*n and Hall, Ltd.* 1920.) *Price* $10.

ORGANIC CHEMISTRY FOR ADVANCED [illegible]DENTS. PART I., REACTIONS; PART II., STRUCTURE; PART III., SYNTHESIS. *By* J. B. C[illegible]N. *Third edition. Pp.* 366, 435, and 37[illegible] (*London: Edwin Arnold.* 1920.) *Price* 54*s.*

NUCLEIC ACIDS: THEIR CHEMICAL PROPERTIES AND PHYSIOLOGICAL CONDUCT. *By* DR. WALTER JONES. *Second edition. Pp.* 150. (*London: Longmans, Green and Co.* 1920.) *Price* 9*s.*

PUBLIC HEALTH CHEMICAL ANALYSIS. *By* A. FORSTER *and* R. C. FREDERICK. *Pp.* 305. (*London: Constable and Co., Ltd.* 1920.) *Price* 21*s.*

COAL IN GREAT BRITAIN. *By* DR. WALCOT GIBSON. *Pp.* 311. (*London: Edward Arnold.* 1920.) *Price* 21*s.*

THE CANADA YEAR BOOK. 1919. *Canada, Dominion Bureau of Statistics. Pp.* 697. (*Ottawa: Thomas Mulvey.* 1920.)

ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE OF THE COLONY OF MAURITIUS FOR 1919. (*Port Louis: Government Printer.* 1919.)

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NICKEL IN 1918. *By* F. L. HESS.

GOLD AND SILVER IN 1918. *By* J. P. DUNLOP.

COBALT, MOLYBDENUM, TANTALUM, TITANIUM, RADIUM, URANIUM, AND VANADIUM IN 1918. *By* F. L. HESS.

LIME IN 1918. *By* G. F. LOUGHLIN *and* H. INSLEY.

CLAY-WORKING INDUSTRIES, SILICA BRICK, AND BUILDING OPERATIONS IN THE LARGER CITIES IN 1918. *By* J. MIDDLETON.

PEAT IN 1919. *By* K. W. COTTRELL.

NATURAL-GAS GASOLINE. *By* E. G. SIEVERS.

ABRASIVE MATERIALS IN 1918. *By* F. J. KATZ.

ANNUAL GENERAL MEETING, 1921.

The Council has accepted the very cordial invitation of the Montreal Section of the Society to hold the Annual General Meeting next year in Montreal. It is hoped that there will be a large and representative attendance of members from this country. Inquiries are being made concerning the probable cost to a home member of attending the meeting, and the information obtained will be duly intimated in an early issue of the *Journal*.

It is proposed to hold the Annual Meeting on Monday, August 29, and it is suggested that visitors should arrive in Montreal on the preceding Saturday [illegible] in the words of the chairman of the Mon[illegible]ction, "they may have a day or two to re[illegible] motor round the island, or play a little golf." The provisional programme is as follows:—

Monday, Aug. 29, to Wednesday, Aug. 31—Annual Meeting of the Society in Montreal.
Wednesd[illegible] Aug. 31, 11 p.m.—Special train to Grand Mere and Shawinigan Falls.
Thursday, Sept. 1.—At Grand Mere and Shawinigan Falls.
Thursday night, Sept. 1.—Special train, Shawinigan Falls to Ottawa.
Friday, Sept. 2.—At Ottawa.
Friday night, Sept. 2.—Special train to Toronto.
Saturday, Sept. 3.—At Toronto.
Sunday, Sept. 4.—Boat across Lake Ontario and by Gorge route to Niagara.
Monday, Sept. 5.—Niagara Falls District, Canadian Side.
Tuesday, Sept. 6.—Niagara Falls, American Side, with visits to such of the large electrochemical plants as may be of interest.
Tuesday night, Sept. 6.—Train to New York.
Wednesday, Sept. 7, to Saturday, Sept. 10.—Meeting of the Society of Chemical Industry with the American Section and the American Chemical Society.
Monday, Sept. 12, to Thursday, Sept. 15.—Chemical Exhibition at the Eighth Coast Artillery Armoury, New York.

The meeting in New York will be held at the invitation of the American Section of the Society and will afford an opportunity for meeting members of the American Chemical Society during the week prior to the Exhibition. The Committee of the Exhibition has very kindly arranged to advance the date of opening by a week in order to meet the convenience of the members of this Society.

Further information regarding the meeting will be published later.

BRITISH CHEMICAL PLANT MANUFACTURERS' ASSOCIATION.

On the initiative of the Association of British Chemical Manufacturers (A.B.C.M.) the first practical step has been made towards developing the manufacture of chemical plant in this country by the foundation of the British Chemical Plant Manufacturers' Association with the following objects:—To promote closer co-operation between manufacturers of chemical plant and the interchange of information among its members and to co-operate with the A.B.C.M. in order that British chemicals shall be made with British plant. To form a medium for placing before the Government the views of British chemical plant manufacturers on matters affecting their industry. To affiliate or co-operate with any other body striving for industrial efficiency or the advancement of applied chemistry or metallurgy, or the industrial or commercial interests of the King's Dominions in connexion with chemical plant manufacture.

The officers are as follows:—Chairman, Mr. J. H. Rawson (Widnes Iron Foundry Co.); vice-chairman, Mr. L. M. G. Fraser (W. J. Fraser and Co.); treasurer, Mr. E. A. Alliott (Manlove, Alliott and Co.); and secretary, Mr. W. J. U. Woolcock, M.P. The executive committee includes the above and:—Mr. R. B. Blizzard (T. and C. Clark and Co.), Mr. T. Broadbent (T. Broadbent and Sons), Dr. H. T. Bush (Huntington, Heberlein and Co.), Mr. J. Robinson (Mather and Platt), Dr. R. Seligman (Aluminium Plant and Vessel Co.), Mr. E. C. Watkins (W. Neill and Sons), Mr. W. W. Wright (Cannon Iron Foundries).

Twenty-two firms have become members of the Association.

NITRE CAKE 1915—1919.

H. T. CALVERT AND E. H. MORRIS.

Before the war the production of nitre cake in the United Kingdom, estimated at less than 2000 tons per month, was easily utilised, mainly in salt-cake furnaces for the production of salt-cake and hydrochloric acid. During the first year of the war, however, increasing quantities were made month by month, and it was not possible to utilise these quantities in the usual way, with the result that makers had to find suitable tips on which to dump.

The firms which had to resort to this wasteful procedure were mainly Admiralty contractors making guncotton and, to a less extent, contractors making TNT and picric acid for the Ministry of Munitions, for the production of high explosives at that date had not reached the high figures of 1916 and 1917. In the case of Government factories this dumping was in the hands of contractors, to whom as much as £1 per ton was being paid to remove the nitre cake, but the contractors refused to accept responsibility for any damage resulting from acid drainage from the dumps. The possibility of such damage to domestic water supplies, to supplies for watering cattle and horses, to fishing and oyster interests, and to vegetation was by no means remote, and the superintendent of one of the Government factories lamented that whilst he and his staff had devoted much time and thought to the question of nitre cake they were no nearer a solution than they were when the production first began to increase, and that an appeal to the Royal Society for assistance had only resulted in a statement of chemical facts all of which were well known to them.

In August, 1915, the Admiralty appealed to the learned societies for suggestions, and in the issue of the *Journal of the Society of Chemical Industry* for August 31, 1915, a joint committee of these societies passed on the appeal to the chemists of the country. The suggestions evoked were forwarded to the Admiralty, and thence to the Ministry of Munitions, and were published in the issues of the *Journal* for November 30, 1915, and January 31, 1916. The advisers of the Government Departments to whom the matter was referred were, however, more impressed with the difficulties of introducing new processes than with the advantages to be gained by adopting them, and the suggestions were turned down as impracticable. No serious damage had yet resulted from the practice of dumping, and hence neither Government contractor nor Government Department was being driven to find another method of disposal and to embark upon a new venture.

In the meantime the Acid Supplies Branch of the Explosives Department of the Ministry of Munitions had realised that the sulphuric acid plant in the country was not sufficient to meet the increasing demands for acid for the manufacture of explosives and at the same time to meet the demands for trade processes, the products of many of which were, equally with explosives, essential for carrying on the war. The manufacturers of acid were being requested to forward adequate supplies to the explosives works, with the result that their ordinary trade customers were often short of supplies. Steps had already been taken to increase output by operating existing plant to the fullest possible extent and by arranging for the erection of new plant at acid makers' works and at Government factories, but the acid position still remained the bottle neck through which the output of explosives had to pass. It was realised towards the end of 1915 that this position could be considerably relieved if the nitre cake which was being wasted could be brought into use as a substitute for acid in trade processes, and as in many of these acid only performs a crude function or is used in dilute form so that solid nitre cake or a solution of nitre cake furnishes an effective substitute, the Explosives Department undertook a campaign to enlist the sympathy and assistance of those manufacturers who were being left short of acid supplies. The increasing production at Government factories, which ultimately reached two-thirds of the total production in the country, was an additional reason for this campaign, as it afforded a possibility of disposing of the nitre cake at a very much less cost than that of dumping, with the attendant dangers.

The Department did not lose sight of other national advantages to be derived from the substitution of acid by nitre cake. Pyrites, from which sulphuric acid is made, had to be imported under most difficult circumstances at a time when the economical use of every ton of shipping was of vital importance, so that by using as much as 26,000 tons of nitre cake in a single month the country saved during that month the import of some 6000 tons of pyrites. Had it been necessary to supply for trade purposes this acid in the form of sulphuric acid, some 8000 tons of 100 per cent. acid would have had to be made at a time when every plant in the country was working at its fullest capacity and at a time when the erection of much Government sulphuric acid plant was already a cause of anxiety to the sulphuric acid manufacturers of the country. The use of nitre cake, therefore, saved the erection of Government acid plant capable of producing at the rate of 8000 tons of 100 per cent. sulphuric acid per month.

The first trade to be approached in the campaign already mentioned was the woollen industry, in which acid was used in pre-war days to the extent of 20,000 tons of 100 per cent. acid per month for the recovery of grease from wool suds and soapy liquors produced in the scouring of wool and the manufacture of cloth. Acid was used for the same purpose by several Corporations for the recovery of grease from sewage. Preliminary experiments, carried out at the instigation of the Ministry of Munitions by a committee of Yorkshire manufacturers, demonstrated the possibility of using nitre cake for this purpose, and the Explosives Department thereupon undertook to organise the transport, supply, and sale of nitre cake produced at Government factories. A short account of this organisation may prove of interest.

The United Kingdom was mapped out into eight districts:—London and South-Eastern Counties, Western Counties (including South of England and South Wales), Lancashire and Cheshire (including North Wales), Yorkshire, Midlands, North of England, Scotland, and Ireland, and the consumption of acid for trade purposes in each of these districts was carefully scrutinised in the monthly returns furnished to the Department by the acid makers and dealers. It was at once evident that the areas in which nitre cake was produced in greatest quantity did not coincide with the areas in which the possibilities of using it as a substitute for acid were greatest, and the Department had to give attention to the question of transport.

Railway Wagons.—The assistance of the Railway Executive Committee was enlisted, and the Department purchased second-hand railway wagons for the traffic. The lining of the wagons with lead, pitch, acid-resisting paint, or bitumastic composition was considered, but it was decided, as the wagons were already second-hand and could not in any case be expected to have a long life, and in view of the urgency of the position, that they should be put into traffic at once. When the nitre cake was exposed to rain on the journey experience showed that the acid drainage on to the laminated buffer springs caused these to become brittle so that they snapped. This was a heavy item in the repairs, and steps were taken to cover the springs with sheet lead. At a later date converted wagons with self-contained buffer springs were obtained, and the repairs to these wagons were much less. Finally, some of the wagons were provided with hinged roofs like salt wagons or with lifting roofs, and this type of wagon proved most satisfactory. The action of the nitre cake on the woodwork of the wagon was not so great as had been expected, and many of the wagons ran for two and a half years. At the signing of the armistice in November, 1918, the number of wagons running in nitre cake traffic from Government factories was over a thousand.

Production and Consumption of Nitre Cake.—During 1916, pressure was gradually brought to bear upon the trades using acid to substitute nitre cake as far as possible, and the Department undertook to supply in truck loads to customers' railway station at a uniform price of 12s. 6d. per ton, a price which barely covered the cost of carriage. The price was raised after some months to 17s. 6d., and later to 25s. per ton. Maximum prices for sulphuric acid had been fixed by the Ministry of Munitions in the meantime, and it was considered that users should pay a price comparable with that of the acid which nitre cake was replacing.

By the end of 1916 the total production of nitre cake in the United Kingdom had reached over 30,000 tons per month, of which rather less than half was being produced at Government factories. The amount which was being used had risen gradually from 2000 to 18,000 tons per month at the end of the year. During 1917, the monthly production continued to increase and reached 42,000 tons in November of that year, though the average monthly production during 1917 was 36,000 tons, and the average monthly use 22,000 tons, with a maximum use of 26,000 tons in November. After this date the increased use of ammonium nitrate resulted in a decreased production of picric acid with a consequent reduced production of nitre cake, and during the first ten months of 1918 the average monthly production was 27,500 tons, and the amount used 22,500 tons per month, or over 80 per cent.

It may be of interest, as indicating how variations in the demands of the explosives programme were borne more heavily by Government factories than by private firms, to note the monthly variations in the production of nitre cake at these two classes of works. During 1917, the average monthly production at Government factories was 17,000 tons, with a maximum of 23,500 and a minimum of 14,000, or a variation of 9500; whereas at private works the average monthly production was 19,000 tons, with a maximum of 22,000 and a minimum of 15,600, or a variation of 6400.

It is also of interest to note that, although during 1918 only rather over 80 per cent. of the nitre cake produced was used, the remainder was produced largely at private works which were situated in remote districts, so that the utilisation of their nitre cake would have involved very heavy transport charges, and, moreover, they were able to wash their waste products into the sea.

During the war nitre cake was made at 17 Government factories, but owing to the closing of some of these in the more thickly populated areas, only 12 were operating at the signing of the armistice, one factory alone producing nearly 7000 tons in February, 1918, and nearly 5000 tons in October, 1918. There were over 60 private works where nitre cake was produced from the manufacture of nitric acid, but the production at some 20 of these was very small indeed, and at the largest works about 2000 tons was made monthly.

In establishing a selling organisation for nitre cake the Department was largely assisted by district committees, each of which sent a representative to a central advisory committee which met in London, and in turn the Department rendered assistance to private firms by hiring wagons for the transport and by indicating the distribution of the nitre cake which would involve as little use of national transport facilities as possible, at a time when the railways were more than congested.

The post-war production of nitre cake in the United Kingdom is estimated at 2600 tons per month, about half of which is estimated to result from the manufacture of nitric acid to be used in the dyestuff industry.

Uses of Nitre Cake.—It has been already explained that the Department gradually brought pressure to bear upon manufacturers who could use nitre cake in place of acid in their trade processes, and in June, 1917, a system of licensing supplies of acid to users was inaugurated. This enabled the Department to withhold acid from those firms which had hitherto resisted pressure but which were able to use nitre cake. These were, however, very few in number, and it was considered that the only possibility of utilising the available surplus of nitre cake was to extend its use to the fertiliser trades, viz., superphosphate and sulphate of ammonia. Preliminary experiments were carried out by various firms and by Dr. E. J. Russell, Director of the Rothamsted Experimental Station, and these attained a measure of success, but the subsequent reduced production of nitre cake rendered it unnecessary to bring further pressure to bear on these trades, especially as the substitution of nitre cake for acid was not so easy as in the case of those trades which ordinarily consumed acid in a very dilute form.

Nitre cake is an acid sulphate of soda produced either in the nitre pots at sulphuric acid works or in the retorts in which nitrate of soda is heated with sulphuric acid for the manufacture of nitric acid. The nitre cake from "potting" did not increase more than 50 per cent. on pre-war figures during the war, but that from nitric acid manufacture increased some twenty-fold, and of the nitric acid made over 95 per cent. was used in the manufacture of explosives, the consumption for other purposes remaining practically constant at 1000 tons of 100 per cent. nitric acid per month.

It will thus be seen that it was the nitre cake from the second source which caused the difficulty in disposal. It usually has an acidity equivalent to 30 or 33 per cent. sulphuric acid, and is run molten from the retorts into shallow cast-iron trays, in which it solidifies and is then broken by hand labour and loaded for transport. The more strongly acid nitre cakes absorb moisture and appear wet more readily than those containing a smaller percentage of acid. Some of the Government factories were able to economise in the use of sulphuric acid to such an extent as to produce a cake containing only 28 per cent. acidity, but this was not usual, and 30 per cent. should be considered an average figure.

Nitre cake thus contains the equivalent of a mixture of 30 per cent. of sulphuric acid and 70 per cent. of sodium sulphate, and the ideal use would be a process in which these two substances are required in the proportions stated. It must be confessed that in most of the processes in which nitre cake was employed during the war it was only the sulphuric acid which was utilised, although in a few, as will be noted later, the sulphate of soda was also used.

At the end of 1917, when nitre cake was being utilised at the rate of 24,000 tons per month, the distribution among the various trade processes was somewhat as follows:—

Trade process.	Consumption of nitre cake (Tons per annum.)
Grease recovery	72,000
Bleaching and dyeing	72,000
Metal pickling and cleaning	60,000
Hydrochloric acid manufacture	60,000
Mineral water manufacture	12,000
Miscellaneous	12,000
	288,000

The miscellaneous processes in which nitre cake was being used included the manufacture of glue or manures from fleshings, hide scrap, leather dust, and leather scrap, the manufacture of sodium sulphite, glass making, rubber regeneration, glycerin manufacture, the preparation of bisulphate tablets for sterilisation of water, the manufacture of fertilisers (sulphate of ammonia and superphosphate), "striking out" phenol and phenolic bodies, boric acid manufacture, the production of Epsom salts, dissolving zinc and copper ores, fluxing in metal extraction, the manufacture of hydrogen and sulphuretted hydrogen, the preparation of tartaric acid substitute, paper sizing, alum making, and the extraction of rare earths.

Distribution.—When it was realised that nitre cake would have to be transported over considerable distances from Government factories to the consuming centres it was at first suggested that depots or stores should be established by the Ministry at convenient centres, and that the Ministry should maintain stocks at these depots from which manufacturers could obtain their supplies by cart or motor lorry. It was found, however, that manufacturers preferred to receive consignments to their nearest railway station, so that it was decided, as already stated, to forward the material in bulk in truck loads of six or eight tons. In case a manufacturer was not in a position to receive so large a quantity, arrangements were made for him to share a truck load with other manufacturers in his neighbourhood, or to consign the truck load of nitre cake to a local chemical dealer, who undertook the distribution in smaller parcels. Later experience demonstrated the advantages which such depots would have had, despite the double handling which their maintenance would have involved. At times either of fluctuating production or consumption of nitre cake, when railway delays held up supplies, when the closing of some factories necessitated a redistribution of supplies, or during holidays which did not synchronise at producing and consuming works, they would have served as reservoirs to which supplies could have been regulated according to varying circumstances.

One such depot, capable of storing three to four hundred tons, was established in Bolton for the purpose of supplying the Lancashire bleachers in that district. It served a very useful purpose and enabled manufacturers to obtain small supplies as required. In the case of two Government factories, for instance, it enabled the whole of their small and irregular production of nitre cake to be sent for disposal.

In the case of several Government factories which were situated in close proximity to or within a few miles of the works using nitre cake, the Department effected distribution by means of motor lorries, the bodies of which were lined with sheet lead.

The fact that there was one central distributing organisation for the disposal of all the nitre cake produced at Government factories made it possible to maintain regular supplies to the consuming trades, and the close touch which the Department maintained with private makers through the district committees must certainly be regarded as having contributed in no small degree to the success of the policy of the Acid Supplies Branch of the Department.

At the cessation of hostilities in November, 1918, the geographical distribution of the nitre cake production and disposal was carefully estimated to be somewhat as follows:—

tion as was available. In France the use of acid for metal pickling was prohibited, doubtless because the shortage of sulphuric acid was more acutely felt there than in any other of the belligerent countries.

Granulated Nitre Cake and Solution.—The method of cooling nitre cake in shallow trays exposed to the air has already been described. This was recognised to be a cumbersome process involving much manual labour for breaking and loading, and hence attempts were made to introduce improved methods. It was thought that if the nitre cake could be produced in a clean powdered form many of the prejudices against its use would be overcome. This was accomplished in two ways—either by playing upon a falling stream of molten nitre cake with a current of compressed air, when the particles congealed as small pellets during their travel through the air, or by rabbling the molten nitre cake in rabbling pans. Both these forms of granulated nitre cake commanded a ready sale at a price of 10s. per ton above that of the lump or block form.

The granulated nitre cake had to be carried in the railway wagons provided with roofs or packed in casks, especially for shipment to Ireland or Norway.

Tons per month.

Area.	Production.	Consumption	Exported from area.	Imported into area.	Dumped.
1. London	3400	2100	480 220 to Area 2 260 to Area 4	Nil	820
2. S. of England and South Wales	3300	3900	Nil	1420 220 from Area 1 960 from Area 3 240 from Area 5	820
3. Lancashire and N. Wales	6300	4600	2880 1920 to Area 4 960 to Area 2	1320 120 from Area 4 960 from Area 6 240 from Area 7	140
4. Yorkshire	3900	7200	120 120 to Area 3	3700 1380 from Area 6 260 from Area 1 1920 from Area 3 140 from Area 7	280
5. Midlands	3800	3350	240 240 to Area 2	Nil	210
6. North of England and Gretna	2700	280	2580 240 to Area 8 960 to Area 3 1380 to Area 4	180 180 from Area 7	20
7. Scotland	3200	1900	560 180 to Area 6 240 to Area 3 140 to Area 4	Nil	740
8. Ireland	540	300	Nil	240 240 from Area 6	480
Totals	27,140	23,630			3510

It must be borne in mind that with the closing of the factories in thickly populated districts and with the opening of new factories this distribution was continually changing, and although the above figures only apply to the period mentioned, they give some idea of the amount of traffic which had to be organised for the transport of nitre cake.

Use in Other Countries.—It must be left to the future to tell us exactly what use was made of nitre cake during the war in enemy countries, but from information obtained by the Intelligence Department of the War Office the chief uses in Germany were for metal pickling and in the manufacture of fertilisers. It may be thought that with the production of nitric acid either from the air or by the oxidation of ammonia no nitre cake would be obtained, but the indications are that some at least of the nitric acid was absorbed by soda, and that the resulting nitrate and nitrite of soda were decomposed in the old-fashioned way.

With regard to our Allies, there was co-operation, and the Department placed at the disposal of the French and American Governments such informa-

At one of the factories the molten nitre cake from the stills was for a time run into large cast-iron coco pans, where it solidified on cooling to large blocks weighing a couple of tons each. The slow rate of cooling of these blocks necessitated the provision of such a large number of pans, and the resulting product was so generally inacceptable to the users that the method was abandoned.

Several firms undertook the sale of solutions of nitre cake in carboys, and in this the main difficulty was occasioned by the large number of breakages due to the separation of Glauber's salt from the nitre cake solution. The nitre cake was either run in the molten state into water or the solid cake was washed with hot water and the resulting solution cooled and run into carboys. There can be no doubt that a notable service was rendered to the Department by these firms, as this method of putting nitre cake on the market involved no change on the part of the user who had been accustomed to handling sulphuric acid in carboys.

It is the opinion of the writers that the war-time measures which were taken by the Acid Supplies Branch of the Explosives Department of the Ministry of Munitions for the utilisation of nitre cake were not only of considerable assistance during a period of national emergency, but that they were also of distinct educational value, inasmuch as they demonstrated the possibilities of utilising one of the waste products of industry. The work which was done will certainly lead to a demand for the whole of the peace-time production of nitre cake, and it is hoped that the lesson learnt by both makers and users may find application in other directions. Finally, the achievement which has here been outlined could not have been accomplished without the full and hearty co-operation of all concerned, including makers and users of nitre cake, the officials of all supply branches of the Ministry of Munitions and of other Government Departments.

NEWS FROM THE SECTIONS.

MANCHESTER.

The annual dinner was held at the Grand Hotel, Manchester, on November 28, Mr. John Allan presiding. Apologies for non-attendance were received from the Rt. Hon. the Lord Mayor of Manchester and the Mayor of Salford.

Councillor W. Cundiff, in proposing the toast of "The Society of Chemical Industry and the Manchester Section," congratulated the Society upon being the premier chemical industrial society of the world, with a membership roll of nearly 7000. He referred to Sir William Pope's former association with the Manchester College of Technology and to the valuable work he had done for the Minister of Munitions during the war, and stated that the Manchester (Bradford Road) Gasworks had delivered to the Ministry of Munitions during the war 1,786,000 galls. of crude benzol, 840,000 galls. of standard benzol, 268,000 galls. of toluol, 89,000 galls. of solvent naphtha, 9600 tons of concentrated ammonia, and 5600 tons of concentrated sulphuric acid.

Sir William Pope, in responding to the toast, said that the Society of Chemical Industry was first established in 1881, in Manchester, and shortly after it established what it called a "Local Section" in London, but the name was soon altered to that of the "Metropolitan Section." They were proud of the fact that their great Society started in Manchester, was conceived and launched by Manchester men, and ever since had flourished and increased enormously. After referring to the great work done by Sir Henry Roscoe, Mr. Ivan Levinstein and others, Sir W. Pope said that the Society was only one among a number of others, and he felt that they should endeavour to establish some sort of union with the other large scientific, technical and chemical societies of the country so that they could all act together when they wanted to "pull off" a job in connexion with the Government. This was particularly important at the present time. They had all seen how during the past few years the Government had vacillated over the important question of the production and importation of coal-tar dyes. If in this country we had a big chemical organisation, an amalgamation of their Society with the Chemical Society, the Association of British Chemical Manufacturers, and kindred societies, we should be in a position to go to the Government with weight and authority and have a better chance of obtaining legislation suitable for the needs of the chemical industry.

Mr. John Allan also responded to the toast, and said that the term "Manchester Section" really covered a whole host of towns and villages throughout Lancashire and Cheshire, and was an indication of the virtue of amalgamation for the purpose of mutual benefit.

Prof. F. L. Pyman proposed the toast of "The Chemical Industries of the District," and Dr. Levinstein, in responding, said that Manchester and the surrounding district employed half the chemical workers in the kingdom, and was the centre in which by far the greatest amount of original chemical research was being carried on; the reason of this was that Manchester had recently created research institutions on a scale which had not hitherto been known in this country. He referred not only to the great laboratories which had been built recently by the British Dyestuffs Corporation, in which about 100 research chemists were employed, but also to the development of research in other industries, particularly to the institution which was being built at Didsbury by the Cotton Research Association. The fact that Manchester had become the centre of research on such a large scale was due to the influence and teaching of the School of chemistry at Owens College in years gone by, an institution which was unique in this country. There were two kinds of industry to-day, the staple industries which relied for their success upon mass production on very cheap lines, and the industries which depended upon the novelty and uniqueness of their products, as was the case in the dyestuff industry. To discover a new substance in a laboratory was a comparatively easy task; to produce on a large scale required great outlay of capital and extensive engineering and commercial organisation. The industry he represented was perhaps very much to blame because it had not succeeded in bringing about that amalgamation of talent to which Sir William Pope had referred for the purpose of bringing pressure to bear upon the Government; but he would ask Sir William Pope, figuratively and rhetorically, which Government did he mean? They had had a pledge from three Governments, two Prime Ministers and four Presidents of the Board of Trade. What more could have been done?

NEWCASTLE.

At the meeting held on November 17, Dr. J. H. Paterson presiding, Mr. F. H. Jennison read a paper on "The Use of Tannic, Arsenious, and Phosphoric Acids in the Production of Lake Pigments from Basic Dyestuffs," the main object of which was to emphasise the fact that tartar emetic and tannic acid, usually the most effective precipitants, are not always the best for producing lakes from basic colours.

Lake colours are pigments obtained by precipitation from dyestuffs and colouring matters. Owing to their hard and horny nature, the lakes obtained from certain dyestuffs are useless as pigments; but if they are produced on a suitable base or extender they give good pigments. Such bases or extenders in use are barytes, china clay, *blanc fixe*, orange lead, aluminium hydrates and sulphhydrates, or mixtures of these. The physical properties of lakes are largely determined by the nature of the base on which or with which they have been produced. Vat colours, such as Durindones and other Indanthrene colours, do not yield true lakes; they are pigments ground with extenders to make the most of their staining power. Another class of pigments is produced by the absorption of basic colours by Green and White Earths; these are much faster to light and alkalis than lakes produced from the same colours by other means. The lakes produced from the hydroxyanthraquinone series—known as the Alizarin colours—can, however, be considered as types of true lake pigment. Of the various metallic salts commercially available for the production of lakes, those of aluminium are by far the most effective.

The author described, and illustrated by experiments, the production of commercial lakes with tannic acid and tartar emetic and with arsenious and phosphoric acids; he also discussed the chemical and physical properties of the various aluminium hydrates and the conditions under which they react with the acids named to yield lakes of the required character.

NOTTINGHAM.

At the meeting held on November 24, Mr. J. H. Dunford presiding, Messrs. J. M. Wilkie and W. A. Kneightley presented a paper on the "Determination of Minute Amounts of Arsenic in the presence of Large Amounts of Iron."

The authors are of the opinion that the Marsh test in its original form must be abandoned, as it involves some unknown and uncontrollable source of error which has not been explained or overcome. The estimation of small amounts of arsenic by means of the lead electrode, as devised by one of the authors, has been found sometimes to give varying and low results; and the improved method involving the reduction of all the arsenic present to the arsenious state by means of glycerol was described recently (*cf.* J., 1920, 179 R). Reduction of the iron present to the ferrous state was also shown to be necessary, and this is best effected by adding five drops of a 10 per cent. solution of potassium iodide, followed by a crystal of sodium sulphite, whereby a solution is obtained with glycerol and sulphuric acid which remains colourless on boiling. By this method the arsenic present in solutions containing up to the equivalent of 0·3 gm. ferric oxide can be determined with accuracy, and the results are not affected by the presence of citric acid or sugar. Certain slight changes in the method are necessary in special cases.

A paper on "The Present and Future Position of the Chemical Societies of Great Britain" was then read by Mr. H. D. Richmond.

LIVERPOOL.

Mr. A. E. Findley contributed a paper "On the Corrosion of Coke-Oven Walls" at the first meeting of the present session, held in Liverpool on Nov. 26.

The author has investigated the relative effects of the salt, iron, and moisture, contained in the fine coal used for coking upon the durability of the coke-oven walls, and has arrived at the following conclusions:—(1) The durability of the fireclay walls decreases as the salt content of the coking slack increases; (2) the durability is further diminished if both salt and iron contents are high; (3) when much iron and moisture are present, but only very little salt, the durability of the walls is but very slightly affected; and (4) the higher temperature obtaining in the vertical flues of a regenerative-oven system is conducive to deterioration of the oven walls.

Experiments were carried out on the influence of the presence of chloride (hydrogen, sodium, calcium, magnesium) upon the volatilisation of the iron content of coal, the solid being heated in a silica tube to 900°—950° C. in air, steam and air, coal gas, and steam, air and hydrogen chloride. The maximum loss of iron occurred in the last-named atmosphere, and the losses observed with the solid chlorides were too small to lead to definite conclusions.

In the discussion it was stated that the Belgian coke-oven bricks imported before the war were by far the most durable, and that when their price became too high, the best quality Kentish bricks were found to be a fairly good substitute; but although these bricks were derived from the same clay formation as the Belgian, they were far less satisfactory.

MEETINGS OF OTHER SOCIETIES.

INSTITUTION OF MECHANICAL ENGINEERS.

"Sterilisation of Water by Chlorine Gas" was the subject of a paper read by Capt. J. Stanley Arthur before this Institution on November 19.

At the outbreak of war, water was treated in the field in the water cart by precipitation with aluminium sulphate, with or without the addition of alkali, followed by filtration through a cloth-covered cylinder and the addition of bleaching powder. The control of this process was improved by means of the Case method, which is described in an appendix to the paper. Continuous processes superseded the intermittent treatment, and the plant therefor, mounted on a 3-ton motor lorry, delivered up to 400 gallons of sterilised water per hour; excess of chlorine was removed by means of a solution of sodium bisulphite.

The plant finally adopted as the standard for the British Army involved the use of chlorine gas, and the paper contains descriptions, with diagrams, of the chlorinators of Darnell (Amer. Pat. No. 1007647, Oct. 31, 1912), and of Messrs. Wallace and Tiernan, of New York. Two types of apparatus are made by the latter firm, viz., the direct-feed type, in which chlorine is added directly to the water, and the solution-feed type, in which chlorine is added in aqueous solution.

Experimental tests made in 1916 on canal water at Brentford, Middlesex, led to the following conclusions:—Chlorine is a most efficient sterilising agent for water; a direct-feed machine is extremely satisfactory; the taste of water so treated is far less marked that that of water sterilised with bleaching powder. Sulphur dioxide gas was used to remove the residual chlorine, and with this modification the direct-feed form of the Wallace and Tierman chlorinator was adopted as the standard for all types of water purification plants in the Army. These included portable plants built on motor lorries, or barges, and stationary plants on land. The process of purification is the same for all types and includes: — Treatment with aluminium sulphate, with addition of alkali when necessary; sedimentation; filtration; sterilisation by chlorine gas; and de-chlorination by sulphur dioxide gas.

The preliminary chemical treatment is for turbid waters, etc.; and sedimentation in portable plants is carried out in canvas dams, but in permanent plants tanks are installed for this purpose. The filters consist of cylindrical tanks filled with sharp clean sand resting on a bed of graded gravel with the usual facilities for washing. Sterilisation is complete after 20 minutes contact of the chlorine with the water in tanks, as shown by negative results with the McConkey and Neutral Red agar tests. The amount of sulphur dioxide to be added is determined by the potassium iodide and starch test. If the water is to be carried for the use of troops, it is thought best to leave about one half part of chlorine per million to maintain sterility during transit, the general experience being that all free chlorine disappears by the time delivery of the water is made. It is claimed that experience in the war showed that water purification plants using chlorine are extremely efficient, cheap, and simple to operate. Liquid chlorine stored in cylinders is cheap, and does not deteriorate on keeping, in which respect it is much superior to bleaching powder, the use of which for water sterilisation in the East was attended by many difficulties. Bromine bleaching powder (a patented product) is available as a substitute for the ordinary commercial bleaching powder, and as it does not decompose below 100° C., its advantages for practical use are obvious.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At an extra meeting of this Institution, held in London on November 23, the adjourned discussion on the papers by Messrs. Bates and O'Neill on "Colloidal Fuel" (*cf.* J., 1920, 395 R) was taken first. Most of the speakers asked for information concerning the stability of Colloidal Fuel on storage, *e.g.*, whether the de-stabilised fuel could be re-stabilised by agitation.

Mr. N. A. Anfilogoff pointed out the difficulties likely to be encountered in the transport and transference of such a fuel, such as the wear and tear on pump valves, fittings, etc., and also the involved necessity for altering filtering arrangements now in use on fuel oil lines.

Dr. W. R. Ormandy protested against the name "colloidal" being used for a substance of this type, suggesting that it more resembled an emulsion, and instancing the difference in character between this substance and a true colloidal suspension. He also stated that by using 35 per cent. of finely-ground coal with petroleum, it was possible to make a mixture from which the solid particles did not separate at all readily, but he had been unable to obtain a suspension using a smaller proportion of coal. Referring to the authors' suggested use of cheap coal-tar compounds, he said that at the present time there were no cheap coal-tar compounds.

Mr. J. H. Anderson quoted figures showing that colloidal fuel was less suitable for naval use than fuel oil, owing to the fact that it increased the dead-weight of fuel required to be carried, and therefore left less capacity for dead-weight cargo.

Mr. A. E. Cockes, of the Admiralty, stated that contrary to the authors' experience, there was no loss from evaporation on storage of fuel oil; he had just had a tank measured in which oil had been stored for some years, and no loss whatever had occurred.

Mr. G. Bulkeley said that in view of the fact that the United States authorities had considered Colloidal Fuel sufficiently worthy of trial to allocate a battleship for this purpose, it could not be lightly dismissed, and that very probably there was a future before it for use in railway locomotives.

Mr. H. Barringer pointed out that even with the present system of storing liquid in double bottoms, difficulty was experienced in cleaning out the deposits from fuel oil in these receptacles, and that a deposit from Colloidal Fuel would be almost impossible to clean out; therefore, in the absence of convincing proof of the stability of the new fuel, it could not be considered suitable for naval use.

Mr. Cunningham Craig said he looked forward to the time when Colloidal Fuel would be in general use in this country, and thereby conduce to the conservation of our natural fuel resources; but he objected to the word "colloidal" in this connexion.

Dr. M. B. Blackler deprecated so much discussion on the subject of colloids as most of the speakers who had used the term had not the slightest idea of how a colloid acted in technical practice. Mr. Bates claimed to have made an advance on the fuel question, and it was up to him to prove that his claims were justified.

Mr. L. W. Bates, in reply, affirmed his conviction that time would prove the whole of his statements to be correct, and gave recent instances of the satisfactory use of this fuel after long storage. If the fuel became de-stabilised it could not be re-stabilised by simple agitation, but this could be effected quite easily by adding more "fixateur." No trouble had been experienced in connexion with wear and tear of pump valves and fittings. He admitted that the word "colloidal" was not an ideal one, but it would serve in place of a better. A more detailed reply will be published in the *Journal* of the Institution.

A "Note on the Lamp Method of Sulphur Determination" was read by Messrs. J. S. Jackson and J. Kewley, who described a modification of the Esling lamp consisting in a wick composed of capillary tubes instead of cotton strands; an internal air-tube serving as a carburettor, the air being blown over the surface of the fuel under test; and a silica jet in place of the fusible glass jet hitherto employed.

Messrs. E. Lawson Lomax and F. G. P. Remfrey described the methods used by them in "The Laboratory Testing of Oil Shale for Oil and Ammonia Yields." Methods of retorting were described and illustrated with diagrams, and the refining of the small amounts of oil obtained by distillation was discussed. Dr. Remfrey also contributed a note on the weathering of shale, in which he showed that on exposure subsequent to mining, the oil-yield of the shale rose rather sharply to a maximum within about 4 weeks, and then gradually fell; and that by choosing the correct time for retorting an increase in oil-yield varying from 9 to 20 per cent. can be obtained.

SOCIETY OF DYERS AND COLOURISTS.

Before the West Riding Section on November 25, Dr. E. Fyleman read a paper on the "Standardisation of Dyestuff Intermediates," the chief points in which were as follows:—

Mainly on account of the necessity for facing foreign competition, it is important that the various branches of the dyestuff industry should co-operate as far as possible both with one another and with dye-users. To this end the standardisation of intermediates is desirable. The pharmacopœias of modern States are admirable examples of the utility of such a standardisation of chemical substances, aud the dyestuff industry at present is in much the same condition in this respect as drug users would be without a pharmacopœia. The advantages of standarisation of intermediates would be:—(1) Practical identity of products from all sources; (2) economy in manufacture of intermediates resulting from definite knowledge of the quality required; (3) a definite recognised standard for British products; (4) the pooling of knowledge and experience between producer and consumer resulting from the working of a standardising committee, and also improvements in analytical methods; and (5) the commercial advantages of definite official specifications as to quality.

Attention is directed to possible metallic contamination of products and the desirability of referring to this in specifications. Very little has been published on methods of titration of the commoner intermediates, and how, in the ordinary methods of diazotisation and of coupling with diazo-bodies, the exact conditions of titration must be prescribed for each substance if consistent results are to be obtained. Methods of describing the strength of such materials as naphthalene hydro- and amino-sulphonic acid are discussed, and the use of "gross" molecular weight, *i.e.*, the number of grams containing a gram-molecule of active ingredient, is suggested. The general considerations to be borne in mind in the standardisation of boiling point, melting point, setting point, chemical stability, solubility, specific gravity, refractive index, colour and characteristics dependent on surface properties (*i.e.*, speed and ease of solubility and reaction of solids and pastes) are discussed. To carry out these proposals, the author recommends the formation of a standardisation committee composed of representatives of dyers and printers, manufacturers of dyes, of intermediates, other manufacturers, and analysts. This committee would revise the standards periodically in accordance with changing conditions. The reasons usually urged against standardisation are that it is unnecessary, and that it tends to conservatism and to an upper as well as to a lower limit of excellence. The first objection does not apply, and the second difficulty would be prevented by the periodical revision of standards to which the committee would be forced by the stress of foreign competition.

SOCIETY OF PUBLIC ANALYSTS.

An ordinary meeting was held on December 1 at the Chemical Society's Rooms. The president, Mr. A. Smetham, referred with regret to the resignation of Mr. J. L. Baker from the editorship of *The Analyst* after fifteen years' service.

In a paper on the estimation of theobromine, Mr. R. V. Wadsworth criticised the ordinary processes employed and put forward a new method based on the use of calcined magnesia and extraction with tetrachlorethane. The estimation of quantities of chromium of the order of 0·01% was described by Mr. B. S. Evans in a paper entitled "A New Process for the Estimation of Small Quantities of Chromium in Steels." The steel is dissolved in sulphuric acid, oxidised with nitric acid, and after the addition of 25 gm. of ammonium phosphate the liquid is boiled with excess of potassium permanganate (to convert the chromium into chromate) and then poured into excess of boiling caustic soda solution acidified with acetic acid and made up to a known volume; an aliquot part is filtered off and made strongly acid with sulphuric acid. The chromium is then determined colorimetrically by matching with N/100 potassium dichromate solution. Good results are obtained with contents ranging from 0·003 to 15·0% of chromium. "Some Notes on the Reactions between Fulminate of Mercury and Sodium Hyposulphite" were contributed by Messrs. P. V. and F. H. Dupré. The authors described the titration of fulminate of mercury in sodium hyposulphite, and discussed the retarding effect of boric acid on the secondary reaction, which leads to loss of alkalinity; the evolution of heat and its influence on the destruction of fulminate by hyposulphite; the effect of boric acid on heat evolution; and the nature of the final products of the reaction between fulminate and hyposulphite.

THE CHEMICAL SOCIETY.

At the ordinary meeting, held at Burlington House on December 2, Sir J. J. Dobbie presiding, 147 new Fellows were elected and four papers were read.

Sir Prafulla C. Ray described briefly the preparation of a number of complex platinum compounds containing mercaptanic radicles in which the platinum functions as a tervalent, quinquivalent, sexvalent, or octavalent element. Mr. H. E. Cox read a paper entitled "The Influence of the Solvent on the Velocity of Certain Reactions. Pt. II., Temperature Coefficients. A Test of the Radiation Hypothesis." The author has studied the temperature coefficients of the interaction of aniline and bromoacetophenone and of sodium β-naphthoxide and ethyl iodide in a number of solvents, and he draws the general conclusion that his work supports the radiation hypothesis, provided that the specific character of the solvent used be taken into consideration.

Dr. T. A. Henry contributed an account of hyenanchin, isohyenanchin, and other constituents of *Hyenanche globosa*, a toxic plant indigenous to South Africa, where it is used for poisoning hyenas and other animals. By extraction first with chloroform and then with alcohol a new phytosterol and a new wax were obtained, together with a yellow colouring matter of the flavone series and the neutral principles of hyenanchin and isohyenanchin. The properties of the last two substances indicate that they belong to the group of non-nitrogenous, convulsant poisons, which brings them into close relationship with picrotoxinin, picrotin, coriamyrtin, and tutin. Dr. W. S. Denham read a paper on the Methylation of Cellulose. By modifications of the methods previously described, viz., the action of methyl sulphate on cotton impregnated with sodium hydroxide, a series of methyl ethers of cellulose has been obtained. The indications are that the ether of limiting methoxyl content is trimethyl cellulose, to which the most highly methylated ether actually prepared approximates in composition. The solvent action of Schweitzer's reagent on methylated cellulose decreases as the methoxyl content increases, and this reagent has therefore been employed in the investigation of the uniformity of methylation of various products.

NEWS AND NOTES.

UNITED STATES.

Gasoline from Natural Gas.—The charcoal process for recovering gasoline from natural gas is stated to cost less to instal, to be cheaper to operate, and to yield more and better gasoline than any other process. It consists in passing the gas through activated charcoal which adsorbs the gasoline, and then recovering the latter by steam distillation.

Dietetic Value of the Flesh of Horses, Seals, Etc.—Experiments have just been completed at the U.S. Department of Agriculture which show that the flesh of the horse, seal, kid, and rabbit are as digestible as that of other better-known meats; and also that in a mixed diet the meats above-mentioned do not decrease the digestibility of the other constituents of the diet.

Egg Preservation.—At the Oklahoma Agricultural College it has been found that a thin coating of aluminium soap is preferable to other media in use for preserving eggs. The eggs are dipped into dilute sulphuric acid and then immersed in a solution of the soap in a volatile solvent, such as gasoline or pentane. With the latter solvent only one immersion is necessary.

"Physiological Reviews."—The American Physiological Society will publish, as from January next, a quarterly journal bearing the above title, which will contain short but comprehensive articles dealing with recent work in biochemistry, biophysics, experimental pharmacology and pathology. The selection of subjects and writers will be undertaken by the editorial board.

Chaulmoogra Oil.—Research on the active principles of chaulmoogra oil as a specific for leprosy is to be encouraged by the United States Health Service in connexion with the Louisiana Leper Colony. It will be recalled that administration of large effective doses was made possible by the chemical preparation of salts of the two active acid constituents of the oil, chaulmoogra and hydrocarpic acids.

Detection of Fruit which has been Frozen.—Dehn and Taylor have worked out a simple method of finding out if a given fruit has been preserved by freezing, by determining the ratio of sucrose to invert sugar in the sample. The processes of ripening, rotting, and freezing promote inversion, but inasmuch as invert sugar is consumed by moulds, yeasts, etc., to a greater extent than sucrose, this method is not applicable to fruit which has been kept in cold storage over too long a period.

Deterioration of Sugar during Storage.—It is claimed that the deterioration of raw sugar during storage, caused by moulds and bacteria, may be prevented if dry or superheated steam be used in the final washing in the centrifuge instead of water. The loss of the Cuban crop due to these organisms is estimated at 1 per cent., or 70 million lb. annually. A method has been devised whereby the probability of loss on storage may be foreseen from a microscopical examination and reference to a curve plotted from observations.

Chemical Publications.—In his presidential address to the American Chemical Society at Chicago in September, Prof. W. A. Noyes reviewed the history, present position, and prospects of chemical publications.

The plan adopted by the German Chemical Society of issuing its abstract journal, the *Zentralblatt*, only to those who pay a separate subscription for it has not been a success, as nearly one-half of the members do not subscribe for it, and the expense is therefore unduly excessive. When the American Chemical Society launched its abstract journal, *Chemical Abstracts*, in 1907, it increased its membership dues by $3 and supplied it to all members—a policy which has proved very successful. This publication aims at giving an abstract of every chemical article published in the world, provided it contains new results, and "it reaches this aim more nearly than any other abstract journal now published."

The new, fourth, edition of Beilstein's handbook of organic chemistry, now being issued, cost 250,000 marks before printing began, and the advisability of preparing a similar work in English is to be questioned; such a work would take a staff of twenty chemists five years to collect the materials, and the cost might easily be two or three times that of the German handbook. Our needs might be better met by a different type of work, *e.g.*, a book giving all the classes of organic compounds with their methods of preparation and properties, followed by a selected list of the more important compounds of each class with their physical constants and references to the literature.

The series of chemical monographs now being prepared under the auspices of the American Chemical Society, are classified into scientific and technical. In the latter series will appear one on "Industrial Hydrogen," by H. S. Taylor, and one on "Carbonisation of Coal," by H. C. Porter. A monograph on "Enzymes," by K. G. Falk, will be issued shortly, and other volumes in course of preparation are "Organic Mercurials," by Dr. Whitmore, "The Animal as a Converter," by H. P. Armsby, and "Silicates," by R. B. Sosman.

The formula index which will appear for the first time this year in *Chemical Abstracts*, has been founded on a system more logical and consistent than that of Richter. It has been devised by E. A. Hill, of the U.S. Patent Office, and includes inorganic as well as organic compounds.

The Editor of the *Journal of Industrial and Engineering Chemistry* has expressed the difficulties he experiences in resisting the constant pressure put upon him to modify the scientific character of that journal by adopting some of the practices of trade publications. Such methods are not essential for acquiring advertising business, and the practice of including a wide variety of matter so as to interest not only scientific men, but also those in works, commerce, etc., conduces to this end.

Prof. Noyes reminds those who wish to receive and pay for only one or two of the Society's publications that the cost of collecting material for them, editing and type-setting is the same whatever the number of journals printed, and that after this initial work is done the cost per copy is only about $2-3.50; moreover, any decrease in the circulation of the industrial journal would seriously affect the revenue from advertisements.

The address is printed in the November issue of the *Journal of the American Chemical Society.*

BRITISH INDIA.

Estimated Sugar-cane Crop for 1920-21.—The total area under sugar cane in India in 1920-21 is estimated at 2,669,000 acres, a nominal increase of 2000 acres over the final estimate of last year. The distribution of the producing area is as follows:—United Provinces 52·4%, Punjab 16·5%, Bihar and Orissa 10·5%, Bengal 8·7%, Madras 4·2%, Bombay and Sind 3·1%, Assam 1·4%, North-west Frontier Province 1·3%, and Central Provinces and Behar 0·9%. The present condition of the crop, on the whole, is reported to be fair.—(*Indian Tr. J., Oct.* 29, 1920.)

CANADA.

Discovery of Sodium Sulphate in Saskatchewan.—A lake containing sodium sulphate and covering an area of 250 acres is reported to have been discovered near Radville in south-east Saskatchewan. Local interests are preparing to market the sulphate, which is stated to be of about 96 per cent. purity. This is the third sulphate lake that has been found in Western Canada during the last two years.—(*Official.*)

Forest Products Laboratories of Canada.—Referring to the paper entitled "Canadian Opportunities in Chemistry," read by Mr. S. J. Cook at the Third Annual Convention of Canadian Chemists, of which a short review appeared in our issue for October 15 (p. 335R), Mr. Cook writes that our rendering, "Canada has a Forest Products Laboratory but no chemists are employed," is liable to misinterpretation; the phrase he actually used was, ". . . but the Dominion Government is too economical of the people's money to pay chemists to work there." The Superintendent of the Laboratories has also written to the effect that the laboratories have always had a first-class chemical staff, although at the present time (November 5) the force is at a minimum (three men), owing to recent re-organisation; and that the number is to be increased at an early date.

SOUTH AFRICA.

White Sugar Manufacture in Natal.—In the Natal sugar industry a good deal of trouble has always been experienced in the clarification of the juice obtained by crushing the Uba cane. Although this variety of cane has proved the most suitable under the particular climatic conditions prevailing in South Africa, it gives juice which is so "gummy" that the operations of filtering off the mud or precipitate obtained in clarification, and of subsequently boiling the syrup to grain, are both unusually slow. It has long been thought that a more thorough elimination of the impurities than is afforded by ordinary sulphitation was necessary in the case of such juices, and it is therefore of interest to note that at the Mount Edgecombe Estate the carbonisation process (as largely used in Java, requiring 7—10 times the amount of lime used in sulphitation) has been initiated. Very favourable results are reported. Filtration was found to be easy, and boiling to grain was accomplished in much less time than with syrup clarified by sulphitation, whilst a good yield of brilliant white sugar, possessing nearly all the qualities of a refined sugar, was obtained. A disadvantage of the process is the high cost of the limestone, which has to be transported by rail to the neighbourhood of the mills from a distant part of the colony.—(*S. African J. Ind., Oct.*, 1920.)

JAPAN.

The Arsenic Industry.—Fairly large deposits of arsenical ores, carrying from 15 to 30 per cent. of arsenic, are said to occur in the Prefectures of Oita, Miyazaki, Hiroshima, Hyogo, Shimane, and Okayama. The production of ore was 816 tons in 1918 and 952 t. in 1919, exclusive of ore converted into arsenious oxide at the mines. Arsenious oxide, of which 396 t. was produced in 1918 and 1278 t. in 1919, is obtained directly from the ore and also as a by-product in copper and lead smelting; the former method has been in use on a small scale for the last ten years, but by-product recovery plant has been installed only recently. The three largest producers of white arsenic in Japan have a yearly output of 840 tons (crude), 360 and 180 tons (refined), respectively; and the total capacity of the industry is stated to be 4000 tons of arsenious oxide per annum. Arsenious oxide is not imported into Japan, but as it is only used locally to a small extent in the preparation of medicines, insecticides, and wall-paper, the greater part of the production is available for export, chiefly to the United States, Great Britain, Australia, and a little to the Philippine Islands. A certificate of analysis is required for oxide intended for export.—(*U.S. Com. Rep., Oct.* 27, 1920.)

FRANCE.

Industrial Notes.—*Chemical Industry.*—With the exception of the soap makers, who are not working at full capacity on account of the large stocks held by the middlemen, there is great activity in the chemical industry, as is evidenced by the customs returns. In many cases, *e.g.*, synthetic perfumes, glucosides, condensed milk, resinous products, bromine, chlorine, and calcium carbide, the imports have been considerably reduced and in some instances an exportable surplus has remained after the home requirements have been met. German competition, however, is beginning to be felt in spite of the steps taken to prevent it; this is shown by the increasing importations and decreasing exports of sulphuric, nitric, and hydrochloric acids, and of ammonia. The reason is to be sought for in inefficient management, combined with the high price of fuel and the difficulties of transport.

Coal. — During October, Germany supplied 1,145,000 tons of fuel, which is considerably less than deliveries of previous months, and this is causing some anxiety in the French industrial world, particularly in the metallurgical industries, as they are at present largely dependent on imported German coal. In addition, it is rumoured that the United States may cease exporting coal to France. In these circumstances, attention is being paid to the use of lignite briquettes as a ready source of present and future supply. Briquettes made from lignite from the Cologne coalfield have been found to have a content of 21 per cent. oxygen and 44·9 per cent. of volatile matter. These briquettes have already been used industrially, and have given satisfactory and economic results. During the first ten months of the present year, the French production of coal amounted to 72,887,161 tons, which compares with 58,602,721 t. for the same period in 1919 and 96,856,005 t. in 1913.

Metallurgy.—The demand for metallurgical products remain low, on account of accumulation of stocks and restricted purchases. This state of affairs is apparently world-wide, and has led to the lowering of prices by Belgian and German producers in order to secure orders from the United Kingdom. The shortage of pig-iron in Germany has induced a German syndicate to enter into negotiations with French producers for supplies of phosphoric pig iron. The Comptoir Métallurgique Luxembourgéois has opened a branch in Paris for the sale of its products in France and French colonies.

GENERAL.

The Finsbury Technical College.—The projected closing of this college in July, 1921, has occasioned very deep regret not only to a host of old students, but to many others who are familiar with the excellent work which has been done there for nearly forty years. For its size the Finsbury College has furnished a remarkably high proportion of men who are prominent to-day in British chemical science and industry, and there can be no doubt that their success has been largely due to the training they received at the College, training which has not only been scientific and thorough, but which has been imparted by teachers of marked individuality and initiative. With the object of taking active steps to prevent the impending closure, the Finsbury Technical College Defence Committee has been formed, and all who wish to support the movement are asked to send in their applications (with entrance fee 2s. 6d.) to Dr. Atkinson, Finsbury Technical College, Leonard Street, E.C. 2.

Production of Fructose from Inulin.—In *The Times* of November 15, under the attractive title "The Sweetest Sugar," it is stated that Prof. Willaman, of the University of Minnesota, has proposed that artichokes should be cultivated on a large scale with the object of adding to the world's supply of sweetening material. The scheme outlined involves the extraction of inulin from the "fresh tubers," and the subsequent hydrolysis of the polysaccharide to give the simple sugar.

It is premature to criticise the proposal from the economic point of view, but it is evident that some of the statements attributed to Prof. Willaman require correction; if they remain unchallenged, a misleading impression may be given of the progress which has been made in this subject by British chemists. Thus, in the report referred to, it is stated that, "at present nothing is known as to the commercial separation of inulin, or as to the transformation of inulin into fructose, except on a laboratory scale, and Prof. Willaman hopes to direct the notice of technical chemists to research on these processes." In reply, it may be pointed out that, during the war, large quantities of inulin and fructose were extracted from various plant sources (including artichokes), the work being conducted for the British Government in the chemical research laboratory of the University of St. Andrews. As about 7½ tons of raw material was manipulated, the preparation can hardly be described as insignificant, and it may be added that, for the past three years, Messrs. T. Kerfoot and Co., Ltd., of Ashton-under-Lyne, have been extracting inulin and converting it into fructose as a factory operation. It is obvious that if technical or research chemists act upon the suggestion reported in *The Times*, they will find the field well explored.

So far from our knowledge of the compounds in question being imperfect, the chemistry of both inulin and fructose has been actively investigated in this country, and reference need only be made to a paper recently read before the Chemical Society by Prof. J. C. Irvine, which shows that the determination of the constitution of inulin has been far advanced. Another important point which must be borne in mind in considering Prof. Willaman's reported statement is that inulin, under customary treatment, gives a poor yield of solid fructose, the bulk of the product consisting of an uncrystallisable syrup. These by-products are essentially auto-condensation compounds derived from "γ-fructose," and it is by no means certain that such a material could be used as an accessory foodstuff. This has an important bearing on the statistics of the prospective yield quoted in *The Times.*

The article furnishes a striking example of the errors distributed by the daily press in dealing with scientific subjects, errors which result in the raising of false hopes and in discrediting the foresight and work of British chemists.

Nitrates (1913—1919).—(*Imperial Mineral Resources Bureau. Pp.* 28. *Price* 9*d*.).—The chief value of this brochure lies in its statistical tables dealing with the production of and trade in potassium and sodium nitrates during the period of the war. The data, which are confined to the British Empire and Chile, show that, as in the past, the nitrate industry is greatly stimulated by war conditions. Thus the production of saltpetre in British India rose from 14,446 tons in 1913 to 25,056 t. in 1916, and 24,741 t. in 1918; and the imports of sodium nitrate into the United Kingdom increased from 199,000 t. in 1914 to 388,000 t. in 1916, and 526,000 t. in 1918.

Apart from the occurrence of potassium nitrate in British India, the British Empire appears to possess only insignificant supplies of natural nitrates, and it is disappointing to learn that the deposits near Prieska in South Africa (*cf.* J., 1919, 360 T) have proved to be commercially valueless. In June, 1920, the Bureau was informed by the Inspector of Mines, Pretoria, that over 100 tons of shale had given a recovery of about 2 tons of saltpetre, the cost being excessive and resulting in a large loss; most of the nitre was obtained from the outer 12 inches of crust, and at a depth of 4—5 ft. the yield amounted to about 1 lb. of nitrate per ton of rock.

With regard to the duration of the nitrate deposits in Chile, the report of the Chilean Nitrate Committee is quoted to the effect that the estimated amount of sodium nitrate in the examined ground is 245,300,000 tons, a quantity which is not likely to be exhausted for 200 years. The production of Chilean nitrate in recent years has been as follows (metric tons):—1913, 2,773,552; 1914, 2,464,427; 1915, 1,763,639; 1916, 2,914,542; 1917, 3,013,517; 1918, 2,841,198; 1919, 1,672,374.

The "Caa-ehe" Plant as a Sweetening Agent.—The "caa-ehe" (*Stevia Rebaudiana*) is a plant belonging to the Compositae which grows along the base of the Amambay Hills in north-east Paraguay, where it is used by the natives as a sweetening agent. The sweet constituent is a glucoside named estevin, which is accompanied in the plant by another known as rebaudin, which is probably a compound of estevin with potassium and sodium. Estevin and rebaudin are stated to be, respectively, 150 and 180 times sweeter than cane sugar; the leaves are said to contain 20·26 per cent., and the entire plant 1·6 per cent. of the sweet principle. The plant also contains a wax, resin, fatty oil, and a bitter principle, which remain in the crude sweet principle extracted from the plant; the bitter principle, however, can easily be separated from the glucoside. Although the plant does not grow well from cuttings and is usually not reproduced from seed, it is said to be propagated easily by division of the stalk and from suckers. A plantation of "caa-ehe" has been established and is reported to be in a position to supply plants. It has been stated that the glucoside cannot be profitably extracted on a commercial scale, and that the powdered leaves would have to be used for sweetening purposes.—(*Bull. Imp. Inst.*, 18, *No.* 1, 1920.)

Salt Production in Holland.—The scarcity of salt in Holland during the war led to the search for this mineral, which was ultimately discovered in the provinces of Gelderland and Overijssel. Production began in August, 1919, and the output, which was 5244 tons in 1919, is now estimated to be at the rate of 28,000 tons per annum, *i.e.*, one-sixth of the total Dutch consumption (170,000 t.).—(*U.S. Com. Rep., Sept.* 15, 1920.)

Coal Production in Holland.—The Dutch production of anthracite in 1919 was 3,401,546 metric tons, and that of lignite 1,881,962 t., compared with a total production of 1,873,000 t. in 1913. The number of miners increased from 18,250 in 1918 to 20,318 in 1919, wages were advanced by 37 per cent., and the 8-hour day was adopted, but the annual output per man fell from 185 to 166 metric tons. Holland requires about 8,000,000 t. of coal per annum, and therefore it is largely imported. During the first quarter of 1920, Germany furnished 627,707 t. of coal (264,210 in 1918) and 135,675 t. of coke (70,186 in 1918), but Belgian exports decreased considerably, and as it has been impossible to obtain supplies from England, the United States and South Africa, the coal situation has become very serious.—(*Techn. Mod., Oct.*, 1920.)

Lignite Production in Italy.—The Italian output of lignite began to increase after the outbreak of war in 1914, and from 697,319 tons in 1913 it reached 1,702,880 t. in 1917 and 2,216,583 t. in 1918. Following the armistice there was a decline in production, partly owing to the cessation of war demands and partly owing to the poor results obtained at some of the mines. The largest production in 1918 was furnished by the Arezzo mines, viz., 1,051,000 t., and this was followed by Perugia, Siena, and Grosseto, with 333,000, 219,000, and 135,000 t., respectively. Before the war the reserve of lignite in Italy was estimated at about 100 million t., but recent work has shown that the known deposits contain about 270 million t. (*cf.* J., 1919, 188 R).—(*U.S. Com. Rep., Sept.* 4, 1920.)

Dyestuff Requirements of Poland.—The development of the Polish chemical industry prior to the war was rendered impossible by Russian policy and by the favouritism shown to German industry by the Austrian Government. United Poland, however, has a highly developed textile industry, and for this the necessary dyestuffs and intermediates cannot be obtained from Germany, partly on account of the low value of Polish currency, and partly owing to German obligations under the Peace Treaty. It is estimated that 4862 tons of dyestuffs is required annually, in addition to large quantities of pharmaceutical chemicals; and the Polish Government, basing its claim on the devastation wrought by Germany, is appealing to the Allies to force that country to furnish reparations in the form of dyestuffs and chemicals.—(*Polish Econ. Bull.*, Nov., 1920.)

The German Asbestos Industry.—Germany imported prior to the war about 15,000 tons of asbestos per annum, chiefly from Canada, Russia, and to a smaller extent from the United States, China, and South Africa; owing to the favourable conditions of importation, the home production was less than 2000 tons per annum. On account of shortage due to the war, existing mines, such as those at Zöblitz (Erzgebirge) were worked more intensively, and deposits hitherto unexplored were opened up in Thuringia, in the Reusser Oberland, and at Heberndorf. The mineral usually occurs mixed with ochre and sand as asbestos-earth, and is difficult to win. As it has a short fibre and cannot be spun, it is mainly used for boards, packing, etc. The great home demand for asbestos has not been met by increased production, and imports have somewhat diminished. It is reported that asbestos mines have been opened, through German agency, at Valtellina (Italy), Sterzing, Zillerthal, St. Gothard (Tyrol), Mantern in Steiermark, and near Newjansk in the Government of Perm (Russia).

A substitute known as "Deutsches Asbest" was produced during the war, and other materials employed included a mixture of good-quality wool waste, silk, cotton, and animal hair, about 10 per cent. of magnesium chloride being added to these to reduce inflammability. There was a large output of asbestos boards during the war, and at one time it rose to a million square metres per month.—(*Bd. of Trade J., Oct.* 14, 1920.)

The German Electro-technical Industry.—According to a report of the Siemens, Schuckert, Henrich Co., the German electro-technical industry, which furnished 40 per cent. of the world's production in 1913, has been adversely affected by foreign competition, strikes, a 50 per cent. decrease in orders, high production costs, and labour unrest. The output of electric lamp bulbs was 70 millions, and of this amount only 25 per cent. was exported, compared with 50 per cent. before the war. The provision of raw materials constitutes a problem in itself, and the fuel shortage, due to the Spa agreement, further complicates the situation. The decreased production has greatly increased working costs, and although profits have risen they by no means compensate for the advance in wages.—(*Techn. Mod., Oct.*, 1920.)

Resources of the Crimea.—The Crimean peninsula has an area of 6,373,147 acres, and supports a population of 808,900. Wheat, the principal product, is grown over about one-half of the cultivated area. The flax grown in the districts of Theodosia and Eupatoria is used for the production of linseed oil. There are enormous reserves of high-grade salt, of which 560,549 tons was produced in 1919. In addition to table salt, the lakes and deposits yield large quantities of sodium sulphate and also bromide, the production of pure bromide from Sakki alone amounting to 36,100 lb. in 1916. Reserves of magnesium chloride, estimated at about 1,620,000 tons, are present in the Perekop district in lakes cut off from the sea. Iron ore occurs in the Kertch district, where the pre-war output amounted to 467,410 t. of ore with 40 per cent. of iron and 1 per cent. of phosphorus; the deposits are extensive; they lie on the surface and are situated near the seaboard. Coal was recently discovered at Beshonisk and is now being mined. Petroleum occurs in the Kertch district, where a yield of about 650 tons was obtained before the war. The sulphur deposits situated between Kertch and Theodosia were worked prior to 1914, but have been abandoned since the revolution.—(*Russo-Brit. Ch. of Comm. J., Aug.*, 1920.)

Mineral Resources of Bulgaria.—The mineral wealth of Bulgaria has been known from very ancient times, but mining was generally on a small scale and of a primitive nature. Recently, however, surveys have revealed considerable mineral resources, and German interests have been actively engaged in prospecting for coal and other minerals. Prior to 1912, 40 concessions were granted for various minerals, and since then a large number of concessions has been granted for lignite and oil-schist areas. There are large reserves of lignite, with a calorific value between 2300 and 4500 heat units and good briquetting properties, and near Sofia there is a very extensive basin containing a black bituminous coal of a calorific value varying from 7000 to 8500 units. Several rich copper deposits occur at Placalnitza (70 km. west of Sofia), where a large smelting plant is operated by a French company, and at Burgas, on the Black Sea. Iron and manganese deposits are found in several districts, usually under favourable conditions as regards supplies of water power and fuel, but lack of capital has hitherto prevented their exploitation. There are numerous copper, zinc and lead deposits, and gold has been found in several river beds, whilst abundant supplies of granite, marble, lithographic stone, fuller's earth, fire clay, various ochres, etc., are available, but have not been worked to any extent.—(*Ch. of Comm. J., Sept.* 24, 1920.)

PERSONALIA.

The Mackenzie Davidson medal of the Röntgen Society has been awarded to Dr. F. W. Aston for his work on isotopes.

Dr. F. Mollwo Perkin has been appointed Commander of the British Empire (C.B.E.) for valuable services rendered to various Departments of State.

Dr. R. H. Pickard, Principal of the Battersea Polytechnic, has been appointed director of research to the British Leather Manufacturers' Research Association.

Mr. H. N. Thomson, of the International Smelter, Tooele, Utah, has been called to the chair of metallurgy in the University of British Columbia, Vancouver.

Dr. Wilder D. Bancroft, professor of physical chemistry at Cornell University, U.S.A., has been appointed director of research to the Norton Company, Worcester, Massachusetts.

Dr. E. Anderson, professor of agricultural chemistry in the Transvaal University College, Pretoria, has been appointed to the chair of general chemistry in the University of Nebraska.

Prof. H. MacLean, professor of chemical pathology at St. Thomas's Hospital and a well-known biochemist, has been appointed director of the Clinical Medical Unit in the same institution.

Recent professorial appointments in Germany include that of Dr. G. Rasch, formerly of the Technical "Hochschule" at Aachen, to the post of honorary ordinary professor of pure and applied physics in the University of Heidelberg; of Dr. F. Knoop, who recently declined the chair of physiological chemistry at Leipzig University, as professor of the same subject in the University of Freiburg; and of Dr. F. Czapek, of the German University at Prague, to succeed the late Prof. W. Pfeffer in the chair of plant physiology in the University of Leipsig.

The Salters' Institute of Industrial Chemistry has awarded five fellowships for post-graduate study in the laboratories indicated:—Mr. A. H. Adcock (Liverpool University), Mr. J. A. Gentle (Oxford), Mr. S. J. Saint (Reading), Mr. C. B. Taylor (Imperial College of Science and Technology), and Mr. Donald Turner (Sheffield). Scholarships have been awarded to Messrs. M. D. Forbes and G. M. Lowe (Imperial College of Science and Technology), A. W. Pritchard, and F. W. Turner (East London College). Forty-five grants-in-aid have been awarded to chemical assistants, occupied in factories in or near London, to facilitate their further studies.

We record with regret the death, on December 5, of Mr. P. S. U. Pickering, aged 62 years.

By the death of Sir William Abney, on December 3, at the age of 76, photographic science loses one of its earliest and most prominent investigators. Captain Abney, as he then was, did notable work at the time when the collodion "wet" plate was being superseded by the "dry" plate, and he wrote the first practical treatise on the manufacture of sensitive emulsions. Later he did much to further our knowledge of colour photography by the three-colour process. He was also prominent in the investigation of colour vision, and as early as 1872 he was awarded the Rumford Medal of the Royal Society for researches on radiation. Sir William Abney was many times president of the Royal Photographic Society, and he held various prominent appointments in the Science and Art Department, South Kensington, and at the Board of Education.

The death is announced of Dr. S. J. Meltzer, head of the department of physiology and pharmacology in the Rockefeller Institute of Medical Research.

Mr. Charles E. Acker, who joined this Society in 1902, died on October 18, at Ossining, N.Y., at the age of 52 years. Mr. Acker was a prolific inventor in the field of electrochemistry and was awarded the Elliott Cresson gold medal of the Franklin Institute for an electrolytic process for the manufacture of caustic soda. Latterly he had been identified, as vice-president of the Acker Process Co., with the development of the power resources of the Niagara Falls.

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

German "Reparation" Dyes.

Answering Major Barnes, Sir R. Horne said that the amount of German dyes delivered to this country under the reparation clauses of the Peace Treaty was about 560 tons last year, and about 1050 tons to the end of October, 1920.—(Nov. 22.)

Importation of Gas Mantles.

Sir R. Horne, replying to Sir J. Remnant, stated that the value of the imports of gas mantles from January 1 to November 6, 1920, was £136,000, an increase at the rate of 500 per cent. compared with the same period in 1919. The loss in wages to British workers due to these imports might be 50 per cent. of the total value. During the first week of November, gas mantles valued at £3936 were imported, and their foreign origin was in some cases not indicated clearly. Legislation to deal with key industries and to amend the Merchandise Marks Act in accordance with the recommendations of the Merchandise Marks Committee would be introduced early next session.—(Nov. 22.)

Importation of Glass Goods.

In a statistical answer to Mr. A. Short, Sir R. Horne gave the total value of the glass and glassware imported from all countries during the period January 1, 1919, to October 31, 1920, as £10,575,234, including:—Plate and sheet glass, £3,014,261, of which Belgium supplied 81·1 and the United States 5·8 per cent; glass bottles and jars, £3,060.201 (Netherlands 36·6, United States 24·1 per cent.); other glass and glassware, £4,500,772 (Belgium 31·5, Germany 15·8, United States 15·1 per cent.).—(Nov. 23.)

Values of Soap-making Materials.

Replying to Major Barnes, Sir R. Horne stated that the values of soap-making materials had decreased, but no reduction had been made in the price of soap. It was hoped that the sub-committee now investigating combinations in the soap-making industry would present its report before Christmas. —(Nov. 29.)

Importation of Photographic Paper.

In reply to Mr. Grant, Sir R. Horne said that he was aware that the photographic base paper industry, which was developed during war time and which is covered by the Prime Minister's pledge in regard to key industries, is seriously menaced by foreign competition on account of the low rates of exchange. It was hoped to introduce legislation dealing generally with key industries and other matters of commercial policy as the first matter of next session.—(Nov. 29.)

Benzol Production.

Sir R. Horne, answering Mr. Brittain, gave the average monthly production of refined benzol during the first nine months of the current year as about 1,650,000 galls., which compared with an average monthly production of 2,200,000 galls. during 1918. In his opinion the reduced output of coal had had the effect of reducing the output of by-products.—(Nov. 29.)

Electrical Power (Severn Scheme).

In a written answer, Sir E. Geddes informed Mr. Jesson that it was proposed to combine the scheme for a bridge over the Severn with a scheme for the generation of electrical power. It was estimated that a continuous supply of 500,000 units could be produced at a cost of a little over ½d. per unit. The scheme, which ought to be referred to independent experts before Parliamentary sanction is sought, would find employment for 10,000 men for seven years, but it was not sufficiently advanced from a technical point of view for early adoption, even if financial conditions did not arise.—(Nov. 30.)

[The scheme referred to has been put forward by the Ministry of Transport. It proposes to harness the tidal waters of the Severn by erecting, at a point where it is about 2½ miles wide, a barrage in which turbines and generators would be installed. The generators would have a capacity exceeding one million continuous h.-p., one-half of which would be available for distribution, and the other half would be utilised for pumping water from the river Wye to a high-level reservoir near Tintern Abbey; so that when the turbines in the dam were unable to operate, the water from the reservoir would be used for driving a second set of turbines.]

Canadian Oilfields.

Mr. Kellaway, in reply to Mr. Pennefather, said that H.M. Trade Commissioner at Winnipeg had reported that oil had not yet been discovered in commercial quantities in Canada save at Fort Norman on the Mackenzie River, 1,000 miles north of Edmonton, where climatic and other conditions tended to restrict immediate development.—(Dec. 2.)

Dyestuffs (Import Regulation) Bill.

The Government Bill to safeguard the British dyestuff industry was introduced by Sir R. Horne, the President of the Board of Trade, on December 2. It proposes to prohibit the importation into the United Kingdom, for ten years only, of all synthetic organic dyestuffs, colours and colouring matters, and all organic intermediate products used in the manufacture thereof. Goods imported under the Act shall be subject to the provisions of the Customs Consolidation Act. The Board of Trade shall have power by licence to authorise the importation of any of the goods the importation of which is proscribed by the Act; and in respect of the granting of licences the Board shall be advised by a committee constituted of five persons concerned in the dye-using trades, three persons concerned in the manufacture of dyestuffs, and three other persons who are not directly concerned, one of whom shall be appointed chairman by the Board. The Board may charge in respect of a licence a fee not exceeding £5. The Act shall not apply to goods imported for exportation after transit through the United Kingdom or by way of transhipment.

The second reading was agreed to on December 7, after an amendment for its rejection had been lost by 277 votes to 72.

Dyestuff Imports.

Answering Mr. Lambert, Sir P. Lloyd-Greame gave the total value of the imports of dyestuffs for the period January to October, 1920, as £7,481,452, which comprised intermediates (including aniline oil and salt and phenylglycine) £636,068, finished coal-tar dyes £5,267,076, dyeing extracts £1,484,786, and natural indigo £93,522. During the same period the total value of the exports of textiles in the manufacture of which dyes have or may have been used was £317,770,896.—(Dec. 6.)

The Dyestuff Industry.

Sir P. Lloyd-Greame, in a written answer to Mr. Glanville, gave a list of the thirty-two principal companies engaged in the manufacture of dyestuffs in the United Kingdom; and in another reply to the same member he said that the terms of the new Bill (*cf. s.*) had been arrived at after conferences with the Calico Users' Association, the British Dyestuffs Corporation, and the Association of British Chemical Manufacturers, the last-named representing also the other dye-makers and the manufacturers of intermediates.

In reply to Mr. C. White, Sir P. Lloyd-Greame stated that the following grants and loans had been made to dye-makers:—Scottish Dyes, Ltd., a grant-in-aid of £75,000 for general purposes, £4000 for research, and a further research grant up to £1000 per annum for three years; J. B. and W. R. Sharp, Ltd., a grant-in-aid of £10,000 and a loan of £17,000; British Alizarine Co., Ltd., a grant-in-aid of £107,000. A grant of £100,000 for research had been made to the British Dyestuffs Corporation in pursuance of an undertaking given to British Dyes, Ltd., at the time of its formation.—(Dec. 6.)

GOVERNMENT ORDERS AND NOTICES.

Export of Photographic Chemicals.—The Board of Trade has issued (December 2) an open general licence for the export of photographic chemicals containing not more than 20 per cent. of coal-tar derivatives.

Export of Coal.—The Board of Trade (Licensing Section) has given notice that, as from December 1, the open general licence for export of coal (of December 18, 1919) is revoked. The Board has made a new order, viz., the Coal (Bunkering and Export) Prices Revocation Order and Direction, 1920, dated November 24.

LEGAL INTELLIGENCE.

Capital Value of a Patent. *Hamer* v. *Inland Revenue Commissioners.*

The question of the capital value of a patent from the standpoint of excess profits duty was considered by Mr. Justice Rowlatt in the Court of Appeal on October 13.

The appellant took out a patent at a cost of £400 in 1917, and having made a net profit of £1740 in a year partly by the use of it, he estimated its value at £6000 for the purpose of excess profits duty. The Revenue Commissioners, however, decided that its value as an asset of business was £400, and the appeal was against this decision.

In dismissing the appeal, his Lordship said that, according to the Finance (No. 2) Act of 1915, the value of the patent was to be taken as it appeared to those who assessed it at the moment it became an asset, and not as it appeared to someone who could foresee its future worth.

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for November 25 and December* 2.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London. S.W. 1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
Canada	Synthetic oils, colours, perfumers' raw materials	714
,,	Chemicals, dyes, colours, gums, tanning materials	*
Egypt	Cement	768
Kenya Colony	Paint, oils	721
Rhodesia	China, glassware	723
South Africa	Glass bottles, toilet soap	716
,,	Galvanised wire, corrugated iron	765
Austria-Hungary Czecho-Slovakia	Heavy chemicals	725
Belgium	Tool steel	769
Denmark	Soda, shellac	731
,,	Oils, asbestos	733
France	Tanners' chemicals, chemicals for dyeing, dressing and bleaching textiles	735
,,	Chemicals, drugs	736
Latvia	Burnt magnesite, magnesium chloride, water-glass, powdered flint	773
Sweden	Heavy chemicals for paper, pulp, glass and textile trades	745
Switzerland	Cocoa beans, petrol, paraffin	746
,,	Pharmaceutical chemicals, disinfectants	747
China	Soap	778
United States	Bottles	782
Cuba	Crockery	754
Panama Republic	Paper bags, crockery	755
,,	Drugs	756
Argentina-Uruguay	Printed sheep skins, paint, varnish, galvanised sheets, carbon papers	784
Brazil	Paint, enamel, varnish, polishes	786
Chile-Uruguay	Rubber tubing	753
South America	All kinds of paper	787

* The Canadian Government Trade Commissioner, 73, Basinghall Street, London, E.C. 2.

Market Sought.—An agent in Rumania offers for sale the mining rights of certain manganese and iron ore deposits in the Krasso-Szoreny district. [Inquiries to the Department.]

TARIFF. CUSTOMS. EXCISE.

Australia.—The import duty on oil of creosote (beechwood) as a medicinal oil not compounded is fixed at 3s. per dozen pint vessels under the British Preferential Tariff.

Barbados.—The restrictions on the import of foreign dyestuffs has been temporarily suspended as from September 30.

The import of cotton seed is prohibited except under licence as from September 2.

Brazil.—All export prohibitions have been removed as from November 17.

Consumption duties, in addition to customs duties, are levied on, *inter alia*, alcoholic beverages, alcohol, perfumery, matches, salt, vinegar, acetic acid, candles, certain kinds of glassware and pottery, and sugar.

A stamp tax has been imposed on all pharmaceutical specialities.

Bulgaria.—The import is still prohibited of spirits, cocoa, chocolate, volatile oils, perfumes, "sterioptin," certain kinds of glass and porcelain, and of various paper and metallic wares.

Gambia.—The export duty on groundnuts is fixed at 20s. per ton. The customs duties on all foodstuffs except kola nuts have been abolished.

Greece.—Export licences are still required for condensed milk, explosives, matches, metals, petroleum, salt, soap, and sugar.

Japan.—Export restrictions have been withdrawn from pulp, printing paper (except "Lara"), superphosphates and other fertilisers.

Luxemburg.—Export taxes on iron ores and iron wares have been withdrawn as from November 14.

New Hebrides.—The import duty on spirits has been raised to 18s. per proof gallon.

Portugal.—The full text of the Decree modifying the import restrictions is given in the issue for November 25.

In most cases the new surtaxes are the same as those of the Decree of May 10, 1919, but that on tin is reduced.

Among the articles now subject to import surtax are skins, camphor, volatile oils, marble, alabaster, tin, tin alloys, salt, alcoholic beverages, vinegar, chocolate, porcelain, plate glass, fireworks, perfumery, and toilet soap.

Spain.—Importation of dry hides and skins is permitted under certain conditions from all countries, except Belgium, as from November 10.

Department of Overseas Trade.—The Department of Overseas Trade (Development and Intelligence) has published a handbook dealing with its organisation and activities, and containing a map showing the location of British Commercial Officers throughout the world. Mr. Kellaway has written an introduction on the need of Government assistance to—not interference with—commerce, and this is followed by chapters on the various methods by which that assistance is given, the organisation overseas and at headquarters, the British Industries Fair, etc. The handbook will be supplied gratis to United Kingdom merchants and manufacturers on application to the Department, at 35, Old Queen Street, S.W. 1. (Ref. No.2092/TG.)

REPORT.

Report on the Economic, Financial, and Industrial Conditions of Holland in 1919. *By* R. V. Laming, *Commercial Secretary to H.M. Legation, The Hague. Pp.* 114. *London: H.M. Stationery Office,* 1920. [*Cmd.* 872. 1*s.*]

The mineral resources of Holland include coal and salt (*cf. s.*, p. 417 R), which do not suffice for local needs, extensive deposits of bog iron ore, moulder's sand, and peat. The bog iron ore is exported to some extent for gas purification, and during the war moulder's sand was shipped extensively to this country. Peat extraction was also intensively pursued owing to the pressing need for fuel.

The Dutch industries recovered sooner than had been expected from the stagnation of the war period, but they were unable to take full advantage of the return of trade on account of export restrictions and American competition in neighbouring countries. Increased confidence, however, is being shown by Dutch investors in the development of home industries.

Chemical and Allied Industries.—Conditions in the chemical industry were unfavourable during the first six months; production decreased, the labour question was acute, and towards the end of the year there was an influx of cheap imports. The manufacture of synthetic dyes developed considerably, but the fertiliser industry suffered from shortage of phosphates and pyrites, although there was an increase in the production of sulphuric acid. The pharmaceutical chemical industry improved its position and benefited from a brisk demand from both home and foreign markets. The paint factories were kept working at full capacity, and prospects were considered good, provided the supplies of raw materials from Germany (lithopone, zinc white) and England were maintained. The soap, wax, dextrin, and cement industries were unfavourably affected by foreign competition, and the oil-crushing mills suffered from high prices of raw material, increased wages and freightage, and low rates of exchange. Many oil mills were expected to close down, and others were maintained by crushing the raw material imported by the margarine factories, as only linseed oil crushed from seed not imported by the Government was free from export restrictions; the demand for rapeseed oil decreased owing to the greater demand for margarine for cooking. The margarine industry had to meet a continuous increase in the demand on the home and foreign market, and its prospects were considered good. An improvement took place in the glass industry towards the end of the year, and there was a considerable home demand for bottles and window glass. The manufacture of electric-lamp bulbs continued to improve, and was not affected by the adverse exchanges owing to the large demand and the excellent quality of the output. The future of the gas-mantle industry is regarded with anxiety owing to foreign competition and the closing of the chief market—the British Empire. Although the match industry was not in a satisfactory condition at the end of the year, the future seemed more promising. The metallurgical industries benefited from a large home demand, and foreign competition did not prove very severe. The rubber, artificial silk, and textile industries were, on the whole, fairly prosperous, but the leather industry was practically at a standstill at the end of the year. Sugar factories had a prosperous year, and the cocoa and chocolate factories resumed normal work, but after the home demand had been satisfied and exports permitted, the adverse exchanges stopped business and led to a decline in output.

Foreign Trade.—The exports in 1919 amounted in value to £143,116,529 (taking the par value of the florin as 1s. 8d.), and included:—Margarine, £5,352,314; minerals, metals, and products thereof, £30,828,926; chemical products, drugs, and colours, £2,440,744; oils, resin, wax, pitch, coal tar, and products thereof, £9,418,595; hides, skins, leather, and leatherwork, £4,292,707; earthenware, chinaware, pottery, etc., £718,016; glass and manufactures of, £1,138,182. The total imports were valued at £246,138,182, and included:—Minerals, metals, and products thereof, £81,380,992; chemical products, drugs, and colours, £3,811,983; oils, resin, wax, pitch, coal tar, and products thereof, £20,061,653; hides, skins, leather, etc., £5,812,727; earthenware, chinaware, pottery, etc., £848,182; glass and manufactures of, £659,597. Coal imports amounted to 2,957,191 metric tons, worth £11,464,023, including 772,922 tons from Germany, 1,079,449 tons from Belgium, 375,543 tons from Great Britain, 663,536 tons from the United States, and 64,802 tons from Canada.

In general the demand for British goods was great for all classes of articles, and it is stated that the unique opportunity during the past year for obtaining a good hold on the Dutch market has been taken advantage of by British firms, but keen competition, especially from Germany and America, will have to be met in the future. Although many complaints were made regarding the refusal or delayed delivery of British goods, such complaints were not so serious as those relating to American orders. Germany was still the only source of supply for acetic, nitric, and hydrochloric acids, caustic potash, liquid carbon dioxide, sal ammoniac (75%), lithopone, aniline, synthetic indigo, etc.

TRADE NOTES.

FOREIGN.

The Projected American Dye Trust.—The importance of the impending amalgamation of five of the leading chemical companies in the United States (*cf.* J., 1920, 348 R) under the title of the Allied Chemical and Dye Corporation, with a capital of some £60,000,000, is enhanced by further information that has become available. Of the associating companies, the National Aniline and Chemical Co. has the largest aniline plant in the United States and carries dye production through from base to final products; the General Chemical Co. manufactures a large variety of chemicals; the Barrett Co. is one of the largest producers of roofing and paving materials in the country and makes a variety of coal-tar products; the Semet-Solvay Co. produces steel, copper, coke, lumber, gas, oils, chemicals, etc., and through the Solvay Collieries Co. has over 10,000 acres of coal land available in West Virginia and Kentucky; and the Solvay Process Co., in addition to producing soda products, possesses extensive by-product coke plants, which will provide the other companies with the necessary supplies of raw materials. At present, the American output of dyes is about 30,000 tons per annum, or roughly the same as that of the British dye factories.

Trade Conditions in Japan.—A report from H.M. Commercial Counsellor at Tokyo states that although the commercial situation in Japan will probably grow worse before it gets better, the country as a whole is financially sound. The present depression is due to extravagant speculation, excessive buying having resulted in the accumulation of stocks for which there is no sale, particularly in regard to cotton and textiles, fertilisers, caustic soda, soda ash, carbolic acid and other chemicals, tinplate, copper, etc. The value of the imported fertilisers increased from about £7,000,000 in 1913 to about £19,000,000 in 1919, and during the first seven months of 1920 it reached the record figure of £20,000,000. This market has become much overstocked, great losses have been incurred, and large quantities have been re-exported. Of the many new ironworks which were erected during the war, it is said that not one is now paying its way, and several have been closed down. The normal export of copper is about 40,000 tons yearly and the imports nil; in the first half of this year 3500 tons was exported and 20,000 tons imported, with the result that prices fell and copper had to be re-exported at a considerable loss. The export trade is more hopeful, the figures for the period January to July having practically reached the level attained for the same period in 1918; and it is suggested that if the Japanese will cut their losses and not try to maintain prices at an unnatural level by decreasing production, their trade may soon recover.

Proposed Japanese Duties on Chemicals and Dyes.—The Japanese Chemical Industry Association has started an inquiry into the need of instituting a comprehensive tariff system for those chemical products which have not yet been protected (*cf.* J., 1920, 348 R). The suggested duties include:—Carbolic acid, 35% *ad valorem*; potashes, 20%; glycerin, 60%; caustic soda, soda ash, and other alkaline products, 25%; acetate of lime, an increase of 5% *ad valorem* on the present duty.

Japanese indigo merchants have taken steps to prevent the importation of natural indigo from British India and other countries for the next five years. The local indigo industry, which revived during the war owing to lack of foreign competition, is now severely menaced by the resumption of imports from abroad. For the first six months of 1919 and 1920, the imports of natural indigo were 112 tons and 389 t., and of synthetic indigo, 70lb. and 53 t., respectively.—(*Oil, Paint and Drug Rep., Oct.* 27, *Nov.* 11, 1920.)

The Tinplate Industry in Japan.—In spite of the growing demand for tinplate, due to the development of the petroleum and canning industries, the home manufacture is still in its infancy on account of lack of skilled labour, insufficient capital, and high production costs. The following figures show the imports of tinplate in recent years (the value of the yen being taken at 2s.):—

	Tons.	Value. £
1911—1915 (average)	26,277	493,347
1916	39,305	1,008,370
1917	26,848	1,172,562
1918	29,311	2,683,671
1919	37,366	1,751,565

—(*Bd. of Trade J., Oct.* 27, 1920.)

Coal-Tar Dyes in Serbia.—Prior to the war the Serbian trade in coal-tar dyes was controlled by the Bayer and the Cassella companies, which maintained stocks in Belgrade and usually supplied consumers with small quantities sent through the post against cash payments. The stocks of these two German companies have been purchased by a Serbian undertaking, Tanaskovitch and Bogdanovitch, which now practically monopolises the market.—(*U.S. Com. Rep., Sept.* 20, 1920.)

Chemical Requirements of Rumania.—The chemical industry of Rumania is very undeveloped and when the country became a belligerent there were only 18 chemical factories of any size, and these works were practically all managed by Austrian technologists. Konzelmann and Mörsner A.-G., of Galatz, is the largest undertaking and has a capital of 1·2 million lei (£48,000 on the basis of 25 lei to £1). There are 14 firms located at Bucharest, having capitals varying between £4000 and £30,000. The two sulphuric-acid factories have a total capital amounting to £80,000; they employ a maximum of 120 men, and their annual production is valued at about £32,000. The local production of chemicals does not meet the demand, and large quantities have to be imported, chiefly from Germany, Austria, England, France and Belgium; imports in 1913 were as follows:—Chemical and medicinal products, £486,520; perfumes, £74,080; paints and varnishes, £106,200; explosives, £1,246,454; vegetable oils, £48,580. Of the total value, £1,961,834, Germany supplied 49·9, Austria-Hungary 38·4, England 5·1, France 4·3, and Belgium 1·5 per cent. Owing to her increased territory and larger population, Rumania's requirements in chemicals will now be very much greater.—(*Chem. Ind., July* 28, 30.—1920.)

Trade of Mesopotamia.—The internal development of Mesopotamia has already begun and trade conditions have been stabilised to a certain extent. The total imports, which have shown a marked increase during the last two years, were valued at £12,266,666 (1399 lakhs of rupees) in 1919, and included metals and ores worth £166,666 and soap worth £153,333; exports, valued at £6,503,333, included sugar (£533,333), spices (£63,333), and gum (£66,666). Barley and dates form the bulk of the agricultural produce exported, and wool constitutes an important item in normal years. As one-half to three-quarters of the goods imported into Mesopotamia eventually reach Persia, as much attention should be paid to Persian requirements as to those of Mesopotamia.—(*Bd. of Trade J., Sept.* 30, 1920.)

Corrigendum.—In the issue of November 30, p. 396 R, line 60, in lieu of "professional," read "professorial."

COMPANY NEWS.

BRITISH CELLULOSE AND CHEMICAL MANUFACTURING CO., LTD.

According to the report of the directors, the financial year ended June 30 last was one of great difficulty owing to the cessation of Government demands for war products, for the manufacture of which the factory at Spondon was primarily established. The termination of the Government contracts necessitated the development of new industries having commercial outlets commensurate with the capital invested in the works. The installation of a large silk plant was decided upon, for which the raising of fresh capital became necessary. The issue of preference capital in March was fully subscribed. Constructional work has progressed as satisfactorily as conditions have allowed, but manufacture was only possible on a comparatively small scale, and the output of carbide, celluloid, "spondite," and various chemicals was rendered unprofitable by the dead weight of overhead charges applicable to the whole undertaking. The position, it is stated, will be remedied as soon as the output of silk reaches a commercial level. Lt.-Col. W. Grant Morden, Maj.-Gen. G. B. Hughes, and Mr. A. B. B. de Tscharner have retired from the directorate.

The accounts presented summarise the results of the transactions of the company and those of the operating company (now in liquidation) since their inception. They show a loss on the year's operations of £237,739, which reduces the balance at credit of profit and loss to £85,007, and this sum is recommended to be carried forward. Trading loss accounts for £85,393, interest £96,821, general expenses £57,521 and depreciation £1590 (less sundry profits £3587). The issued capital at June 30 was £6,543,269, of which £4,250,000 represents 7½ per cent. preference shares of £1 each. Property and assets include:—Land, buildings, plant, etc., at cost, £3,286,938; preliminary expenses, £304,814; goodwill, patents and patent rights, £1,884,678; stocks, stores, etc., £296,093; and cash, £814,246.

Wetcarbonising, Ltd.—At a special meeting held on December 2, the Rt. Hon. Gerald W. Balfour presiding, it was resolved that the company should go into voluntary liquidation. The liabilities are placed at £372,000 (including £200,000 to the Government), and the assets, immediately realisable, at practically nil. The company held the exclusive right to a process of peat-drying.

Low Temperature Carbonisation, Ltd.—According to a technical report on the company's process as now operated at Barnsley, prepared by Major H. L. Armstrong, managing director, the capacity of the retorts is 25,000 tons per annum and that of the by-products plant nearly 100,000 tons. The company's engineers state that the plant is working very satisfactorily, and that the yields to be expected are, from every ton of bituminous coal carbonised, 14 cwt. of "coalite" smokeless fuel, 16—20 galls. of fuel oil, 3 galls. of motor spirit, gas and sulphate of ammonia.

Chilean Nitrate Producers Association.—It is reported that an arrangement has been arrived at with the German nitrate producers (the German Nitrate, Sloman, and Gildemeister companies) whereby these will immediately join the Association. The basis is said to be that the Association will pay the German companies 3s. 6d. per quintal on the 2 million quintals they have for sale, on the understanding that the whole amount shall be withdrawn from the market. If this arrangement be ratified, the Association will represent about 97½ per cent. of the total nitrate production in Chile.

REVIEWS.

Electro-deposition of Metals. *By* G. Langbein. *Translated, with additions, by* W. T. Brannt. *Eighth edition, revised and enlarged. Pp.* 863. *(London: Hodder and Stoughton, Ltd.* 1920.) *Price* 42*s. net.*

This work is a new edition, considerably enlarged, of Dr. George Langbein's handbook on the subject originally published in Germany in 1886. It is divided into four sections. The first gives a short historical survey of the development of the art of electro-deposition. The second deals with theoretical considerations, mainly in connexion with magnetism and electricity. The third treats of sources of current, simple cells, accumulators and dynamos, their construction and care. The fourth, and considerably the largest, is almost entirely practical and deals at length with most metals and alloys in industrial use for ornamental and protective coatings. The subject of electrotypy (galvanoplasty) is also given attention, and a fairly complete glossary of chemicals and materials used in the art forms a useful appendix. The work has been deservedly popular, owing to the eminently practical manner in which the subject is treated, and the English translation has passed through several previous editions.

The time had undoubtedly arrived for a considerable revision, and for the inclusion of new subject matter, since much research work both scientific and practical has been carried out during the last ten years which needs embodiment in text-books and works of reference. Unfortunately it cannot be said that either revision or inclusion of new matter has been done in a satisfactory manner; and —particularly in view of its bulk and price—the work is not worthy of its opportunities.

The serious criticism must be made that, although claiming to be an up-to-date work of reference, the book omits several published processes of importance, such as the investigations carried out in 1913 by Kalmus and others on the electro-deposition of cobalt—work which includes formulæ for cobalt plating much more efficient than those previously in use. Several metals, such as chromium and cadmium, are also omitted, and the treatment of iron deposition is very unsatisfactory. Apparently the editor has ignored the extensive researches on this subject which have been carried out in the United States, England, and Germany during the present century. A further matter for criticism is the space taken up in describing plant and machinery of one particular firm's manufacture—such descriptions being more in keeping with trade catalogues, since there are few distinguishing features to be traced.

The chief fault of the book is indeed that it is bulky without being adequate. Many sections might with advantage be abbreviated, and space made for the inclusion in the text of more up-to-date material. The last two decades have witnessed great activity in the whole subject of the electro-deposition of metals, and valuable results have been published in recognised scientific journals. Yet for the little new matter included, the editor appears to have relied entirely on "quotations" from popular trade magazines.

For the practical worker, however, the book contains much of lasting value. Dr. Langbein was not only a scientist, but a practical man dealing with every-day problems of the technique of the depositors' art, and apart from the faults outlined above (which one is disappointed to find), the work remains what it has always been, a mine of valuable and on the whole, within its limits, reliable information.

W. R. Barclay.

Manufacture of Sugar from the Cane and the Beet. *By* T. H. P. Heriot. *Monographs on Industrial Chemistry, edited by Sir Edward Thorpe. Pp.* 426. (*London: Longmans, Green and Co.* 1920.) *Price* 24*s. net.*

Sugar technologists are provided with a number of excellent books which very fully treat their subject from different points of view. Yet it seems certain that there is room for a monograph which would summarise in a critical spirit the more important part of the research carried out during recent years in connexion with the chemistry of the manufacture of sugar from the cane and the beet. Such a book, there seems little doubt, would be appreciated generally in the sugar world. In the past, cane sugar manufacture has borrowed a good deal from its sister industry; and now the beet factory chemist will not deny that he can find much of interest in the records of his colleagues working in the tropics.

Mr. Heriot's book can hardly be said to fill such a *lacuna* in our literature; and it must really be pronounced as a disappointingly unoriginal contribution. One is rather astonished to find that the information it gives has been culled mainly (if not entirely) from certain works published in English, notably those of Prinsen Geerligs, Palmer, Ware, and Newlands, all of which are very well known to those engaged in the manufacture of sugar. There need be no hesitation in stating that it adds nothing of value to what has already been published on the subject.

Apart from the unoriginal character of the "monograph," criticisms may be urged on several grounds. One of the most obvious of these is that too much space is devoted to descriptions of plant and accessories (largely attempted without the use of illustrations), and to their mechanical operation; whilst too little is allotted to what should be regarded as the essential purpose of the book, namely, the discussion of the applied chemistry of the various stages of processes of sugar manufacture. As an example of this, it may be mentioned that the important question of the chemical effect of liming and carbonatation on the several constituents of beet juice is dismissed in about two pages, although this is a vital matter to the chemist, especially when he is called upon to investigate the difficulties that may arise in these operations. Yet upon this question of the chemistry of the carbonatation process of clarification, volumes containing much practical and theoretical information of value have been written.[1]

It is probable, however, that the author has intended his work to be regarded as an elementary textbook on sugar manufacture in general for the use of the young student. Judged in this light, the result cannot be said to be successful. After a careful perusal of the volume, the opinion of the reviewer is that from the point of view of the chemist the discussion here presented of the rationale of the processes of manufacture leaves much to be desired. The rather dull section on the manufacture of white sugar, for example, is in unfavourable contrast with the very interesting and lucid account given in Harloff and Schmidt's manual on this branch of the industry. Again, regarded from the point of view of a general introductory work, the volume before us is inadequately illustrated; whilst no references to articles in the technical press are given to enable the reader to enlarge his knowledge on the questions raised. In any case, it may be added, the student of cane-sugar manufacture has been very well catered for by Spencer's admirable handbook, in which the exposition of the theory and practice of the subject is both fresh and clear.

As suggested above, Mr. Heriot appears to have missed his opportunity to supply a useful work on the application of chemistry to the sugar industry. He might very well have written one upon the lines adopted by the Czecho-Slovakian author, Dr. Oskar Wohryzek, in his valuable "Chemie der Zuckerindustrie," dealing, however, with cane as well as with beet sugar manufacture; and thus have produced a work containing a large amount of information unduplicated for the greater part in any book published in the English language. Such a treatise would probably have been welcomed by students and practicians alike in both industries.

J. P. Ogilvie.

[1] *Vide* Sykora and Schiller's "Kürzgefasste Chemie der Rübensaft-Reinigung"; Wohryzek's "Chemie der Zuckerindustrie"; and Stuyvaert's "Manuel de la Fabrication du Sucre de Betteraves."

PUBLICATIONS RECEIVED.

A System of Physical Chemistry. Vol. II. Thermodynamics. *By* W. C. McC. Lewis. *Pp.* 454. (*London: Longmans, Green and Co.* 1920.) *Price* 15*s.*

The Yeasts. *By* A. Guilliermond. *Translated and revised by* F. W. Tanner. *Pp.* 424. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1920.) *Price* 33*s.*

Geology of the Non-Metallic Mineral Deposits other than Silicates. Vol. I. Principles of Salt Deposition. *By* A. W. Grabau. *Pp.* 435. (*New York and London: McGraw-Hill Book Co., Inc.* 1920.) *Price* 30*s.*

Benzol, its Recovery, Rectification *and* Uses. *By* S. E. Whitehead. *Pp.* 210. (*London: Benn Brothers, Ltd.* 1920.) *Price* 12*s.* 6*d.*

The Platinum Metals. *By* A. D. Lumb. *Imperial Institute Monographs on Mineral Resources with Special Reference to the British Empire. Pp.* 63. (*London: John Murray.* 1920.) *Price* 3*s.* 6*d.*

Bamber's Rubber Calculator Book. *In the English and Metric Systems. Pp.* 65. (*London: MacLaren and Sons, Ltd.* 1920.) *Price* 6*s.*

Report of the Lubricants and Lubrication Inquiry Committee. *Advisory Council. Department of Scientific and Industrial Research.* (*London: H.M. Stationery Office.*) *Price* 2*s.* 6*d.*

Publications of the United States Bureau of Mines. (*Washington: Government Printing Office.* 1919 *and* 1920.):—

- Boiler and Furnace Testing. *By* R. T. Strohm. (*Tech. Paper* 240.)
- Blow-holes, Porosity, and Unsoundness in Aluminium-Alloy Casting. *By* R. J. Anderson. (*Tech. Paper* 241, 1919.)
- A Glossary of the Mining and Mineral Industry. *By* A. H. Fay.
- Absorption as Applied to Recovery of Gasoline Left in Residual Gas from Compression Plants. *By* W. P. Dykema *and* R. O. Neal. (*Tech. Paper* 232.)
- Accidents at Metallurgical Works in the United States During 1918. *By* A. H. Fay. (*Tech. Paper* 256.)

United States Geological Survey. Department of the Interior. (*Washington: Government Printing Office.* 1920.):—

- Cobalt, Molybdenum, Nickel, Titanium, Tungsten, Radium, Uranium, and Vanadium in 1917. *By* F. L. Hess.
- Stone in 1918. *By* G. F. Loughlin *and* A. T. Coons.
- Thorium, Zirconium and Rare-earth Minerals *in* 1919. *By* W. T. Schaller.
- Copper in 1918. *By* B. S. Butler.
- Magnesium in 1919. *By* R. W. Stone.

PRESENT POSITION OF THE FINE CHEMICAL INDUSTRY.

C. A. HILL.

The British fine chemical industry is to-day in a critical position—a condition resulting from a combination of circumstances. According as the Government redeems its pledge or not, the industry can either stabilise itself and become second to no other fine chemical industry in the world, or, alternatively, will sink back into its pre-war condition, or something very nearly like it.

The chemical industry consists of two parts:—(1) heavy chemicals, (2) fine chemicals. The former has several main branches, such as the acid, the alkali, and the soap industries; all of these were well-developed and well-organised British industries before the war. The latter has very many branches, but none was well developed before the war, nor was the industry organised. Dyes constitute a group of fine chemicals, so large and important that they are generally considered as a separate branch of chemical industry; actually, however, they cannot be thus divorced from the rest of the fine chemical industry. Parliament is legislating for the dye industry; it must also legislate for the remainder, and no short-sighted policy should be allowed to interfere in this important national question.

Comparatively few people outside the profession of chemistry know what the fine chemical industry is; still less do they know of its many and far-reaching ramifications, by reason of which it is essentially and truly a "key" industry, and therefore of vital importance to the national welfare. Before the war even chemists, generally, had rather vague notions as to what precisely fine chemicals are. How often has one heard such loose expressions as "medicinal and fine chemicals" or "fine chemicals and analytical reagents," and the like. Indeed, a notorious Board of Trade memorandum, born a little more than a year ago and now decently interred, made use of the expression "analytical reagents and the following fine chemicals." "Fine chemicals" is the term comprehensive of *all* fine chemicals, and includes the various groups:—(1) laboratory chemicals (i.e., analytical reagents and research chemicals), (2) medicinal (or pharmaceutical) chemicals, (3) photographic chemicals; together with other groups according to taste.

It is now well known that whereas before the war the manufacture of certain fine chemicals was satisfactorily established in this country, in the large sense, the fine chemical industry was essentially German. There was no organised industry and no organisation of manufacturers. To-day the Fine Chemical Group of the Association of British Chemical Manufacturers is numerically the strongest and possibly the most active in the Association.

The outbreak of war rudely awakened the country to the fact that fine chemicals are products of national importance, and, incidentally, that war cannot be waged without them, so that many and many a substance which we had until then contentedly bought from Germany had to be manufactured hurriedly with inappropriate plant and almost regardless of cost. Some of these were wanted for the immediate purposes of war, others for the manufacture of munitions, yet others for their medicinal properties. Arrangements prompted by the action of the Institute of Chemistry and the Society of Public Analysts were made for the supply of analytical reagents of requisite and known purity. More recently the manufacture of research chemicals has been systematically undertaken, and is now approaching a satisfactory condition. Good headway has been made by the makers of photographic chemicals, and also by those of synthetic perfumes and essences. The manufacture of medicinal organic synthetic products has made very considerable progress; those begun early have been improved, perfected, and stabilised; and many others have been added or were in course of being added when the present *impasse* arose. It is much to be able to say that we have never gone short of essentials. British manufacturers have proved that they can turn out products of first-rate quality. Economy of manufacture, maximum yields, with corresponding reduction of costs, were following in due course, slowly, it is true, but nevertheless surely.

Rome was not built in a day. To train up an army of skilled organic chemical workers requisite to the fine chemical industry is a matter of years.

The British fine chemical industry—as we now understand it—had to be initiated under war-time, *i.e.*, the worst possible, conditions. The early post-war period afforded manufacturers the first opportunity to stabilise their immature efforts, but it was then that they experienced to the full the difficulties of obtaining plant and of erecting buildings, long delays and high prices being the prominent features. The efforts of the industry—a new one —to expand were hindered by the dead weight of the excess profits duty. Yet, despite all the enormous difficulties, progress on the whole was really good until the Sankey judgment, like a bombshell, completely changed the situation. This, helped by the anomalous position of foreign exchanges, has led to the swamping of the market with German goods, a combination of circumstances which threatens defeat unless the Government steps in promptly and redeems its pledge to protect "key" industries.

Fine chemical manufacturers, after very full consideration, have unanimously pronounced in favour of prohibiting imports of fine chemicals except under a system of licences, which should readily be granted when British manufacturers are unable to meet genuine demands for essential products. This, it will be seen, is precisely similar to the course it is proposed to adopt in the case of dyes: a natural coincidence when it is borne in mind that the fine chemical industry and the dye industry are indissolubly linked together and must inevitably go hand-in-hand. Indeed, one of the less obvious, but by no means negligible, features of the fine chemical industry is that it elaborates the otherwise useless by-products of the dye industry, thereby giving employment to thousands of men. Incidentally, it affords a training ground for chemists, technical and industrial, which no other school can rival.

An amendment to the Dyestuffs (Import Regulation) Bill was designed to exclude from the provisions of the Act "synthetic organic products imported mainly for medicinal or surgical purposes." This attitude on the part of some of our legislators does not augur well for the safeguarding of the organic chemical industry, nor for the future of the Empire. It is, indeed, a very short-sighted policy which seeks to gain a small, problematical, and temporary reduction in the cost of a certain number of medicinal substances at the expense of losing an industry already half-established, and which if fully developed would make the nation permanently self-supporting in the production of curative agents. Moreover, the Bill provides for the importation under licence of substances which cannot be produced at home. It is this kind of opposition, born in ignorance and nourished in apathy, which confronts those who have the national welfare at heart. It is to be feared that there are others remaining in the background and doing their work covertly, who are directly concerned that England shall *not* have a fine chemical industry, and who are doing all in their power to let her sink back to her pre-war dependence upon Germany.

The many uses of fine chemicals in peace time, which justify so fully the claim of the industry to be regarded as a "key" industry, do not need to be laboured here. Research chemicals for our universities and teaching institutions, together with analytical reagents for the same purposes and for works' laboratories, have already been mentioned. The importance of the industry to medicine and national health is not confined to the supply of synthetic drugs, but rests also upon the fact that the expansion of an organic chemical industry is intimately associated with developments in biochemistry and in the most modern methods of treating and preventing disease.

It cannot be too frequently nor too cogently insisted upon that the nation which possesses fine chemical and dye industries possesses potential arsenals for waging war, so that the nation which does not possess them is ever at the mercy of nations which do.

The present critical position of the fine chemical industry is largely due to the lack of confidence which manufacturers have in the Government. Today it is not too late to save the situation; soon it will be.

RAIL CONVEYANCE OF CHEMICAL COMMODITIES..

J. LUKES.

It was with satisfaction that I read the article which appeared in the *Journal* of November 15, written by Mr. L. Archbutt with the assistance of several of his railway colleagues, including one expert in rates, as those who may have compared this reply with my remarks which appeared in the issue of September 30 will have gathered that although the trader who consigns dangerous goods by rail may be wrong in his ideas, the railway companies have the power to decide as to which merchandise falls under this heading and to fix the sum which has to be paid for carriage, whether their views be right or wrong. Another inference I feel sure the reader will draw is that if the railway companies are so considerate and painstaking in the interests of the trader, if their conditions of carriage and the resultant charges are so manifestly reasonable, as suggested, they cannot possibly have any objection to the establishment of an impartial business tribunal as a court of appeal. The picture drawn so carefully by Mr. Archbutt does not represent the facts, at least as I view them, and the following remarks, whilst they may not carry conviction to all, will bring out more clearly the main point, namely, that the railway companies are the judges in their own cases, which is admittedly against the principle of British fair play.

Are the Rates on Chemicals Unreasonable?—Mr. Archbutt opens by stating that I charged the railway companies with having regarded *practically all* chemicals as dangerous goods, and then proceeds to show that non-dangerous goods are charged in accordance with the Statutory Orders, and takes credit for the fact that some rates for such non-dangerous goods have been reduced by the railway companies. It was stated distinctly by me that non-dangerous merchandise is scheduled in Part 1 of the Order Confirmation Acts 1891–1892, and that the consignor would have means of ascertaining the component parts of his rate.

Legal Conditions and Rates for Dangerous Goods.—It was never suggested that the railway companies had refused to convey dangerous goods, and it is obvious that if they abused their rights, the power given them "in ancient history" to refuse to carry must have been withdrawn. Nevertheless, as the law stands to-day (Clause 105 of the Railway Clauses Act, 1845), the railway companies need not carry any merchandise which in their judgment *may* be of dangerous nature, and it is a sore point, as stated (not only to myself but to all the traders concerned) that the carriers are the sole judges of what goods may be dangerous. (It should be noted that it is not a question of the merchandise being dangerous in fact, but dangerous in the opinion of the railway company.)

The question is then raised as to whether any other arrangement would be just and reasonable, seeing that the railway companies are responsible for the safety of the public, etc. Referring to America, Mr. Archbutt says, "Accidents which were occurring led to the establishment of the Bureau of Explosives in 1907, and Col. Taylor came over here on purpose to study our British regulations."

The following quotation from the American Inter-State Commerce Commission Regulations for the Transportation of Explosives and Other Dangerous Articles by Freight and Express, Reg. 1706, 1918 edition, will show the status of the Bureau of Explosives (the italics are mine):—

"The Bureau for the safe transportation of explosives and other dangerous articles, hereinafter called Bureau of Explosives, organised by the railways under the auspices of the American Railway Association, is an efficient bureau in charge of an expert chief inspector. The Bureau will make inspections and conduct investigations *and will confer with manufacturers and shippers* with a view to determining what specifications and regulations will, *within reasonable limits*, afford the highest degree of safety in packing and preparing these dangerous articles for shipment and in transporting the same. *The Commission will seek to avail itself of the expert knowledge thus developed*, and, in formulating amendments to these regulations or specifications supplemental thereto, *while not bound thereby*, will give due weight to such expert opinions."

So the Bureau of Explosives organised by the American railways *must* confer with manufacturers and traders, and decisions rest not with the Bureau but with the impartial tribunal, the Inter-State Commerce Commission.

Reference is made to the American regulations being more severe than our own, and it is stated that "All glass carboys there have to be boxed and to withstand a swing test," but nothing is stated as to the limits of inflammability (over 80° F. is considered safe in America—over 150° F. *may* be thought safe in this country, but I refer to this point later). Mr. Archbutt has omitted to state that the American regulations provide that the thickness of the glass carboys should not be less than 2-32 inch (whilst our British railways specify about ⅜ inch). Further, the American regulations do not provide a swing test when iron-case outside containers are used for carboys; the regulations state that special arrangements are made.

Mr. Archbutt refers to the only three test cases heard before the Railway and Canal Commissioners, and adds that the Court decided that the railway companies did arrive at their decision in good faith and on good grounds. The reader will not overlook what the judges decided, viz., "that the railway companies did arrive at their decision in good faith . . . etc.," that is the railway companies *decided*, and the Judges found that they acted in good faith.

The decisions in these cases may be summarised as follows:—

(1) *Reckitts v. North-Eastern Railway.*—The Court decided that liquid metal polish having a flash point of 80°—85° F. is "dangerous goods" within Part IV. of the Statutory Schedule.

The Hon. A. E. Gathorne Hardy—one of the Commissioners—said in his judgment:—"The article carried may be regarded *as very near the border line as regards danger.* The flash point is not high, great care is exercised by the manufacturers in manufacturing and securely closing the tin vessels in which it is enclosed."

Sir James Woodhouse—the other Commissioner—said: "If the issue we had to determine were simply one of fact, whether liquid metal polish is dangerous for the purpose of railway transit, I should, for my own part, after a careful consideration of the evidence, regarding it purely from a business point of view, come to the conclusion that as an article of commerce very extensively used, *it is not a dangerous article for the railway company to carry,* because it involves nothing beyond what I consider is an ordinary commercial risk. . . . By that Act (1845, section 105) the railway company can refuse to carry goods of a dangerous nature, and what goods come within that description is left solely to their judgment to determine. . . . If I am right in this view, then it follows *that though I think that as a fact the goods are not dangerous for the purposes of railway transit,* yet it is open to the railway companies to take upon their responsibility a different view, and so long as the Court is satisfied that they have arrived at their judgment in good faith, it is conclusive."

(2) *Traders' Traffic Conference v. Midland Railway and Others.*—The Traders contended that benzol, toluol and naphtha flashing under 73° F. were chargeable as Spirits of Tar under Class 2 of the Statutory Classification, and *admitted that the goods were dangerous goods in opening their case.*

(3) *Midland, Great Western, and Lancashire and Yorkshire Railway Companies v. Brotherton and Co., Ltd., and Wm. Butler and Co. (Bristol), Ltd.*—The railway companies applied for a declaration that a tar product flashing not below 100° F. was "dangerous goods" within Part IV. of the schedules.

In his judgment, Mr. Justice Lush, in addition to the quotations given, said: "The Legislature, from the earliest times in the history of railway legislation, quite clearly left it to the railway companies to decide what goods are dangerous, and enabled them to refuse to carry any goods which in their judgment were dangerous."

It will, therefore, be seen that in one case—(*Reckitts v. North Eastern Railway*)—one Commissioner stated that metal polish flashing *between 80° F. and 85° F.* was on the borderland of danger, and another that metal polish so packed was not dangerous in fact; whereas in the case of the tar product flashing *not below 100° F.* no judgment was given as regards danger.

It seems, therefore, of little use to ask, "Is not the decision of His Majesty's judges sufficient?" when they have now decided that they are prohibited from judging whether any commodity is dangerous, in fact.

Mr. Archbutt points out that Mr. Justice Lush in his judgment said: "The railway companies and their advisers and witnesses place the limit of a safe flash point at 150° F." This should be compared with the instructions given by the Bureau of Explosives in America to its inspectors:—"An inflammable liquid, as defined by the Bureau of Explosives, *does not mean any liquid that can be burned.* The meaning is restricted to liquids which at ordinary temperatures give off inflammable vapours. These vapours are not only inflammable, but when mixed in proper proportions with air in an enclosed space will explode with great violence, if ignited by any means. This action is exactly similar to the explosions caused by the ignition of coal gas mixed with air in houses, cellars, sewers, etc., which frequently occur through the accidental escape of gas into enclosed spaces. *Any liquid giving a flash point of 80° F. or less is classified as an inflammable liquid.*

"The flash point is determined by gradually heating the liquid in question in a small *open* cup; after each five degrees rise in temperature a small flame is passed across the top of the cup about ¼ inch above the surface of the liquid. The lowest temperature at which a flash passes over surface of liquid is called the flash point. It will be readily seen that the lower the flash point of any liquid, the greater the risk in handling it."

It may be added that in America liquids flashing above 80° F., open test, are carried and treated as non-dangerous goods by the railway companies.

I must leave it to your readers to decide whether tar products flashing not below 100° F. are really dangerous in transit any more than other materials are dangerous, such as paper, cotton and woollen goods, hay, straw, and thousands of other articles.

Rates on Dangerous Goods.—With regard to the rates chargeable, Mr. Archbutt states, "The Order Confirmation Acts, 1891–1892, enacts that the charges made for the conveyance must be reasonable;" but the Act reads: "such reasonable sum as the company may think fit in each case." Again, we are told that the trader has a remedy if he considers the charges excessive; doubtless he has, if he is prepared to contest his position, in connexion with every rate for every commodity manufactured, through to the House of Lords.

I feel confident in leaving to the judgment of impartial persons the decision as to whether a decidedly interested party should be the judge in his own case to the extent indicated, when the result of such judgment entails the payment to him directly or indirectly of considerably increased carriage charges, knowing the great reluctance of the trader to appeal to the law courts in every case of dispute.

Further, I maintain that in regard to commodities removed from the white pages or statutory classification, to the yellow pages or dangerous goods classification, the charges have been raised directly or indirectly, the conditions having become more onerous. A rather striking case arose recently in connexion with trinitrotoluol, which for some years past was not treated as an explosive during conveyance, being charged at "*Class 2 rates, collected and delivered, company's risk.*" The Home Office decided that the merchandise was to be treated as an explosive during transit, and although the increased cost of conveyance did not add to the safety, the companies raised the class to Class 5, plus 50%, station to station, owner's risk:

	Class 2, collected and delivered.	Class 2, less cartage.
	s. d.	s. d.
Leeds to London ...	82 8	68 4 per ton.
Leeds to London, Class 5, plus 50% station to station ...	... =	200 9 per ton.

(The difference, £6 12s. 5d., per ton increase, would not encourage trade.)

Spirits of tar appear in the Statutory Classification under *Class 2, company's risk;* the judgment referred to, viz., *Traders' Traffic Conference v. Midland Railway and Others,* gave the companies the right to charge a higher rate at *Class 3, owner's risk.* Also in the Tar Products case mentioned, the judgment means that the railways charge as for

Heavy Naphtha, class 2, owner's risk, as against Mineral Tar Oil, Class 1, company's risk.

The chief objection, however, to the insertion of commodities in the dangerous portion of the classification is that the trader loses all statutory rights over the rates and conditions; the "reasonable sum" thought fit by the railway companies is not subject to disintegration, and no allowance from station rates is readily given to traders who have provided private sidings at their own expense, and relieved the companies of heavy capital expenditure, the cost of services, etc.

The explanation given to justify the application of station rates to private sidings is interesting:—a trader using the station provides a private siding, and as one-fifth of the tonnage is diverted to the siding, etc., the station is thus deprived of traffic to that extent, although equipped to deal with the whole business.

Evidence has recently been given in public by the Chief Goods Manager of an important northern railway company that, in round figures, there are in Great Britain 10,000 private sidings and 7000 railway stations, and that the stations could not deal with the whole traffic. The same Goods Manager indicated that his company welcomed the opening of private sidings on his line; and the advertisement to "build your works" adjacent to so-and-so railway line is familiar to all.

The majority of railway stations has been so congested that traffic has had to be refused, restricted and regulated by the companies, to the great inconvenience of the trading public, as everyone concerned in transportation knows only too well.

Is it reasonable that a trader who has provided a private siding (in fact a station of his own) at his expense should pay the charges for station accommodation and labour services as if he used the railway station? If so, such a trader has to pay twice, viz., for the provision and upkeep of his siding, the wages of his staff, and for the railway company's station and staff. The Private Siding Act of 1904 gives the trader a right to a siding, and the Order Confirmation Acts, 1891–1892 (which Mr. Archbutt quotes), provides that the railway companies cannot charge for station accommodation and station services upon private-siding traffic; yet they have made equivalent charges, and the expense of an appeal to the Railway Commission Court is necessary in most cases to get any abatement or siding allowance; and the manufacturer of so-called dangerous chemicals is in a most difficult position, as already explained, owing to Section 105 of the 1845 Act and to Part IV. of the Order Confirmation Acts.

How can traders in dangerous goods use railway stations? The companies raise what are admitted to be *penalty* charges if stock is detained (see my remarks under *Contract Conditions*); they do not stare the commodities in their warehouses; and it is admitted that many stations could not provide standage accommodation even for the many tank and open wagons which the trader is forced to provide to conduct this particular class of business.

Contract Conditions.—Even Mr. Archbutt does not try to justify all the conditions to which traders have to submit. He omits any reference to the charge of 5s. per ton per hour for standage of tank wagons at stations (20-ton tank=£120 per day); also the fact that the carriers are exempted from responsiblity for *loss*, damage, misconveyance, delay, or detention of the said goods, *or a trader's* truck or sheet, except in case of wilful misconduct on the part of the company's servants. It is, however, a fact that if a trader complies with the railway companies' packing specifications he is not at the present time responsible for third party damages in case of accident, etc. Why should the trader be responsible for train accidents or negligence of railway companies' servants, over which he has no control whatever? The point as to the responsibility for accidents, etc., has received public attention on various occasions, and it is referred to in Mr. Russell Rea's Report, 1911, as follows:—"We think that if they carry such goods (dangerous or inflammable) they should not deprive the trader of an opportunity of sending them on terms under which the companies would be responsible for loss or damage occurring as a result of their own negligence, and not in consequence of the nature of the goods."

Premiums for Risk.—Rolling Stock.—It is noticeable that although Mr. Archbutt found my figures in regard to German rates too vague to be of any service for comparison (although he admits that the German chemical industry was prostituted *as well as subsidised* through the railways), he makes no reference to the rates, quoted by me, chargeable by the English companies. He does assert, however, under the heading *Rolling Stock*, that the rates on crude naphtha and fuel oil in tank wagons are lower than in steel barrels; but is this not in accordance with the principle of the Statutory Classification, which, although framed in 1891 when tank wagons were little used as compared with to-day, generally indicated a lower class for liquids in tank wagons than when conveyed in casks or drums?

Let us consider what this means; 20 tons of liquid is conveyed in a tank wagon, costing about £900, provided by the trader; this would entail the use of from 80 to 100 fifty-gallon drums, and the provision by the railway companies of from 6 to 7 trucks for the full drums and 4 to 5 for the returned empties. Surely it is only equitable to make some difference in the rate, as although no additional charge is made for the return of the empty tank wagon, a large amount of haulage is necessary for each empty railway truck; in fact, we were told quite recently in a railway manager's evidence before the Rates Advisory Committee that the statistics of the Ministry of Transport show that in the case of coal and goods, if a wagon goes 70 miles on the outward journey loaded, on the average it comes back 30 miles empty.

It is interesting to note in passing that for some reason crude naphtha, whether flashing below, at, or above 73° F. is chargeable at the same rate, although naphtha, not crude, flashing below 73° F. bears a higher charge than naphtha flashing at 73° F. and over. This is an illustration of the application of "such reasonable sum as the companies think fit," and my experience is that the classification of crude naphtha, viz., Class C, plus 10 per cent., is too high, and is actually prohibiting traffic from passing in many instances.

Dangerous or Non-dangerous?—Mr. Archbutt is entirely wrong in stating that I am disturbed because the English railway companies are guided by a body of chemists; what I do object to is that the railways can finally decide what is dangerous upon the advice of their chemists. It seems to be entirely overlooked that the manufacturers' chemists have a much closer, and, I submit, a better knowledge of the commodities they specialise upon. These chemists have, as a rule, the highest qualifications, they are familiar with transportation throughout large works, through cities, etc., and their knowledge of the commodity and its behaviour under all circumstances is sufficient to enable them to judge of its safety during rail transport. There is no doubt, however, that difficulties will arise, not only with so-called dangerous goods, but with all classes of merchandise, in the event of serious train accidents or of faulty stowage into trucks by railway servants.

It must not be overlooked that this phase of the question was fully considered by the Board of

Trade Conference on Railway Matters in 1909—"Committee A reported that the existing grievances arose from the unrestricted power of the railway companies to decide what came under this (dangerous) classification, and under what conditions they should be carried. The Conference, following the recommendations of the Committee, suggested the appointment of an Advisory Expert Committee to deal with the classification of dangerous goods other than explosives. The terms of the resolution adopted were as follows:—

"As regards dangerous goods, other than explosives (as to which no question was raised), it is recommended that an advisory expert committee be established, to which may be referred by the Board of Trade questions at issue between traders and the railway companies in connexion with the inclusion of articles in the list of dangerous goods; such a committee to be constituted of an expert nominated by the Home Office, an expert nominated by the Admiralty and Army Council, and an expert nominated by the Board of Trade and Board of Agriculture and Fisheries; the railway companies and the traders concerned each to state their case by means of experts, and the committee to recommend whether the article in question should be included in the list of dangerous goods, and, if so, what conditions of packing and labelling should be imposed.

"No such question should be referred to the Advisory Expert Committee before it has been dealt with by the railway companies parties to the Railway Clearing House, or until the Board of Trade gives a certificate that there has been unreasonable delay on the part of the railway companies."

Mr. Archbutt complains that my reference to the recent case in the Railway Commision Court is quite misleading, and he quotes the words in the judgment of Mr. Justice Lush, "The companies and their advisers and witnesses place the limit of safe flash point at 150° F." During the hearing of the case counsel for the railway companies pointed out that in 1891 three consignment notes existed, one of which was for products flashing over 150° F., and he added, "because the railway companies never recognised that 150° was in any way a limit of safety." Further, giving evidence on behalf of the railway companies, Mr. J. H. B. Jenkins, the Great Eastern Company's chemist, replied to the railway companies' counsel that in the opinion of the companies, though the vapour is inflammable above 150° F., close test, he thought it necessary to treat it as dangerous goods. If the Judge intended that 150° F. should be taken as the dividing line and the railway companies accept this, they should insert this flashpoint as the limit of inflammability in their classification.

Assistance for Key Industry.—I am aware that the classification of intermediate products for use in colour manufacture has received considerable attention recently, with a view to fixing *uniform* rates and conditions, and although it is beside the point, I fail to understand why railway companies, assisted by the State, should not encourage key industries for the national benefit. The point of my argument was that extortionate charges are demanded; the trade—far from being encouraged—has to fight against prejudice and extreme views.

Revision of Railway Rates.—There are now reasons to suppose that an impartial tribunal will fix the classification of dangerous goods; yet it is not—and never has been—the traders' idea that the Railway Chemists and Dangerous Goods Committee should give less patient attention and consideration to these matters; it is essential that its members should continue to apply all their ingenuity and experience to the problems which arise. What the public asks is that the Committee shall not have the power to *decide* finally the rate or charge, or as to what is dangerous or not dangerous.

It is conceded on all sides that the railway companies should have an opportunity of earning an adequate revenue, but is it not a more business-like proposition to charge against all traders in proportion to the cost to the railway for the accommodation provided and used, and the services rendered, plus a reasonable margin for profit, than to suggest that if light chemicals get some reduced charges, heavy chemicals or other merchandise must bear some increased burden?

Mr. Archbutt may take it, and I have the authority of the Association of British Chemical Manufacturers to say so, that the light and heavy chemical manufacturers and others are willing to pay their just proportion of railway charges measured by the railway accommodation provided and used, and the duties undertaken by the railways at the traders' request and for their convenience.

I have recently been reading with great interest the report made by the chairman (Mr. Joseph B Eastman), of the Special War Committee at the Thirtieth Annual Convention of the National Association of Railway and Utilities Commissioners of the United States of America. He advocates the need for local public tribunals, and adds that "Men who for years have viewed railroad policy in the light of railroad interest do not overnight become satisfactory exponents of the public interest."

IMPRESSIONS OF THE AMERICAN GLASS INDUSTRY, 1919-1920.

W. E. S. TURNER.

To the person who has some acquaintance with the conditions of the glass industry in this country there are several things which come home with great force when he comes into contact with the corresponding industry in the United States. He is, for example, impressed by the fact that nearly all efforts are directed to the mass production of articles for sale to the million, and whilst it is true that America has become nearly self-supporting in respect of articles of glassware, optical glass manufacture is still in its infancy, and glass of the higher quality for table decoration and general artistic purposes occupies a relatively smaller place in the American glass industry than in our own.

As already stated, glass manufacture in the States is, wherever possible, confined to such articles as can be produced in enormous quantities. Not only so, but each manufacturer tends to specialise in a limited number of types of one particular form of glassware. For example, a glass-bottle manufacturer will confine his attention as far as possible to just a very few types of bottles; one very large undertaking, having several factories under its control, manufactures only wide-mouth milk bottles, of which it produces an enormous number.

This specialisation and high production are made possible by the use of automatic devices at every stage; and by limiting the number of types of article, the design of the machinery becomes greatly simplified. Automatic belts and various other devices are in operation for the conveyance of articles of glassware from the machine to the annealing oven or lehr, whence they are again automatically transferred. Both the transfer from the machine to the conveyor and from the conveyor again to the annealing oven, are only possible where all the articles are of one size and type. Further, where the annealing oven carries one size only of a particular type of bottle it is possible both to obtain the closest possible packing and to adjust the temperature quite precisely.

Speaking generally, the American glass industry can be regarded as divided into two main sections, the first comprising those branches in which glass is melted in pot furnaces and the second those in which tank furnaces are employed. The works employing pot furnaces are as a rule among the oldest in the industry, and anyone who makes a prolonged and thorough tour of the American factories will realise that there are some which display rule-of-thumb methods just as much as some of our own. In the more modern plants, however, the pot furnaces employed differ from our own in two respects. In the first place, they are usually much larger and hold 16 or 18 pots, each pot being of a large capacity, *e.g.*, 3000 lb. of a light lead metal, and in the second place, recuperative furnaces find no employment. Regenerative pot furnaces are everywhere in use. The writer was told that some 20 years ago an unsuccessful attempt was made to introduce recuperative glass-pot furnaces. The regenerative pot furnaces are very economical when under scientific control. At two large modern works the writer was told that it was the regular practice to melt one ton of glass (in the particular case in question for electric bulbs) by the use of half a ton of coal, and one of the large glass engineering firms undertakes to erect such a furnace of sixteen pots, and to guarantee that it will operate on eight tons of coal per day. This is far and away better practice than is customary in our own country, where the furnaces are small and the size of the pot is also small as a rule.

The efficiency of the furnace is becoming an important matter in the American glass industry. Up to comparatively recently, natural gas has been fairly abundant in Pennsylvania, Ohio and Indiana, as well as in West Virginia, but its wasteful use has so diminished the quantity available that it is being conserved now in the interests mainly of domestic users. In consequence, in the winter time the gas pressure becomes so feeble that it is essential to have some other fuel supply, either oil or producer gas, available. Not only so, but in Pennsylvania, Ohio and Indiana natural gas even when available is now becoming too expensive for use. For this reason many glass manufacturers are installing gas producers, of which several types compete for favour, namely, the Chapman, the R. D. Wood and the Morgan, whilst the use of the Chapman Agitator is rapidly spreading, and it is frequently added even to the old type of stationary producer. It is now recognised that the cost of fuel is going to play an important part in the cost of production. In the Canadian factories, indeed, at Toronto and Montreal, it is a serious item in the cost. Coal which even only last year cost \$7½ per ton is now being charged at \$15.

The great tendency in American glass practice is to get away from the use of glass pots and pot furnaces and to make glass in tanks. At the present time, the following types of glassware are being made from glass melted in tank furnaces:—Bottles of all types, chemical glassware including tubing, glass tumblers, and other pressed glassware in great variety, glass cooking ware, electric bulbs, the commoner forms of illuminating ware such as globes and shades, and even wine glasses and blanks for cutting or other forms of decoration.

The tank furnaces vary greatly in dimensions. Generally speaking, they are no larger than corresponding furnaces in this country, if as large. Tank furnaces for window glass are an exception to this, and the writer recently saw a new tank furnace in America capable of holding about 1250 tons of molten glass. The capacity of a furnace, however, is never stated in America in terms of its deadweight contents as in this country, but always in terms of its daily output or capacity for output. This output reaches very large dimensions. One furnace which the writer saw yielded 160,000 glass jars every 24 hours, of an average weight of 14 oz. In order to obtain such a huge output, the melting-end of the furnace is usually longer and narrower in proportion than in corresponding British furnaces. Further, the batch mixture melted contains more soda ash and less lime than has been customary in this country. At least three advantages ensue; in the first place, with this softer batch the temperature required for melting is usually lower than in furnaces at home. Secondly, the rate of melting is increased, whilst the action of the glass and of the melting batch materials is less destructive of the refractory blocks composing the furnace than in our own country where a more corrosive batch and a somewhat higher temperature have up to now been employed.

The outstanding contribution of America to the glass industry of the world has been the application of mechanical devices. This is shown by the fact that all other countries have their eyes at the moment turned on America for the supply of machinery. Several illustrations may be given. In the glass-bottle industry machines were in operation in Great Britain earlier than in America, but having once adopted machines, the Americans began to make progress at an exceedingly rapid rate. To America we owe at the moment the glass-bottle making machines such as the Owens, the O'Neill, the Lynch, the Miller and the Hartford-Fairmont, all of which give very high production and are coming into use in this country. The first-named is capable of adaptation to making bottles from about $\frac{1}{6}$ oz. up to 15 gallons. The former it can turn out at the rate of about 200 per minute, since the machine in its latest type carries 15 arms, and each of these arms can be provided with a triple mould, producing therefore 45 bottles for each revolution of the machine.

Whilst the Owens machine is fully automatic in that it gathers its own glass from a special revolving furnace fitted to the main melting furnace, the other machines are only semi-automatic. Labour conditions and the desire for increased production have, however, led to the invention of feeding devices by means of which the glass is fed continuously from a tank furnace either by permitting it to flow or by pumping or ladling it out and separating the stream by shears into portions which can be adjusted in weight suitably to the size of the article required. Some of these feeding devices have been highly successful and are coming into wide use. Here again, at the moment, the only practical devices on the market are all of American origin.

Machines of the Miller, the Hartford-Fairmont, and to some extent of the O'Neill type, are also employed largely in making glass tumblers in enormous quantities. The operation has also been rendered automatic as in the case of bottles. The glass is fed by an automatic feeding device into one of the machines, the tumbler is taken out and transferred mechanically to a belt which carries it through the gas-fired chamber, so that the surface can be given a fire polish. Subsequently the fire-polished article can be transferred mechanically to an annealing oven. A single machine of the Edward Miller type fed by the Tucker Reeves feeding device has turned out 11,000 tumblers a day, each of which was fire-finished. As several such machines are in operation, fed from the same furnace, it will be seen that the output of such articles is enormous. For containing preserves, a very cheap type of tumbler is also made in great numbers. These are not given a fire polish.

Electric light bulbs, especially the smaller sizes in such abundant use, are now made by machinery.

The Empire machine is only semi-automatic. It has four arms and takes the place of a skilled workman in so far as marvering the gathered glass and blowing it into a bulb are concerned. Such a machine must be attended by a gatherer who collects the glass required and by a taker-off who removes the blowing iron with the finished bulb on it. This machine is also designed to make blown tumblers, lamp chimneys, etc.

The Westlake machine is a fully automatic machine. There are two types, one with 12 arms and one with 24. With such a machine, the glass is gathered mechanically, swung out, and subsequently blown mechanically, whilst additional devices detach the blown bulb and convey it through a short annealing oven. A machine with 12 arms has a capacity of 100,000 bulbs per day.

Glass tubing is now drawn mechanically. Two or three devices have been put into operation, the most successful being the fully automatic device originated by Dana and exploited by the Libbey Owens Co. In this machine the glass flows in a continuous stream from a furnace, either from a pot or from a tank, on to a clay cylinder inclined at an angle to the vertical. This cylinder, which may be 5 or 6 in. in diameter and perhaps 18 in. long, is kept rotating. The glass flows down the cylinder, and would, unless otherwise treated, form a solid mass as it poured over the ends, but it is prevented from becoming solid by a current of air blown through a water-cooled iron tube which passes down inside the clay cylinder. The hollow conical-shaped mass of glass so obtained is pulled by a machine which therefore draws out the glass in the form of tubing, the pulling or drawing machine being situated perhaps 100 or more feet from the revolving clay cylinder. Such a machine works day in and day out, only stopping for repairs; and more than 120 ft. per minute of tubing may be drawn, dependent on the diameter of the tubing.

Finally, reference may be made to the Libbey Owens Window-Glass plant operating on the Colburn patent. The Libbey Owens Co. has expended a very great deal of money on this particular process in working it up to the commercial stage. The glass flows out of a tank furnace into a shallow heated trough, and is drawn from there continuously in a sheet, first of all in a vertical direction for about 3 ft., and then over a roller in a horizontal direction and down an annealing oven, from which it issues, after travelling about 200 ft., as a perfectly plain cold sheet needing only to be trimmed and to be cut into standard lengths. Much scepticism in regard to this process existed in the United States up to about 18 months ago, but the progress of the invention has been so rapid that the company has not only turned out a very large quantity of commercial glassware, but its orders are so heavy that it has recently doubled its capacity from 6 furnaces to 12, whilst the plant has been visited by engineers from many foreign countries, including Japan, where the first factory outside America is, the writer understands, already being installed.

All these contrivances may seem typically American. Indeed, they are, for the Americans have shown in the glass industry such ingenuity and cleverness, such freshness of ideas and patience in working them out as to provide an object lesson for the rest of the world. We can only hope that engineers in this country will be stimulated to take a greater interest in the home glass industry.

In conclusion, it may be said that on the actual glass-making side also development is becoming active largely through the work of scientific investigators. It is sufficient to refer to the development of really good selenium red glass, to the "daylight" lamp, and to Pyrex glassware and other glassware for cooking purposes.

SOCIETY OF CHEMICAL INDUSTRY.

DECEMBER MEETING OF COUNCIL.

The monthly meeting of Council was held on December 10, Sir William J. Pope presiding. The draft programme of the Annual General Meeting to be held in Montreal next year, as published in our last issue (p. 407 R), was submitted and approved, as were also the draft Rules of the new Section at Shawinigan Falls, Canada. This Section was declared duly constituted, and it was reported that Dr. F. W. Skirrow and Mr. F. E. Dickie were to be the first chairman and secretary-treasurer, respectively. The Society has now five separate Sections in Canada.

The Council approved the recommendation of the Finance Committee that after the issue of the *Journal* for December 31, 1920, authors of papers appearing in the *Transactions* should receive 50 reprints *gratis*, according to the practice formerly in vogue but interrupted by stress of circumstances arising out of the war.

On the report of the Publications Committee, the proposal submitted by the chairman of the Federal Council for Pure and Applied Chemistry to the effect that the Society should nominate representatives to confer with delegates of the Chemical Society with a view to effecting more co-operation in the matter of chemical publications was approved, and Sir W. Pope, Mr. E. V. Evans, Dr. C. A. Keane, and Dr. S. Miall were appointed to represent this Society (*cf.* report of November meeting, p. 399 R). It was also reported that the Publications Committee had drawn up a very complete panel of referees to advise on the suitability of papers submitted for insertion in the *Transactions*.

Following a communication received from the British Chemical Ware Manufacturers' Association, a resolution was passed to the effect that legislation to restrict the importation of foreign chemical, scientific and illuminating glassware is urgently needed in the interests of members of the Society as consumers, and of the nation in general, in order that the industry may be retained in this country. It was decided to forward this resolution to the President of the Board of Trade.

A communication was submitted from the Director of the National Physical Laboratory regarding the "Tests of Graduated Glassware" carried out at the Laboratory, and Mr. J. L. Baker, Mr. F. H. Carr, and Dr. Bernard Dyer were elected the Society's representatives to confer with the Laboratory authorities on this matter.

Prof. A. R. Ling and Mr. J. W. Macdonald were re-appointed the Society's representatives on the British Empire Sugar Research Association, and Mr. C. S. Garland was elected representative on the Chemical Industries Sub-Committee of the Imperial Mineral Resources Bureau in place of Dr. C. C. Carpenter resigned.

Thirty-nine new members were elected, of whom 26 are home members, 8 colonial, 2 Indian, and 3 foreign.

NEWS FROM THE SECTIONS.

MANCHESTER.

The third meeting of the session was held on December 3, with Mr. J. Allan in the chair. About sixty-five members were present and two papers were read. The first paper was by Prof. R. Robinson and Mr. F. H. Gornall on "Beta-trinitrotoluene and its Derivatives," and was read by the former.

When crude trinitrotoluene, obtained by direct nitration of toluene in stages, is washed with cold alcohol almost ten per cent. of the material passes into solution, and when the latter is evaporated the residue is found to consist mainly of the dinitrotoluenes, especially 2.4-dinitrotoluene, and isomerides of 2.4.6-trinitrotoluene. The paper contains an account of experiments undertaken to discover possible uses for the residues when produced on a large scale.

The second paper, read by Mr. W. B. Hart, dealt with the history and analytical value of the thalleioquin reaction for quinine (the addition of chlorine or bromine to a solution of quinine in dilute sulphuric acid, and then ammonia, giving a green colour due to thalleioquin). The author has determined the limits of concentration within which the reaction takes place, the limit for qualitative purposes being 1 part of quinine in 250,000 parts of solution in a liquid 2½ inches deep. For quantitative work, so many variables are involved that except under very rigid conditions and in very dilute solutions no reliance can be placed upon the reaction.

BIRMINGHAM.

The "Corrosion of Non-ferrous Metals and Alloys" was the subject of a general discussion on November 25, Dr. H. W. Brownsdon presiding.

Dr. Brownsdon, who opened the discussion, said that the corrosion of non-ferrous metals and alloys had only recently become the subject of organised research. The corrosion of condenser tubes was dealt with in the reports of the Corrosion Research Committee, and the Brass and Copper Research Association was about to initiate research on atmospheric corrosion. The Cumberland process for preventing corrosion (*cf.* J., 1907, 1206, and 1916, 51) still remained the most definite achievement, and its success pointed to electrolysis as underlying certain forms of corrosion. The problem might be solved by the preparation of a non-corrodible metal or alloy by the metallurgist, or by the discovery of a suitable protective coating by the chemist; probably the greater chance of success lay with the metallurgist. The ideal would be to obtain perfect chemical and physical homogeneity, but this was not possible in commercial metals or alloys. In a physical sense no material could be homogeneous in the crystalline state; the physical properties of a chemically pure crystalline metal or alloy would vary in different crystallographic planes, and from this point of view the study of corrosion in single or idiomorphic metallic crystals would be of interest. The inhibiting effect of a polished metal surface on corrosion afforded strong support to the theory that work caused some of the crystalline material to break down into a form revealing modified physical properties. If we could produce a finished metal product with a greater thickness of "polish" than that now obtainable it might be expected to exhibit increased resistance to corrosion. This might be done by building up, by electrolytic deposition, successive amorphous layers and polishing them. The fact that the protective value of a deposited oxide or salt was much enhanced by the subsequent application of oil, paint, or similar medium, indicated that the action of the former was probably more mechanical than directly protective, and that it formed in combination with the medium a much stronger and more continuous protective coating than either would form separately.

Dr. O. F. Hudson, of the Admiralty Research Laboratories, discussed the corrosion of copper and of 70:30 brass from the electrochemical standpoint and emphasised the insufficiency of the electrolytic theory to explain all kinds of metallic corrosion. He believed that electrochemical action was never the sole cause of corrosion, and in the case of neutral or slightly alkaline solutions it was relatively unimportant, the action in these cases being almost entirely direct chemical action. Electrochemical action played a more important part in acid liquids, but in these cases the metal failed by general thinning rather than by pitting or localised attack. The simplest remedy was to neutralise the free acid. In his opinion there was little prospect of discovering either an alloy or a protective layer or scale which would resist corrosion under all conditions.

Prof. T. Turner emphasised the superior non-corrodible nature of polished metallic surfaces, and expressed the opinion that little was to be expected from the study of inter-metallic substances, owing to the readiness with which they are dissolved by acids and their often brittle and unworkable nature.

Dr. G. F. Morrell gave the results of experiments on the effect of varnishing aluminium and its alloys in relation to their corrosion by water and sodium chloride solution.

The discussion is to be resumed at a subsequent meeting.

BRISTOL AND SOUTH WALES.

At the meeting held on December 2, at Bristol, Mr. Ernest Walls in the chair, a paper on "The Alkalinity of Soaps with reference to their Action on the Skin," by F. C. Beedle and T. R. Bolam, was read, in the absence of the authors, by Miss M. E. Laing, and illustrated by photo-ultramicrographs.

Following the paper there was shown a number of attractive exhibits designed to illustrate the chemical industries of the district. The local gas company exhibited special drawings of plant, samples of by-products, methods of testing, etc.; Messrs. Wm. Butler and Co., a graded selection of intermediate and finished products from tars, resins and oils; and Messrs. John Hare and Co., a selection of colours in various stages of treatment, also white lead products and blocks illustrative of processes used in oil-cloth manufacture. Messrs. Capper, Pass and Sons sent samples of Chempur tin accompanied by test pieces and tables of physical constants, and Messrs. John Cox and Co.'s Successors showed sole and patent leathers. A calorific bomb in non-rusting steel, to replace the platinum-lined bomb, was exhibited by Mr. Waterfall, and Messrs. Christopher Thomas and Bros. displayed soaps in various stages of manufacture, by-products, candles and waxes. The United Alkali Co.'s products were shown accompanied by some freak crystals of sal-ammoniac; Messrs. Ferris and Co. displayed a large selection of raw materials together with the various tinctures, extracts, etc., obtained from them, and a unique pharmacist's outfit; and Messrs. Pritchard and Co. sent an interesting series of oil fractionations. The St. Anne's Board Mills and the South Wales Cement Co. showed specimens of their products, and Messrs. P. and S. Evans exhibited a range of leathers, with samples of the damage done to hides by flies. Specimens of fine chemicals were supplied by Messrs. Evans, Gadd and Co.; colours, varnishes, enamels and waxes by James Rudman and S. Willis and Co.; vinegar and vinegar products by Messrs. Purnell and Panter; and the Bristol Refining Co. showed a case of graded foodstuffs.

Another meeting of the Section was held at the Engineers' Institute, Cardiff, on December 3, Prof. C. M. Thompson presiding. In a paper on "The Works Chemist: what he is and what he might be," Dr. R. V. Stanford discussed the training, functions, status, value, prospects, and potentialities of a chemist in relation to industry; he reviewed the problems connected with scientific and industrial research, and with works' control, comparing the conditions prevailing in this country with those in other lands. He emphasised the need of better appreciation of the chemist on the part of the employer and capitalist, and for greater commercial outlook and capacity on the part of the chemists, so that they might make their value to industry more apparent.

EDINBURGH AND EAST OF SCOTLAND.

The December meeting of this Section was held on the 7th inst. in the Hall of the Pharmaceutical Society, Edinburgh. Dr. D. S. Jerdan presided, and a paper on "The Work of the Chemical Waste Products Committee" was read by Principal A. P. Laurie.

This committee was appointed under the Munitions Inventions Department during the war to make inquiries concerning the chemical waste products available throughout the country, and to make investigations with a view to their utilisation. Numerous important investigations were carried out, and the results of these made known to interested manufacturers. Dr. Laurie referred particularly to the work on sulphide of arsenic residues from sulphuric-acid works, bauxite residues, and the residues from the rectification of benzol. He also instanced many interesting problems which were suggestive for future researches. Several investigations were in progress when the work of the Committee was stopped on the declaration of the armistice. The results of these would have been of incalculable value to the industry of the country, and Dr. Laurie was strongly of the opinion that a permanent organisation should have been set up by Government to continue this work. (*Cf.* J., 1919, 231 R.)

Mr. B. D. W. Luff then read the report of a Joint Committee of the Local Sections of the Institute of Chemistry and the Society of Chemical Industry which had been appointed to consider the proposal to start a Scientific Club in Edinburgh. Such a club would be open to all male members of the various scientific societies in Edinburgh and to all graduates in science and medicine resident in the district. The proposal was discussed, and the feeling of the meeting was that there was need for an organisation in Edinburgh which would provide an opportunity for social intercourse among all persons of varied scientific interests. It was agreed that the proposal be circulated among people interested, and that a meeting should be called early in the year to discuss details.

NOTTINGHAM.

The December meeting was devoted to the reading and discussion of a paper on "Theory and Practice in Chemical Industry, with special reference to Physical Chemistry" by Dr. E. B. R. Prideaux, of University College, Nottingham.

Although at the moment chemical industry is labouring under troubles mainly of a political and social nature, the frequent neglect of theory constitutes an important, if minor, handicap. The successful practical man, who is often an unconscious theorist, would doubtless add to his efficiency by studying the theories upon which his processes are based, and the more empirical the branch of chemistry, the greater the need for guiding theories. For new points of view and working hypotheses the industry is just as dependent upon academic work as formerly (*cf.* Sir W. Ramsay's presidential address to this Society in 1904). In view of the multiplicity of the new branches, summarised under the term "physical chemistry," it was difficult for the student to know what to learn and what to leave. Research in works' laboratories involved the application of the results of "pure" science, and for this a thorough grasp of theoretical foundations during a college course was essential. The author then gave a number of illustrations of the applications of physical principles to various branches of chemical technology and to the work of an analytical laboratory.

In the discussion Mr. H. D. Richmond referred to the importance of colloidal phenomena in dairy chemistry, such as the adsorbed layer of colloidal matter around fat globules, the rate of motion of fat particles under centrifugal force, and the preservation of the right hydrion concentration in condensed milk; and Mr. J. T. Wood spoke of the need of investigating the action of the emulsion of soap, oil and water used in oil tanning. In reply, Dr. Prideaux described some of the difficulties he had encountered in arranging short courses of lectures on physical chemistry for evening students.

NEWCASTLE-ON-TYNE.

The Joint Committee of this Section and of Armstrong College has arranged a course of six lectures, three to be given by Mr. E. Hatschek on "Colloids," and three by Mr. L. Archbutt on "Lubrication and Lubricants." The lectures will be given in the Chemical Lecture Theatre of Armstrong College, Newcastle, on Wednesdays, January 12 and 19, February 2, 9, 23, and March 9, commencing at 7.30 p.m. Applications for tickets should be sent to Mr. A. Trobridge (1, Brunswick Place, Newcastle), together with the appropriate remittance, viz., 10s. 6d. for the course, 2s. 6d. for a single lecture, but members of this Society and of certain kindred societies can obtain tickets at half the above prices.

MEETINGS OF OTHER SOCIETIES.

THE FARADAY SOCIETY.

The annual general meeting was held at Burlington House, W., on December 13, when Prof. A. W. Porter was elected president in succession to Sir Robert Hadfield.

At the ordinary meeting which then followed, Mr. A. L. Norbury read a paper on "The Electrical Resistivity of Dilute Metallic Solid Solutions." In discussing the general interpretation of resistivity data, the author draws attention to the methods of plotting the results, and shows that the type of curve obtained by plotting resistivity against temperature may vary considerably. Le Chatelier's interpretation of Matthiessen's results for two mutually insoluble components indicates a linear relation between conductivity and composition. In other cases the resistivity-composition curve more nearly approaches a straight line. Schleicher, however, has shown that the mechanical arrangements of the constituents may have an important effect. The author gives reasons for thinking that the initial additions of solute to a metal solvent cause an almost linear increase in the resistivity of the solvent. The examination of a large number of solid solutions confirms this view. The effect of cold work and crystal size on resistivity, although appreciable, is small. The author has collected a large number of experimental data showing the effect of 1·0 atomic per cent. of added element on the resistivity of pure metals, viz., iron, nickel, cobalt, palladium, platinum, copper, silver, gold, magnesium, and cadmium. Some results for liquid copper, sodium, and potassium are also given. The author can find no obvious analogy between solid solutions and aqueous solutions. On the contrary, the atomic effects are large or small according as the solute is far from or near to the solvent in the Periodic Table. The bearing of the author's work on that of W. H. and W. L. Bragg on crystal structure is also discussed.

A paper by Mr. W. E. Hughes described the forms of electro-deposited iron and the effect of the acidity of the bath on its structure. The structures of deposited iron may be divided into two classes:—(1) Normal, consisting of approximately equi-axed grains, and (2) fibrous, in which the crystal structure is indefinite. In the latter case the appearance suggests that "the deposit is composed of a mass of threads or fibres situated at right angles to the cathode surface." The fibrous structure is obtained when the electro-deposition is carried out in a bath containing free acid, or in a neutral bath which is kept agitated. If the current is maintained for a sufficient time to remove the free acid, the type of the deposit changes. It is found that there are certain macroscopic features which correspond to definite microstructures; this is of use in controlling the process.

A paper by Prof. E. D. Campbell (University of Michigan) on "A Force Field Dissociation Theory of Solution applied to some Properties of Steel" was presented by Dr. A. E. Oxley.

INSTITUTION OF PETROLEUM TECHNOLOGISTS.

At the meeting held on December 14, a paper on the "Estimation of Sulphur by the Lamp Method," by F. Esling, was read in the author's absence by Dr. A. E. Dunstan. The author did not claim anything new in the general method, but described a new form of lamp and absorption apparatus.

The lamp is made from blown glass and weighs about 15 grms. The wick-holder, which is sealed to the cap, passes almost to the bottom of the lamp, preventing fractionation of the oil during the burning. A small stoppered side-tube is fitted to the body of the lamp, by means of which absolute alcohol or other solvents may be introduced in order to ensure combustion of the whole of the oil. The absorption apparatus consists of a U-tube, one limb of which is packed with glass wool saturated with $N/16$ solution of sodium carbonate. Esling found that glass wool is usually strongly alkaline and requires careful washing with acid and water before use. The sulphur is estimated by titration of the absorbent liquid, after washing out the bulbs, against $N/16$ sulphuric acid, using methyl orange as indicator and neutralising to a standard tint, or by determining the sulphur gravimetrically as barium sulphate.

In the discussion Dr. Dunstan stated that he preferred a silica wick-holder to a glass one, and for absorption apparatus he used a tube of the Orsat absorber type filled with glass tubing of very narrow bore, which gave practically perfect absorption.

Dr. F. B. Thole stated that difficulty was experienced in obtaining a smokeless flame with a chimney of the size that Esling used, but this could be obviated by using a larger chimney. He also suggested that unless the whole of the oil under test was consumed there was liability of adsorption of sulphur compounds in the wick, also that the volumetric estimation always gave high results owing to the formation of a small amount of nitric acid during the combustion.

Mr. H. V. Mitchell, in comparing this method with that of sulphur estimation in the calorimetric bomb, instanced cases where explosions had occurred in using the bomb for the determination of sulphur in petrols.

Mr. L. Lomax, who had made over a thousand sulphur determinations by means of the bomb without any injury to the apparatus, stated that these explosions were probably due to excessive initial oxygen pressure in the bomb, or to the use of too much petrol. He never employed 25 atmospheres pressure as given by most workers, but only 10 atm., the combustion being complete with this pressure.

Dr. W. R. Ormandy stated that glass wool was usually made from soft glass, and if quartz wool were substituted the difficulty in regard to alkalinity would disappear.

A paper on "Boring in Palestine" was read by Capt. P. W. Mangin.

ROYAL PHOTOGRAPHIC SOCIETY.

At the meeting held on the 14th inst., arranged by the Scientific and Technical Group, Mr. E. L. Turner described the results of experiments by himself and Messrs. Smith and Hallam on the photometric determination of the relationships obtainable between the reflection values of the original and of the copy in photolithographic work. The discrepancies are fairly considerable and are not removed by any of the modifications so far examined. Mr. G. I. Higson, of the British Photographic Research Association described the use of crossed wedges in photometric work, originally suggested by Luther in 1910, but adopted only to a very small extent. The method of obtaining the characteristic curve by printing through a wedge copy and a wedge at right angles to it was explained in detail, and the advantages which this method has in some respects over the photometer method were discussed and illustrated by lantern slides. Some of the abnormalities quite definitely shown to exist with some of the plates examined would have been regarded as irregularities of material or errors of experiment if found by photometric measurement. Mr. E. K. Hunter exhibited a form of daylight lamp used in process houses and in textile industries for colour estimation by artificial light. A special tint of blue glass and a diffusing glass are used to tone down the light of an arc lamp.

PERSONALIA.

Mr. Roscoe Brunner, chairman of Messrs. Brunner, Mond and Co., Ltd., has been appointed a director of the Allied Chemical and Dye Corporation, New York.

The Society of Dyers and Colourists has awarded the medal of the Dyers Company to Mr. C. F. Cross for his paper on "Colloidal Tannin Compounds and their Applications."

Mr. E. A. Cappelen Smith, a member of this Society since 1906, has been awarded the gold medal of the American Mining and Metallurgical Society for his work on hydrometallurgy.

Prof. J. C. Irvine has been appointed Principal of the University of St. Andrews. Dr. Irvine was educated at the Glasgow Technical College and the Universities at St. Andrews and Leipzig, and has been professor of chemistry at St. Andrews since 1909.

It is announced that Dr. W. Schlenk, of the University of Vienna, has been offered a chair of chemistry by the University of Berlin; Dr. K. Thomas has accepted the chair of physiological chemistry in the University of Leipzig; and Prof. P. Ehrenberg, director of the Institute of Agricultural Chemistry at Göttingen has been appointed to succeed Prof. Th. Pfeiffer at the University of Breslau.

The death is reported of Dr. E. Ador, formerly professor of chemistry in the University of Geneva, at the age of seventy-five.

NEWS AND NOTES.

CANADA.

Developments in Chemical Manufactures.—*Benzol.*—The benzol plant recently installed at the works of the Steel Company of Canada, Ltd., is now producing 4000 galls. of benzol a day, mainly for use in the preparation of motor-fuel mixtures (*cf.* J., 1920, 200 R).

Fertilisers.—It is announced that the Cross Fertiliser Co. has purchased a 15-acre site at Welland, Ontario, where a factory for the manufacture of chemical fertilisers will be erected next spring. The company's factory at Sydney, Nova Scotia, is suffering from a deficient supply of basic slag.

Sodium Sulphate.—The deposit of sodium sulphate recently discovered at Fusilier, Saskatchewan, is being exploited by the Southern Alberta Refineries, Ltd., which is endeavouring to sell its product in Eastern Canada. The salt could be marketed throughout the Dominion if a reasonable freight rate were obtainable; the present rate is nearly $17 per ton. The Salt and Potash Company of Canada, Ltd., is refining sodium sulphate, derived from its deposit in Saskatchewan, at Kitchener, and successfully marketing it.

Arsenic.—An American company has been organised to develop the mispickel ores that occur in Hastings County, Ontario, but mining has not yet begun.

The Petroleum Discovery in N.W. Canada.—According to Canadian oil experts, the public would be well advised not to take too seriously the recent discovery, by representatives of the Imperial Oil Co., of oil near Fort Norman, 150 miles south of the Arctic Circle. Although the oil appears to exist in commercial quantities (*cf.* J., 1920, 419 R), the difficulties of transport, if not insoluble, are very great, the distance from the nearest railway being 1200 miles. It is authoritatively stated that a pipe line to the railway would cost $50,000,000.

The Rubber Industry.—The Canadian rubber industry has been suffering from depression during the last few months, but it is anticipated that conditions will improve early in 1921. There are 32 rubber factories with a total capital of $45,000,000 and about 12,700 employees. The value of the raw materials used in 1919 was $19,671,453, including $6,221,362 for raw rubber, $652,734 for reclaimed rubber, $7,650,727 for canvas, $1,624,772 for chemical and mineral products, and $1,060,631 for duck and other cotton products. The total value of the output at the factory was $36,651,610, including tyres worth $23,398,673.

SOUTH AFRICA.

Production of Natal Spirit in 1919.—The report of the Union Superintendent of Excise for the year 1919 states that the production of Natal spirits (produce of the sugar cane) decreased from 1,934,040 galls. in 1918 to 1,576,619 galls. in 1919, mainly on account of the Imperial Government's demand for spirits having ceased. The industry of motor fuel, including ether used in its manufacture, absorbed 397,402 galls. of spirits. It was thought that the exportation of Natal spirit would considerably decrease with the cessation of war demands, but it is understood that markets have been found in England and on the Continent which will take all that can be spared from the African market for some time to come, and projects are on foot to augment the plant in all the five existing distilleries.

A new regulation was published during the year authorising the alternative use of Simonsen oil as a denaturant for motor fuel (natalite), and this oil is now being used in the proportion of 0·5 volume with 0·5 volume of pyridine bases in every 100 volumes of the fuel.

From 202,750 galls. of spirit, 89,565 galls. of ether was manufactured in 1919, and this quantity was disposed of as follows:—For motor fuel, 82,351 galls.; wax hardening, 4015; anæsthetic ether, 612; paint manufacture, 201; exported, 912; medicinal and industrial purposes, 652.

During the year permission was obtained by the Natal Cane By-Products, Ltd., to manufacture chloroform, and experiments have proved that standard chloroform of sp. gr. 1·485 can be made cheaply enough to compete with the imported article. The same firm has also started the manufacture of absolute alcohol, and it is expected that an export trade will be obtained in this commodity.

BRITISH INDIA.

Indian Crop Forecasts.—*Sesamum.*—The second official forecast states that the total area under sesamum for the present season is about 2,221,000 acres, which compares with 2,220,000 acres a year ago. The condition of the crop is fair, on the whole, weather conditions having been somewhat unfavourable.

Groundnuts.—According to the first forecast, the total area sown to groundnuts is 1,448,000 acres, against 1,274,000 acres twelve months ago, or an increase of 14 per cent. Seventy-five per cent. of the total area is in Madras, 13·5 per cent. in Burma, and 10·5 per cent. in the presidency of Bombay.

Cotton.—The first forecast gives the total area under cotton at 18,228,000 acres, or 3 per cent. less than the estimate a year ago. The decrease occurs mainly in Mysore and Hyderabad, but increases of 35 per cent. and 16 per cent. are reported in the North-West Frontier Province and in the Punjab, respectively. Weather conditions have been only moderately favourable, and hence the condition of the crop is only fair.

Rice.—A decrease of nearly 2 per cent. is reported in the area under rice, the acreage now being 74,185,000. Prospects are stated to be generally good (first forecast).

Industrial Progress in the United Provinces.—The influence of post-war conditions on industry is commented on in the report of the Director of Industries for 1919-20. The difficulty in obtaining machinery and the restricted coal supply have retarded development, and although capital is available for industrial investments, its flow is mainly directed to the more advanced industrial centres. The export of hides has temporarily fallen off, owing to the cessation of army demands and the large stocks existing in Europe and America, and prices have fallen to almost pre-war level. Up-to-date cotton mills have had more orders than they could fill.

Continued progress is reported in the glass industry. A factory is being constructed near Firozabad for the manufacture of sheet glass, bottles, and bangles. The need of the moment, however, is more up-to-date furnaces and methods of manufacture. Raw material is plentiful, and the results achieved by chemical research with *reh* justify the expectation that the sources of supply may be increased. The increasing import figures show that foreign competition is becoming a factor to be reckoned with, and the Government is obtaining the services of a glass expert to advise manufacturers in regard to machinery and processes of manufacture.

There is a growing demand for liquid oils as a substitute for fat in the manufacture of soap, and the prospects of this industry are bright. Experiments made by the Industrial Chemist show that, when mixed in the right proportion with other ingredients, *neem* oil loses its strong odour and can be solidified, and as the raw material for the manufacture of this oil is plentiful, a new, cheap, and useful ingredient is rendered available in the manufacture of soap. Further experiments point to the possibility of utilising cotton seed in the manufacture of vegetable butter, and the manufacture of casein from cotton seed on a commercial scale would also appear to deserve attention.

A prosperous year is recorded in the essential oil industry. Financial assistance by the Government has enabled experiments to be carried out with a view to improve the indigenous processes of manufacture and substantial help to the industry has resulted. An improved type of still has been introduced and experiments in the distillation of roses continued. Results, however, were only fairly satisfactory, and the Industrial Chemist is of opinion that a higher percentage of essence cannot be obtained without improvement in the flower itself. Experiments with clove-stems showed that with the improved type of still the stems can yield an average of 4½ per cent. of oil with a high eugenol content. It is suggested that although clove-stems are not indigenous, their distillation could be undertaken in India if a cheap supply of the raw material from Africa or elsewhere could be arranged.

The deputation to England early in 1920 to participate in the British Industries Fair achieved excellent results, and the success of the Indian Section was reported to be entirely due to the articles sent from the United Provinces. The various technical schools in the provinces had a satisfactory year and the School of Printing and Dyeing at Cawnpore continues to attract students from all parts of India. A printing school is being established temporarily at Farrukhabad and the organisation of peripatetic instruction in dyeing is also under consideration. The report of the principal of the Weaving Institute at Benares concerning the possibilities of peripatetic weaving schools and methods of widening the scope of their activities is being considered by Government. The appointment of Dr. Watson, chemist, as the first principal of the Research Institute at Cawnpore marks an important step towards the realisation of a scheme which was postponed owing to the war.

AUSTRALIA.

Mineral Production in Tasmania during 1919.—The Secretary of Mines in his report for the year ended December, 1919, states that the aggregate value of the minerals raised in Tasmania during the year was £1,301,090, a decrease of £449,482 on the value of the output for the previous year. The mining industry was hampered very much owing to the shipping strikes on the mainland, the influenza epidemic, and the closing of the Sulphide Corporation's works at Cockle Creek, which was the only market for the silver-lead ores of the western and north-western districts. Another outlet has, however, since been obtained, and the ore is now being purchased by a Melbourne firm for direct shipment to England.

The quantity of silver produced was 525,343 oz., and of lead 2357 tons, the chief producers being the Zeehan, Mt. Farrell, Magnet, and Mt. Claude mines. Osmiridium is being won in the Savage River, Mt. Steward, and Wilson River districts. In the latter part of the year the Government geologist made an exhaustive examination of the osmiridium fields, and his report is awaited with great interest. The production during the year was 1669 oz., valued at £39,614. The King Island Scheelite Co. treated 27,832 t. of ore and obtained 199 tons of scheelite from the only scheelite mine now in operation. A very valuable clay and sand deposit is being worked at Kingston, and high-grade whitening, for which there is a big market, is being produced. The production of other metals and minerals was as follows (the figures in brackets denote the production for 1918):—Gold 7686 oz. (10,528 oz.); copper 5027 t., of which 5014 t. was produced at the Mt. Lyell mine; tin 1580 t.; zinc 285 t.; bismuth 1·77 t.; wolfram 121 t. (155 t.); coal 66,253 t. (60,163 t.); barytes 399 t.; asbestos 51 t. (2854 t.).

Sandalwood Oil in Western Australia.—The Western Australian Government Gazette has published a regulation which prohibits, except for distillation within the State, the cutting or removal of sandalwood from certain districts included within a radius of 200 miles from Carnarvon (North-West Division). The timber from this area gives a higher yield of oil than that growing on the goldfields, and it has been reserved in order to ensure a continuous supply of wood for the local sandalwood-oil industry, in which two manufacturers are now engaged in Perth. The oil is worth 22s. per lb., and the yield is stated to be 50 lb. per ton of wood.—(*Ind. Austral., Oct.* 7, 1920.)

UNITED STATES.

Use of Helium-Hydrogen Mixtures for Airships.—Experimental tests have shown that mixtures of hydrogen and helium containing from 14 to 20 per cent. of hydrogen are not inflammable under aeronautic conditions; with more than 20 per cent. of hydrogen the mixture is unsafe.

A New Lubricant for Chronometers.—Oil suitable for lubricating watches has hitherto been obtained almost exclusively from the maxillary fat of the porpoise, and has cost as much as $250 a gallon. A satisfactory oil for this purpose is now being obtained from petroleum by a new process devised by Dr. C. F. Mabery.

Tanning Research. — The Tanners' National Council has decided to reorganise its research laboratory and to remove it to one of the universities where facilities and personnel are favourable to continuous work. The Council has also decided to establish a tanning school in connexion with some educational institution, and has requested the National Research Council to assist in determining the type of school and the best locality for it.

A New Engineering Organisation.—The Federated American Engineering Societies, which includes over 45,000 engineers, has been organised and the American Engineering Council formed. The new body will engage in public welfare work and will seek to bring engineers into close contact with public service. Mr. Herbert Hoover has been elected president, and one of the first problems to engage attention will be to inquire if there has been retardation in production, and if so to what it has been due.

Maltose Syrup.—Although this syrup is doubtless destined to replace dextrose on account of its superior properties, its immediate prospects are not bright. Many American breweries have taken up the manufacture of maltose syrup without possessing the technical ability necessary for success, and the new industry is, in fact, going through the same stages as did that of dextrose. Competition has increased owing to the increased availability of cheap materials suitable for dextrose manufacture and the sharp fall in the price of ordinary sugar. Nevertheless, well-equipped plants controlled by trained personnel are producing excellent maltose syrup of good colour and free from the objectionable maltose flavour.

Incomplete Combustion of Gasoline in Automobiles.—In a recent address to the Washington Section of the American Chemical Society, Dr. A. C. Fieldner, supervising chemist to the U.S. Bureau of Mines Experimental Station, Pittsburgh, Pa., stated that 30 per cent. of the gasoline used by automobiles in the United States was wasted owing to imperfect combustion due to defective carburettors. The estimated consumption for this purpose is 3400 million gallons yearly, and at the present price of 31—34 cents a gallon, the loss is calculated to be $346,800,000. The estimated wastage was deduced from experimental figures obtained in investigating the ventilation of the projected vehicular tunnel under the Hudson River (*cf.* J., 1920, 168 R).

Nickel in 1918.—The nickel produced in the United States in 1918 amounted to only about 440 short tons, valued at $401,000, which was saved as a by-product in the electrolytic refining of copper. The country obtained its supply from Canada and, in much smaller quantity, from New Caledonian ores matted in France. The total weight of nickel in all forms imported during 1918 amounted to 73,207,147 lb., valued at $11,520,775. The exports during the period amounted to 17,469,500 lb., valued at $6,927,041.

Nickel or nickel salts (nickel sulphate or nickel ammonium sulphate) were produced by the American Smelting and Refining Co., Raritan Copper Works, and Nichols Copper Co. The United States Smelting and Refining Co. separated nickel salts from copper-bearing materials made from Canadian ores and belonging to the International Nickel Co. The salts were all returned to the latter company and are not included in the estimates of American production. The International Nickel Co., which had previously refined all its nickel matte in America, started refining in 1918 at its new plant at Port Colbourne, Ontario. Here it expects to be able to refine enough nickel to supply the British Empire, as the plant was designed to produce about 15 million lb. of nickel per year, together with about half this amount of copper.—(*U.S. Geol. Surv., June* 29, 1920.)

Cadmium in 1919.—The world's supply of cadmium is mainly produced in America and Germany, but a small output is being made at the electrolytic zinc plants of Brunner, Mond and Co. and Chance and Hunt in England. The American production for 1919 amounted to 99,939 lb. of metallic cadmium, valued at $121,926, and 31,197 lb. of cadmium sulphide, valued at $37,436. There is no great demand for cadmium and the production fluctuates very greatly. The maximum capacity for metallic cadmium reported by producers is 29,000 lb. a month, or about 175 tons a year, but the producing capacity could no doubt be brought up to 500 short tons or more per annum. The price of cadmium would be the deciding factor in determining the grade of cadmium fumes which can be worked at a profit. According to the data obtained, the annual accumulation of cadmium-bearing fumes is about 600 short tons carrying a content of about 75 per cent. of metal.

In the 1918 publication (*cf.* J., 1919, 271 R) particulars were given of the substitution of cadmium for tin in solders, and in this connexion the (London) *Mining Journal* of January 3, 1920, published an abstract from the *Metallbörse*, which stated that German experience has shown that cadmium is useless for most practical purposes. The most important use during the war was probably in bronze telegraph and telephone wires, a fraction of 1 per cent. of cadmium being used as a deoxidiser in French and Italian manufacture. The metal is also used as a deoxidiser in making nickel alloys. There is, therefore, some promise of a very considerable demand for cadmium in the next few years.

Sulphide of cadmium is a well-known brilliant yellow pigment of great permanency, which is used as a protective coating over chrome-yellow in painting vehicles. It is also extensively employed to give colour and lustre to glass and porcelain.—(*U.S. Geol. Surv., June* 18, 1920.)

"Commerce Reports."—The annual subscription for *Commerce Reports*, published by the United States Bureau of Foreign and Domestic Commerce, has been raised from $2.50 to $3.50, as from January 1, 1921. From that date the annual reviews of commerce and industry prepared by the consular officers will be incorporated in *Commerce Reports*, instead of appearing in supplement form as hitherto. The Reports can be obtained from the Superintendent of Documents, Washington, D.C.

GENERAL.

German Chemical Publications.—A drastic change in the mode of issue of the *Zeitschrift für angewandte Chemie* has been decided upon for 1921. Hitherto that journal—now coming into its 34th year—has consisted of three parts with separate pagination:—(1) An "Aufsatzteil," containing original articles; (2) a "Wirtschaftlicher Teil," or economic section; and (3) the technical portion of the *Chemisches Zentralblatt*. These parts were issued twice weekly, as follows:—(1), (2), and (3) were issued together at 200 mk. yearly, (2) at 50 mk., and (1) and (2) together at 120 mk. Partly on account of excessive cost and partly because the division of the abstracts into "pure" and "applied" was found to be unsatisfactory, it has been decided to discontinue the separate issue of the technical portion of the *Zentralblatt*, but all members of the Verein Deutscher Chemiker will be allowed to subscribe for the entire *Zentralblatt* at the same subscription rate, viz., 200 marks, that is asked of members of the German Chemical Society, the price to non-members of these societies being 1000 mk. It is stated that the price of 200 mk. does not cover one-half of the cost of production and distribution, the deficit being made good by the Adolf Baeyer Society.

The *Z. für angewandte Chemie* will therefore in future consist of two parts only, an "Aufsatzteil," which will be modified to include reviews of progress in the different branches of pure and applied chemistry, and an economic portion, consisting of the existing publication *Die Chemische Industrie*, to be issued as a weekly supplement. The subscription price for the *Zeitschrift*, together with postage, etc., has been fixed at 56s. for England and colonies, $11.20 for the United States, and 127 fr. for France.

Mauritius in 1919.—The annual report of the Department of Agriculture for 1919 estimates the sugar crop for 1919-20 at 235,490 metric tons, which compares with 252,770 tons in 1918, and an average of 234,340 tons for the period 1912-1918. The crop is estimated to consist of 94·45 per cent. vesou sugar, about 1 per cent. of first syrup, and 4 per cent. low syrup; the increase in the proportion of vesou from 73·8 per cent. in 1911 to the present figure reflects improvement in the methods of manufacture. The number of sugar factories in operation remained at 54. The production of alcohol from waste molasses forms a subsidiary industry, but the output—1,529,315 litres in 1918-19—is mainly used locally for human consumption; attention, however, is being paid to the production of motor spirit. Hitherto, most of the molasses has been used as a fertiliser. Of aloes fibre, 10,139 bales was exported, but trade was limited owing to lack of tonnage and the adverse exchange. The vanilla industry revived during the year owing to improved demand, and the experimental plantation of limes, which is making good progress, was extended. There is considerable scope for the planting of coconuts in the colony; this crop constitutes the staple industry of the adjacent Oil Islands.

During the year the Chemical Division analysed 754 samples of fertilisers, cane juices, molasses, etc., and 452 samples of soil. Investigations were made on the production of salt from sea-water (the four salines in Mauritius produce about 1800 tons of salt per annum), on cane juices, statistics of production, etc. Various diseases and pests of sugar cane, and the causes of deterioration of sugars were investigated by the Geological Division, and a preliminary study of the cost of sugar production was undertaken by the Statistical Division. Among other work the Experiment Stations studied the selection and cultivation of sugar canes, the possibility of replacing the local fibre-plant *Furcroea* by sisal, and the cultivation of Sea Island and Sakellarides cotton (*cf.* J., 1920, 296 R).

Suspension of Nickel Mining in Norway.—Following the closing down of the Christianssand nickel mines, work has now been suspended at Hosanger, and consequently the production of nickel ore has entirely ceased.—(*Z. angew. Chem., Nov.* 12, 1920.)

Fluorspar in Derbyshire.—It is announced that Mr. C. S. Garnett, of Sheffield University, has discovered, near Wirksworth, in Derbyshire, a deposit of fluorspar assaying 90—95 per cent. CaF_2, which is 30 ft. thick and extends for about a mile. A Chesterfield syndicate, it is stated, has secured the land and will start operations very shortly.

Phosphate Production in French North Africa.—In a recent discussion among the owners of phosphate deposits it was stated that the production of phosphates in Tunisia, Algeria, and Morocco could be increased to 5 million tons per annum, of which amount Tunisia could produce 2 million tons. The present low output is attributed largely to scarcity of labour and lack of transport facilities.—(*U.S. Com. Rep., Nov.* 8, 1920.)

The Guano Deposits of Sardinia.—These deposits are now being investigated by leading Italian chemists, who have found that some of them are valueless, but that others contain up to 49·84 per cent. of organic matter. In recent years the guano has been used in Sardinia and in Italy, and experiments have proved its value as a dressing for cereal crops; the cost of production is, however, high owing to the varying richness of the deposits which necessitates careful selection of those which can profitably be exploited.—(*Z. angew. Chem., Oct.* 15, 1920.)

Tungsten Deposits in Russia.—The only known occurrence of tungsten in European Russia is that of wolframite at the Boyev mines, Kamishlov, Government of Perm. These mines were not worked continuously prior to the war, and the total production did not exceed 3½ tons of ore containing over 70 % WO_3. Several deposits of high-grade ore have been worked intermittently in the Nertchinsk district of Transbaikalia (Asiatic Russia), but the output has been small. Indications of tungsten deposits have, it is stated, been found in the Kolyvan mines in Altai; and scheelite is said to occur in the Zmeinogorsk mines in Altai, in the Berezov district of the Ekaterinburg mining district, and at two places in the Caucasus.—(*U.S. Com. Rep., Sept.*, 18, 1920.)

Salt Deposits in Czecho-Slovakia.—The evacuation of eastern Rusinia by Rumania has given Czecho-Slovakia salt mines which yielded about 50,000 metric tons of salt in 1918, or about one-sixth of the entire consumption. The beds, located at Aknaszlatina, are estimated to contain 60 million tons. The salt is of fine grain and contains not more than 0·2 to 0·4 per cent. of impurities. Close to the salt mine there is a large chemical factory which produces soda and other chemicals used in the manufacture of glass and soap, etc.; extensive forests in the vicinity provide ample supplies of fuel. There are also large salt deposits in the Berec and Uzhorod districts of Rusinia, and as the former Hungarian salt mines at Slaná Báne and Solny-rad are also within the territory of Czecho-Slovakia, it is anticipated that the production will be sufficient to cover the whole of the country's needs.—(*U.S. Com-Rep., Sept.* 30, 1920.)

The Polish Salt Industry.—The salt mines now being worked in Poland comprise those at Bochnia, Dolina, Drohobycz, Kalusz, Kossow, Lacko, Lanczyn, Stebnik, and Wieliczka in Galicia; Hohensalza, Gora, Wapno, in the former Prussian territory; and Ciechocinek in the plebiscite area. The output for 1920 is estimated at 681,000 metric tons, and competent authorities anticipate big developments which will react favourably on the chemical, metallurgical, tanning, and paper industries.—(*Z. angew. Chem., Oct.* 5, 1920.)

"Reparation" Dyes in Italy.—An agreement has been made between the Italian Government and the Union of Dye-makers and Dye-users relating to the disposal of dyes and intermediates furnished by Germany under the reparation scheme. The State will fix the sale price of the dyestuffs, and the Union, which has provided a guarantee of 9 million lire (£360,000 at par), will pay all expenses connected with selling, be responsible for transport, and receive a commission on each contract. Up to the present 700 metric tons of dyes has been received, upon which a commission of 4 per cent. is payable.—(*Rev. Prod. Chim., Nov.* 15; *Z. angew. Chem., Dec.* 7, 1920.)

The German Bauxite and Aluminium Industries.—The total monthly output of the State-controlled aluminium works in Germany (*cf.* J., 1920, 95 R) increased from 600 tons at the beginning of 1916 to 2000 and 2500 t. through the autumn of 1917 and in 1918; the production decreased to 1000 t. in February, 1920, on account of the shortage of bauxite and fuel. Two of the State-controlled companies, the Vereinigte Aluminiumwerke A.-G., and the Erftwerk A.-G., have a total capacity of 30,000 tons per annum, and that of the Innwerk A.-G. is not stated. The sales organisation of these companies is controlled by the Metallgesellschaft of Frankfort.

The principal bauxite mines are situated near Frankfort, in the Darmstadt area of Upper Hesse, and on the western slopes of the Vogelsberg. The pre-war prejudice against Upper-Hessian bauxite has been partially overcome by better acquaintance with the product, and the chief bauxite producers have amalgamated to form a new company, the Bauxitwerke A.-G., Frankfort a.M., which will effect its sales in common with certain other companies through the Vereinigung Hessischer Bauxitgruben G.m.b.h. in Munster. It is reported that Dutch interests have invested 1.5 million marks in the new company.—(*Bd. of Trade J., Oct.* 28.1920.)

Prospects of Fertiliser Supplies in Germany in 1921.—The Ministry for Food and Agriculture has recently issued the following information in regard to supplies of fertilisers in 1921:—Given adequate supplies of fuel, the potash industry should be able to meet all demands, but the supply of nitrogenous and phosphatic fertilisers is likely to be difficult. The following table shows the consumption by German agriculture of the potash (K_2O), nitrogen, and phosphoric acid (P_2O_5) contained in artificial fertilisers during the years (ended April 30) mentioned:—

	Metric Tons. Potash.	Nitrogen.	Phosphoric Acid.
1914	557,000	210,000	630,000
1918	779,000	92,000	325,000
1919	670,000	115,000	230,000
1920	756,000	158,000	147,000

By continuously enlarging the factories, it is hoped that the nitrogen industry will be able to supply 300,000 metric tons of nitrogen, as synthetic nitrogenous fertilisers, in 1921, and thus provide amply for home requirements. Supplies of phosphatic fertilisers still cause grave anxiety, but there is hope that, under the terms of the Spa Agreement, large quantities of raw phosphate will be imported and thus enable superphosphate manufacturers to fulfil orders for next spring. Costs of production in the fertiliser industry are so high that any reduction in prices is hardly to be expected. The Ministry is investigating production costs, and taking steps to stabilise prices and to secure more prompt distribution by the railways. —(*Chem. Ind., Nov.* 3, 1920.)

New German Leather Research Institute.—An Institute for Leather Chemistry has been established in the Darmstadt "Technische Hochschule" with the help of contributions from the State of Hesse, the city of Darmstadt, and tanners. Prof. E. Stiasny, of Vienna, formerly professor of the leather industries department at Leeds University, has been appointed principal of the Institute.—(*Z. angew. Chem., Nov.* 9, 1920.)

The Rumanian Oil Industry.—The 140 oil companies operating in Rumania possess a combined capital of 530,500,000 lei (£21,220,000 at par), of which the 37 British companies possess £6,200,000 or 29·7 per cent. and the 13 German and Austria-Hungarian companies £6,480,000 or 30·6 per cent. The percentages of the total capital held by other countries are as follows:—America, 4·7, Belgium 2·1, France 6·5, Holland 7·5, England and Holland 11·3, Italy 1·4, and Rumania 6·3 per cent.—(*U.S. Com. Rep., Oct.* 28, 1920.)

Transfer of the Argentine Oilfields.—The Compañia Argentina de Comodoro Rivadavia has entered into an agreement to transfer its oilfields to the Buenos Ayres Western, Great Southern, and Buenos Ayres and Pacific railway companies for a period of 20 years, with an optional prolongation of a further 10 or 20 years, in consideration of a sum of 150,000 (paper) pesos (equivalent to about £12,100 at normal exchange), of 12½ per cent. of the gross yield of oil after deducting quantities consumed in working the field, and 1,000,000 paper pesos (£83,000) for the plant, pipe lines, petroleum, buildings, etc. The railway companies undertake to bore a minimum of 20 wells a year within three years, and 6 wells a year in the following 3 years, up to a total of 100 wells, but may cease boring within 7 years, when the Comodoro Rivadavia Co. may make new borings for its own account; they also undertake to carry 12½ per cent., or some 200,000 tons, of the oil produced at cost price. As the railway companies require at least 600,000 tons of oil per annum, they have the greatest interest in producing as much petroleum as possible in the shortest time.—(*U.S. Com. Rep., Oct.* 20, 1920.)

The Potosi Mining District in Bolivia.—The Potosi district is essentially a mining district which centres around the Cerro de Potosi mountain. The chief ores are those of silver and tin, but ores of copper, lead, antimony, and other metals are also mined. During 1918 the district exported the following minerals:—Tin concentrates, 4639·5 metric tons; tin bars, 582 t.; wolfram, 1990 kg.; silver, 22·84 t.; copper, 31 t.; and bismuth, 18·36 t. There are three important mining companies, one of which owns the only smelter in Bolivia, whilst another, of French origin like the first, has a modern concentration plant which turns out about 5 tons of barilla, with 55—60 per cent. of tin, a day. The third company is the Anglo-Bolivian Mining Syndicate, Ltd., which owns important tin, silver, and bismuth mines near Atocha, in Southern Bolivia. A company, controlled by British interests, installed two dredges to work alluvial tin deposits in the bed of a river near the city of Potosi, but work has stopped, as the dredges, which cost about £100,000, were burned. Mining methods, in general, are antiquated.—(*U.S. Com. Rep., July* 19, 1920.)

PARLIAMENTARY NEWS.

HOUSE OF COMMONS.

Zinc Concentrates.

Sir P. Lloyd-Greame, replying to Mr. Wignall, stated that the Government had agreed to purchase Australian zinc concentrates for a period of 10 years after the declaration of peace. Stocks of concentrates held by the Government amounted to 503,000 tons, but none had been acquired since January 1, 1920, owing to the strike at Broken Hill. The adverse state of the home spelter industry was not due solely to the Government contract with Australia.—(Dec. 6.)

Petroleum Exploration in England.

Mr. Hope, replying to Mr. Holmes and Viscount Curzon, said that of the seven borings in Derbyshire one has been completed, two were temporarily suspended, and four were still in operation. The Hardstoft well was producing 50 barrels a week, the total production to November 27 being 4318 barrels (557 t.), which had been sold at £22 10s. per ton; a pumping test was to be made shortly. Out of the sum of £1,000,000 voted by Parliament to be expended under the agreement with Messrs. S. Pearson and Son, Ltd., the total expenditure up to the end of October, 1920, was £469,830, including £70,000 spent during the present financial year. (*Cf.* J., 1920, 359 R.)—(Dec. 6, 7.)

Key Industries Bill.

Answering Sir P. Magnus, Sir P. Lloyd-Greame stated that the Government intended to introduce the Bill dealing with key industries, other than the dye industry, as the first measure next session. —(Dec. 8.)

Protection of Dyestuff Industries Abroad.

In reply to Mr. Briant, Sir R. Horne said that with regard to the protection of the dye industry in certain foreign countries, the French tariff duties on chemicals were revised in November, 1919, when the classification of coal-tar dyes was considerably elaborated and the tariff rates on certain classes of these dyes increased; at the same time all colouring materials and chemicals imported from Germany in excess of the levy imposed by the Peace Treaty were subjected to an import licence. In the United States, an Act of 1916 revised the tariff duties on dyestuffs and imposed special and additional duties on dyes and intermediates for at least five years; the prohibition of the importation of dyes, save under licence, established during the war, was still in force. In Switzerland most dyes were subject to a small duty under the ordinary customs tariff.—(Dec. 13.)

Coal Output.

Mr. Bridgeman informed Mr. Swan that the coal output for the three weeks following the full resumption of work in the mines was 15,563,400 tons; in the corresponding period of 1919 the ouput was 14,338,000 t.—(Dec. 13.)

Electricity Bill.

In a written answer to Mr. Simm, Sir E. Geddes said that time had not been available for the consideration of the Electricity Bill, owing to its controversial nature, but the Electricity Commisioners had found a general disposition on the part of undertakers and authorities to co-operate in the promotion of voluntary schemes within the ambit of the Act passed last year. The Bill now on the Order Paper would be withdrawn and replaced by a smaller measure.—(Dec. 13.)

Sir E. Geddes presented the Electricity (Supply) (No. 2) Bill, which is intended to amend the Electricity (Supply) Act, 1919, and to provide the Electricity Commissioners with powers urgently needed to enable them to proceed with their statutory duties.—(Dec. 14.)

Abatement of Smoke and Noxious Vapours.

Replying to Mr. Morrison, Mr. Parker stated that the Interim Report of the Departmental Committee on Smoke and Noxious Vapours Abatement had been communicated to the Housing Commissioners, who had been instructed to consider proposals submitted with a view to giving effect to its recommendations. Local authorities would be invited to consider the various substitutes suggested for the open coal fire where these could be economically adopted.—(Dec. 14.)

Imports and Exports of Coal and Dyestuffs.

Sir R. Horne, in a written answer to Mr. Parkinson, supplied the following information regarding the trade in coal and dyestuffs between the United Kingdom, Germany and Switzerland during the period January–October, 1920:—

United Kingdom.	Germany. Tons.	Switzerland. Tons.
Exports of coal	2395	160,993
" coal-tar pitch	271	827
" tar oil, creosote, etc.	14,883·5	194·7
" other products of coal-tar distillation	452·2	3493·8
Imports of coal-tar intermediates and dyestuffs	2021	2573 5

The total re-exports to all countries of coal-tar distillation products of foreign or colonial manufacture were:—February, 10 t.; July, 29·1 t.; August, 9·8 t.; and September, 12·5 t.—(Dec. 14.)

Tungsten Ores.

In answer to Mr. Wignall, Mr. J. Hope said that the Government was no longer under any obligation to purchase tungsten ore from any source. As a result of war contracts, about 1271 tons of tungsten ores had been received from Australia during the present year, but not more than 200 tons of wolfram and molybdenite remained unsold.—(Dec. 6.)

Unemployment in the Fine Chemical Trade.

Mr. Bonar Law informed Major Barnes that he was aware of the growing unemployment in the drug and fine chemical trade, and with regard to the urgent need of these materials in Russia he referred him to the Prime Minister's statement, made on December 13, to the effect that negotiations were proceeding with the Russian Trade Delegation with a view to establishing trade relations with that country.—(Dec. 13.)

Women and Young Persons (Employment in Lead Processes) Bill.

The Lords' amendments to the Women and Young Children (Employment in Lead Processes) Bill were agreed to on December 14; they were of an explanatory or drafting nature. In Clause 1 the prohibition of the employment of women, etc., in the reduction of zinc or lead ores, and in the manufacture of oxide, carbonate, chromate, or silicate of lead, was extended to the treatment of such ores, and to the manufacture of acetate and nitrate of lead.

Sugar Factory, Jamaica.

Replying to Mr. Jesson, Col. L. Wilson said that the proposed central sugar factory in Jamaica would have a capacity of 10,000 tons per annum and would treat sugar-cane grown by small-holders as well as cane from other sources. A consulting engineer was proceeding to Jamaica to advise the Colonial Government.—(Dec. 15.)

Duty on Pyroxylin Solution.

Mr. Chamberlain, answering Mr. Barrand, said that the import duty on all preparations and mixtures containing spirits was assessed on the quantity of proof spirit they contained, and that no exception was possible, or advisable, in the case of pyroxylin solution (used in making patent leather).—(Dec. 16.)

Dyestuffs (Import Regulation) Bill.

The Bill was considered in Standing Committee on December 9, 13, 14, 15, and, with few exceptions, the amendments moved were rejected. These included proposals to limit the import prohibition to German dyes; to exclude intermediates, synthetic medicinal products, and new dyes (for one year); and to reduce the period of prohibition to three years. Sir R. Horne assured the Committee that at least one scientific man (who should be a chemist) would be appointed as a neutral member of the licensing committee.

On the Report Stage (Dec. 17), a new clause was inserted providing that the import prohibition of any dye, etc. be terminated when it is sold by manufacturers for export at a price below that current in the home market. Another clause proposing to limit dividends paid by a dye-making firm to 8 per cent., so long as the import of any dye made by it was prohibited, was rejected, as was also a proposal to permit the continuance of an import licence until it was proved that the same article was being manufactured in this country. An amendment prescribing that any licence granted in a particular case should *ipso facto* become a general licence was negatived, and a motion to substitute four dye-users, of whom two should represent workpeople, for five, was also rejected. A new sub-section authorising the free ingress of any dyes produced within the Empire was added, but an attempt to limit the period of operation of the Act to one year met with no success. The Government proposal to bring the Act into operation on January 15, 1921, was accepted. The Third Reading was agreed to by 111 votes to 25, and the Bill was passed.

The Bill passed through its several stages in the House of Lords, and was reported to the House without amendment; it received the Royal Assent on December 23.

LEGAL INTELLIGENCE.

ACTION OVER SIMILAR TRADE MARKS. *J. Brown and Co., Ltd., v. The Zeekol Manufacturing Co.*

In the Chancery Division, on December 14, the registration of the trade mark "Zykol," granted to Messrs. J. Brown and Co., Ltd., of Dewsbury, in respect of a liquid disinfectant, was successfully opposed by the Zeekol Manufacturing Co., of Hampstead, N.W., on the ground that the trade mark sought by the respondent company was practically identical with that used by the appellant company for ointment and soap, viz., "Zeekol," as the preparations could be used for similar purposes. The defence submitted that there was no likelihood of confusion, as "Zykol" was mainly used by surgeons and nurses, although some was sold to the general public.

Mr. Justice Eve, in giving judgment, declined to accept the view that ointment and soap could not be described as medicines for human use, and held that the word "medicine" connoted remedies both for external and internal use. As the preparations in question were both medicines, and as there was such a similarity between their names that the risk of confusion was inevitable, the appeal would be allowed, with costs.

REPORTS.

Mines and Quarries. General Report with Statistics, 1919. *By* The Chief Inspector of Mines. Part II.—Labour. [*Cmd.* 1007. 9*d.*] Part III.—Output. [*Cmd.* 1035. 4*d.*]

Output.—The total value of the minerals raised during the year 1919 was £335,673,503, representing an increase of 78½ million sterling over the output value for 1918. The actual quantities raised are given in Part I. of the Report (*cf.* J., 1920, 362 R).

Coal.—The output of 229,779,517 tons of coal represents an increase of 2 million tons on the previous year's production. The average pithead price of coal increased from 20s. 11d. in 1918 to 27s. 4d. in 1919. The amount of coal exported as such was 35,249,568 tons, of which 46 per cent. went to France, 13 per cent. to Italy, and about 4 per cent. each to Denmark, Egypt, Gibraltar, Sweden and Norway; a further quantity of 12,021,242 tons was used for bunkering ships engaged in foreign trade, and coke equivalent to 4,052,230 tons was also exported; so that the total quantity of coal leaving the country was 51,323,040 tons, or 22·5 per cent. of the total output. The amount of coal remaining for home consumption was 178,456,477 tons, equal to 3·866 tons per head of the population.

The total coal carbonised dropped to 35,190,754 tons (38,219,479 tons in 1918), the decrease being almost entirely confined to the coke-oven industry, which produced 11½ million tons of coke, compared with over 13 million tons in the previous year. The number of coke ovens in operation was 15,133, as against 16,292 in 1918, and it is significant that over 900 beehive ovens were shut down. Over 2 million tons of briquettes, valued at nearly £5,000,000, was produced in South Wales.

Iron.—Iron ore is by far the most important of the metallic minerals raised in the United Kingdom, and the recorded output of 12,254,195 tons of ore yielded 3,808,095 tons of metal, or more than half the total pig iron made in this country. The output of iron ore is classified under the three heads:—

	Ore. Tons.	Metal from Ore. Tons.
From Mines under the Coal Mines Act..	4,949,944	1,484,983
" " ..Metalliferous .. " ..	1,313,218	664,274
From Quarries	5,991,033	1,658,838

Of the iron ore obtained from quarries over 46 per cent. was derived from Lincolnshire and nearly 34 per cent. from Northamptonshire.

When the quantity of imported ore is added to the home supply, we find that there was 17,710,870 tons of ore available for the British blast furnaces. The returns for the pig-iron industry are compared in the following table:—

	1919.	1918.
Works in operation	120	119
Furnaces built ..	490	487
Furnaces in blast	279	317
Pig iron made ..	7,417,401 tons	9,107,384 tons
Ore used	19,044,272 "	22,544,064 "
Coal used ..	2,309,587 "	2,6 6,840 "
Coke used ..	9,384,337 "	11,286,680 "

The yields of metals from other home-produced ores were as follows:—

	1919.	1918.
Antimony ..	*Nil.*	4 tons
Copper	144 tons	179 "
Lead	10,277 "	10,909 "
Silver	68,414 oz.	79,645 oz.
Tin	3272 tons	3954 tons
Zinc	2436 "	3245 "

Iron pyrites.—During the year only 7336 tons of iron pyrites (mostly cuprous) was mined, and 344,457 tons imported.

Lead.—Imports of lead amounted to 4435 tons of ore and 217,610 tons of metal, and as the exports totalled 25,672 tons of metal, it follows that some 205,405 tons of lead was consumed in the country.

Manganese.—The mines of North Wales produced only 12,078 tons of ore (17,456 in 1918); imports amounted to 264,800 tons.

Shales.—The Scotch shales continue to give average yields of 20 galls. of oil and 40 lb. of sulphate of ammonia per ton of shale. The average price at the mines rose from 9s. 11d. in 1918 to 11s. 4d. in 1919.

Petroleum.—The petroleum imports show a drop of 45 per cent. on the previous year, the total for 1919 being 721,416,844 gal.

Mercury.—The quantity of mercury imported was 2,841,893 lb. and 3,438,423 lb. of foreign mercury was exported.

Salt.—The amount of British salt exported was 345,209 tons, which was 39 per cent. more than in the previous year.

Tin.—The mean monthly price of standard tin was £257 10s. The imports of tin were 35,737 tons of ore and 22,901 tons of metal, and 14,692 tons of metal was exported.

Tungsten.—The mines of Devon and Cornwall produced 166 tons of tungsten ore (? concentrates); the Cornish ores (? concentrates), which formed the bulk of the production, showed an average metal content of 63·8 per cent.

Zinc.—The mean monthly price of zinc was £42 5s. The imports included 78,552 tons of ore and 98,905 tons of metal, and 10,124 tons of metal was exported.

Labour.—During the year 1919 research work was carried out at the Eskmeals Experimental Station on the following subjects, good progress being recorded:—(1) The propagation of flame in mixtures of firedamp and air, (2) the electrical ignition of mixtures of firedamp and air, (3) magneto exploders, (4) sparks due to frictional heat, (5) the spontaneous combustion of coal, (6) the composition of coal, (7) the limits of inflammability of mixtures of vapours and air, and (8) the ignition of clouds of carbonaceous dusts. The routine work carried out at the station included the analysis of 980 samples of mine air and 73 of mine dust.

The use of electricity in mines showed an increase of over 6½ per cent. on the previous year, the total horse-power of the electrical machinery in use being 1,028,927. The number of electrical coal-cutting machines in use at the end of the year was 1950, against 1797 in 1918. The six fatalities which occurred were due to defects in the earthing circuits. In the metalliferous mines the consumption of electricity was 20,915 h.-p. (See also J., 1920, 362 R.)

Interim Report on Glass Bottles and Jars and Scientific Glassware. *Prepared by a Sub-Committee appointed by the Standing Committee on Trusts. Pp.* 9. *London: H.M. Stationery Office.* 1920. [*Cmd.* 1066. 2*d.*]

The Sub-Committee was appointed under the Profiteering Acts, 1919 and 1920, to inquire into the operations and the influence upon prices of any trade combination in the glass industry, and the present report deals with the glass-bottle trade and scientific glassware.

Glass bottles and jars.—The present prices of glass bottles and jars are 180 and 200 per cent. higher than those charged in 1914; supplies are now improving, but deliveries, especially of medical bottles, are still very uncertain. Attention is drawn to the influence of increased prices of bottles upon the prices of medicines, foods, and beverages, the money value of the container in some cases being greater than its contents. The present costs of manufacture are 210 and 250 per cent. above those of 1914. Output is being increased and labour reduced by the introduction of the Owens automatic machine, and the savings effected therewith vary from 19 to 43 per cent., according to the type of bottle.

The inter-relations of the principal combinations of glass manufacturers are set out in the report, and it is stated that the arrangements made offer prospects of a large output at a low cost, but it appears to the Sub-Committee that they have reduced any chance of bottles reaching the consumer at a reasonable price. A substantial reduction in price should follow the more extended use of the Owens machine, which as yet has no serious competitor. The prices fixed by the Association of Glass Bottle Manufacturers of Great Britain and Ireland are minimum prices, and at present they are the same for hand-made as for machine-made bottles, but only a few Owens machines have so far been installed.

Scientific glassware.—At the outbreak of the war certain glass-bottle manufacturers were induced by the Government to develop the manufacture of laboratory glassware. As this country had previously been dependent for supplies upon enemy countries there were difficulties to be overcome, and Government representatives are said to have given verbal promises of post-war support as an inducement to proceed with new processes. Prices were initially based on those ruling in Sweden in 1915, and were subsequently advanced in proportion to the increased cost of production. In 1916 the manufacturers formed the British Chemical Ware Manufacturers' Association, which determined prices and arranged for any member to visit the works of any other member with a view to mutual assistance.

The Science Masters' Association complained that the progress of scientific instruction was endangered by the inferior quality and excessive prices of British-made glassware, and in consequence its members no longer felt justified in keeping their pledge not to purchase from enemy countries for five years after the war; specimens of recent purchases were submitted in support of their complaint. The Sub-Committee has witnessed manufacturing operations, and does not consider the specimens submitted to be representative; and it cannot express an opinion upon the prices as manufacturers are not yet able to produce cost figures.

Manufacturers state that their products are equal, and in some cases superior, to pre-war foreign supplies, and that the experience gained and the machinery installed would enable them to work on an economic basis, but they cannot extend their works without some safeguard against unfair foreign competition.

Continental goods are now being imported and sold at prices below the cost of manufacture in this country, and those imported goods which are not yet manufactured here are sold at five times the pre-war prices.

Prohibition of imports of scientific glassware except under licence is desirable, and in view of the losses incurred in experimental work, such temporary support should be given to the industry as is consistent with fairness to consumers so as to enable it within reasonable time to meet foreign competition.

REPORT ON THE TRADE AND ECONOMIC CONDITIONS OF TURKEY DURING 1919. *By* CAPT. *C. H.* COURTHORPE-MUNROE, *Commercial Secretary to the British High Commission, Constantinople. Pp.* 191. *London: H.M. Stationery Office.* 1920. [*Cmd.* 942. 2*s.*]

For the purpose of this report Turkey is understood to comprise the pre-war Turkish territory in Europe and that part of Asia Minor now administered by the Army of the Black Sea. This is the first British official report on Turkey which has been published since 1913.

The natural resources of the country include cereals, fruit, and vegetables, vegetable oils, cotton, wool, silk, tobacco, opium, hides and skins, gall nuts, valonea, and timber. The mineral wealth is known to be considerable, especially in the vilayet of Aidin, but development is very backward. Among the minerals found are ores of antimony, arsenic, chromium, copper, iron, lead, zinc, manganese, mercury, and nickel; also emery, salt, asbestos, asphalt, alum, borax, gold, coal, lignite, and sulphur. The well-known emery deposits along the Aidin railway were not worked during the war, but 10,000 tons of old stock was exported during 1919, one-half to the United Kingdom and two-fifths to America. The production of salt in the same vilayet supplied the whole of the Ottoman Empire, the annual output being estimated at about 151,400 long tons; and the antimony mines of Tchinli-Kaya, about 40 miles S.E. of Smyrna, produce normally about 1000 tons per annum. The various deposits of chromite were worked during the war under German military control, the important Karliar mine being one of those exploited by the firm of Krupp, which is still the nominal owner. It is stated that the ore assays 50 per cent. Cr_2O_3, that the property is a very promising one, that 20,000 tons of high-grade ore was mined prior to 1914, and 750 t. sent away during the war. A total of 16,500 t. of mined ore is said to have been left behind by the Germans, but it is doubtful if its value would bear the cost of transport. A second group of chromite mines in the same district was worked by a Munich firm, the chief of which (Dagh-Ardi) is much richer than the Karliar and is equipped with a modern ore-dressing plant having a daily capacity of 30 t.; its pre-war annual output is stated to have been 20,000—30,000 t., which was reduced to about 15,000 t. during the war. The deposit is extensive. A shorter account is given of the coal mines at Eregli (Heraclea), on the Black Sea, where the present output of coal is estimated at 20,000 t. a month (*cf.* J., 1918, 459 R).

Argentiferous lead and zinc ores are mined and smelted at Balia Karaidin, where the yearly pre-war production was about 120,000 t. of ore, yielding 12,000 t. of lead, 24,000 kg. of silver, and 84 kg. of gold, also 10,000 t. of zinc ore containing 41 per cent. of metal. The lignite mines were developed during the war, and the estimated total output is now 63,000 t. monthly. A manganese mine was opened up and worked by the Germans near Eregli in 1916 and a daily output of 73 t. attained; 8000 t. was mined, and there is a large stock awaiting shipment. There is no doubt that the mineral resources of Turkey constitute a great potential asset, but exploitation is rendered very difficult by the lack of coal.

Apart from mining, there are but few industries in Turkey, and over half of these are concentrated in the Constantinople district. Official (Turkish) statistics give the number of factories existing in 1915 at 282, with 14,060 employees; they include 13 tanneries, 55 paper mills and printing works, and 13 chemical factories. Manufactured goods are largely imported, and in this trade the United Kingdom holds first place, supplying textiles, tin-plate, paints, soap, drugs, chemicals, etc. The chemical trade was mainly held by Germany and Austria until 1912, but by 1914 an agency of a large British firm had succeeded in capturing the market. With the exception of a small French trade in drugs, the United Kingdom has been the sole source of pharmaceutical products since the armistice. Early in 1919 the trade in perfumery was in French hands, but latterly a British firm has established itself with success (*cf.* J., 1920, 227 R). Window glass was formerly almost exclusively supplied by Belgium. At the present time there is a great shortage of glass in Turkey. There is also a great demand for building materials and cement, but the prospects of English trade in the latter commodity are not promising as cement of good quality is being supplied from South Russia and sold at a price 40 per cent. lower than that of English cement. (*Cf.* J., 1920, 60 R.)

OFFICIAL TRADE INTELLIGENCE.

(*From the Board of Trade Journal for December* 9 *and* 16.)

OPENINGS FOR BRITISH TRADE.

The following inquiries have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, from firms, agents, or individuals who desire to represent U.K. manufacturers or exporters of the goods specified. British firms may obtain the names and addresses of the persons or firms referred to by applying to the Department and quoting the specific reference number.

Locality of Firm or Agent.	Materials.	Reference Number.
Australia	Glassware, hearth tiles, aluminium ware	789
"	Photographic materials ..	791
"	Chemicals, drugs, perfumery	*412/20/7/330
British Empire ..	Earthenware, tiles, paint, varnish	788
" West Indies	Soap, paper, oil meal, cocoa ..	806
Canada	Bronze, copper, brass, nickel silver, copper alloys ..	822
"	Cold-rolled steel, tinplate, black plates	826a
Egypt	Photographic materials (tender for)	—
New Zealand ..	Chemicals	800
"	Heavy chemicals	802
"	Soap, candles, dyes, inks, starch	803
"	Crockery, glassware, paint, varnish, colours ..	805
Belgium	Fine chemicals, drugs, pharmaceutical and photographic products ..	833
France	Linseed oil	837
Greece	Leather	837a
Hungary	Machine oil, tinplate, copper, tinning materials ..	812
Italy	Galvanised sheets, lead, solder, zinc sheets, caustic soda	838
"	Non-ferrous metals	839
"	Chemicals, oils	839a
Norway	Chemicals, soda, oil, lard ..	840
Spain	China, glass, tiles, iron and steel sheets	813
"	Galvanised iron, tanning extracts, etc	844
Mesopotamia ..	Paper	816
United States ..	Mica	818
Argentina	Plateglass, bottles	819
Mexico	Fats, coconut oil, tallow, grease	852
"	Paper of all kinds	853
Peru	Chemicals, drugs, glass, tinplate, soap, galvanised iron	854

* The Official Secretary, Commercial Information Bureau, Austialia House, Strand, London, W.C. 2.

Markets Sought.—An agent in Turkey desires to get into touch with U.K. importers of gum tragacanth and copper. [815.]

A firm in Cuba wishes to dispose of the mining rights of certain iron-ore properties. [Inquiries to the Department.]

TARIFF. CUSTOMS. EXCISE.

Algeria.—A consumption duty has been imposed on glucose, and that on sugar has heen increased.

Austria.—Export licences for soap, other than common soap, are no longer required.

Czecho-Slovakia.—Minimum export prices have been fixed by the Foreign Trade Commission for sheet glass, kaolin, china, matches, timber, hops.

Among the articles subject to the new "manipulation" fee are dyes, beer, cellulose, sawdust, chemicals (except hydrochloric acid), kaolin, china, faïence, certain kinds of glass, metals, paper, shoe polish, tar and its derivatives, wax, and yeast.

Guatemala.—After January 1, 1921, the customs duties on alcoholic beverages will be increased by 100 per cent.

Kelantan.—The import duty on kerosene, petrol and/or other fuel oil, will be refunded provided the oil has been used for the propulsion of any machine used exclusively for soil cultivation.

Latvia.—A translation of the revised import tariff may be seen at the Department, 18, Queen Anne's Gate, S.W. 1.

Malta.—The revised import tariff is set out in the issue for December 16. The duties have in many cases been increased. Among the duty-free articles are cocoa, lard, preserved milk, charcoal, hides, skins, manure, marble, sand, cement, indigo, scientific instruments, leather, paper, printing ink, laundry soap, copper sulphate, and sulphur powder.

An *ad valorem* duty varying from 5 to 20 per cent. is chargeable on acids, alkalis, candles, chemicals, drugs, pottery, glass, rubber, matches, oils, paint, colours, soap (except laundry), wax, etc.

Netherlands.—Export prohibitions have been withdrawn from, *inter alia*, animal fats, butter, asbestos, caustic potash, potassium carbonate, charcoal, glue, margarine, condensed and dried milk, soda lye, soda salts and chloride of lime.

Norway.—Importation of earthenware is prohibited as from December 6.

Poland.—The list of goods which may be imported without permit may be seen at the Department, 18, Queen Anne's Gate, S.W. 1.

Rumania.—The export is prohibited of, *inter alia*, caustic soda, cement, copper, brass, rubber, gutta-percha, gums, iron ores, cast iron, lard, fats, milk, paper, paraffin wax, artificial phosphates, rape seed, and zinc.

Among the articles which may be exported subject to specified conditions in each case are raw cellulose, ferro-manganese, light benzine, lamp oil, heavy benzine, lubricating grease, and other petroleum products.

Import licences will not be issued for cocoa and chocolate.

Spain.—As from December 1, the customs duties on many articles have been greatly increased as a temporary measure, including marble, alabaster, glass, earthenware, porcelain, textiles, cork, leather, optical instruments, alcoholic beverages, chocolate, and rubber wares.

Sweden.—The temporary suspension of the customs duties on margarine, butter, and condensed milk is continued until February 28, 1921.

The export of cocoa and chocolate is prohibited except under licence as from November 22.

Trinidad.—The new customs tariff is now in force.

Goods grown, produced or manufactured in the British Empire are subject to a preferential tariff. Among the articles affected are explosives, polishes, tiles, candles, cement, chemicals, china, porcelain, pottery, cocoa, glass, gums, matches, drugs, condensed milk, oils, paint, colours, varnish, paper, perfumery, salt, soap, starch, sugar, vinegar, wax.

Among the articles exempted from duty are certain drugs, raw rubber, balata, chicle, raw hides and skins, bones, horn, manure, insecticides, fungicides, copra, tanning and dyeing materials, fuel and scientific apparatus.

Turkey.—The export of olive oil is allowed from all parts of Turkey.

COMPANY NEWS.

British Glass Industries, Ltd.—At the first ordinary general meeting, held on December 8, the chairman, Mr. C. W. Milne, stated that the company (which is largely a holding one) had been earning profits at the rate of over £600,000 per annum during the past nine months, notwithstanding that much of the capital expenditure had not yet become remunerative. The Canning Town factory had two furnaces in operation, and three more ready to begin work. At Charlton, two Owens machines had been working since September, two more would be ready this month, and a further four in three months' time. The two factories had already turned out 15 million bottles. In spite of very strenuous foreign competition, orders had been booked far ahead, and the undertaking was at present able to hold its own. The position of the chemical, optical, and illuminating branches of Webb's Crystal Glass Co., Ltd., was less fortunate, and they looked to the Government to extend the help which had been promised. It was proposed to issue at a later date a further £325,000 of capital to pay off bank loans and to increase the earning power of capital already issued (*cf.* J., 1920, 225 R).

British Cellulose and Chemical Manufacturing Co., Ltd.—Addressing the second annual general meeting, on December 9, Sir Harry McGowan, chairman of the company, explained that work had been carried on at a loss up to June 30 last, and that the large issue of capital made in the spring did not become available until after the close of the financial year (*cf.* J., 1920, 423 R). The change over from dope to artificial silk manufacture had necessarily involved a period of working without profits. Strikes had caused serious delays, but progress was now better, and the equipment for producing 9 tons of silk per day should be complete by the end of March; chemical and mechanical difficulties were being overcome. Artificial silk was to be considered the main product of the undertaking, and other activities would be restricted until this manufacture had been established. The insulating property of the silk was several times that of the natural fibre, its elasticity is equal to that of natural silk, and in many important qualities it was superior to all other artificial silks. There would be no difficulty in dyeing it. The company's carbide plant was the largest in the country, and the aspirin plant was large enough to render the country independent of foreign supplies.

Anglo-Persian Oil Co., Ltd.—Presiding at the meeting of this company, held on December 20, Sir C. Greenway drew attention to the developments of the past year. He said that Scottish Oils, Ltd., was now making a fair profit, although working expenses had increased by £700,000 per annum. The declining price, however, of sulphate of ammonia and some of the other main products would have an adverse effect. The Scotch refineries were being extended to increase the output of shale oil and to refine Persian crude oil. The refinery at Swansea should be ready to start during the next six months, and the benzine and kerosene produced there, and also the output in Scotland, would be marketed by the company's subsidiaries, the British Petroleum Agency and the Scottish Oil Agency. Arrangements had been made to form a French company (capital 100 million francs) to refine and distribute oil and to develop French oil resources. An oil refinery had been established in Australia (*cf.* J., 1920, 339 R), and exploratory work undertaken in New Guinea and Papua. The British Oil Bunkering Co., Ltd., had been formed to establish bunkering installations in all the chief ports. There was no ground for pessimism in regard to future supplies of oil fuel; the difficulty was to open up new supplies in a sufficiently short time. The world's production of liquid fuel available outside the countries of origin was about 10 million tons, but in a few years' time this should be increased to 50 millions. The statement that Persian petrol was almost useless for aviation purposes was entirely without foundation. Although no new oilfields had been opened up in Persia, the existing fields were producing at an extraordinarily high rate. In order to meet increasing transport requirements, the British Tanker Co., Ltd. (a subsidiary) had placed orders for a further large number of tankers.

The accounts for the year ended March 31, 1920, show an issued capital of £11,075,000, debentures £5,000,000, and reserves £1,815,000. The gross profit was £3,458,418, and the net balance at credit of profit and loss £1,848,841 (subject to tax). The preference shares are receiving 8 per cent, and the ordinary shares 20 per cent., for the year. H.M. Government has, said the chairman, already received, directly and indirectly, much more than cent. per cent. on its investment in the company.

British Ammonium Co., Ltd.—The statutory meeting of this new company was held in Manchester on December 20. Dr. F. H. Bowman, the chairman, said that the company's processes of ammonia manufacture, the foreign patent rights of which had all been sold, utilises atmospheric nitrogen and produces yields of ammonium sulphate 25 times greater per ton of fuel consumed than the ordinary coal-distillation process. The plant was simple and inexpensive, could be worked by unskilled labour under ordinary supervision, and would form a necessary auxiliary to existing gas-works' plant.

Cassel Cyanide Co., Ltd.—The profits for the year ended September 30 last, amounted to £95,700, which compares with £69,900 for the previous year. A final dividend of 1s. per share is recommended, which will make the total dividend for the year up to 1s. 9d., against 2s. a year ago, when the capital was much smaller. The sum of £17,000 is carried forward.

TRADE NOTES.

BRITISH.

British Industries Fair, 1921.—The British Industries Fair in 1921 will be held at three centres, viz., at London (the White City) from February 24 to March 4, at Glasgow from February 28 to March 11, and at Birmingham from February 21 to March 4. The London section will include exhibits of glass and glassware, china and earthenware, drugs and druggists' sundries, and scientific and optical instruments. In the Kelvin Hall, Glasgow, will be shown light and heavy chemicals, dyes, domestic chemical products, and textiles; and paints, colours, and varnishes, weighing and measuring instruments, rubber goods, tools, hardware, etc., will be exhibited at Castle Bromwich, Birmingham. All the space available at the London centre has been applied for, but it is understood that space is still available at the other two sections, and applications therefor should be addressed to the General Manager, Kelvin Hall, Glasgow, and to the General Manager, Chamber of Commerce, New Street, Birmingham.

Fertiliser Supplies.—The position in regard to supplies of sulphate of ammonia, basic slag, and superphosphate of lime is very satisfactory. During the four months ending September 30, 1919, roughly 117,800 tons of superphosphate was produced, as against 157,500 tons in the same period of 1920. The production of superphosphate, however, exceeds the deliveries, and there is a danger that, unless orders are placed early, it may be necessary to export large quantities in order to prevent congestion and stoppage of work at the factories. Although the production of basic slag increased from 188,500 tons to 262,300 tons during the periods June–October, 1919 and 1920, it will apparently not be sufficient to meet the continually increasing agricultural demand. Large quantities of German and Alsatian potash are available, and if the prices ade high, this is inevitable under the prevailing economic conditions.—(*Official*.)

Canadian Chemical Trade.—During the six months ending September 30, 1920, the Canadian imports of chemicals and allied products were valued at $21,265,099, of which the United States supplied 75·8 and the United Kingdom 11·3 per cent.; the total does not include imported sulphur valued at $1,102,614. The exports for the same period amounted in value to $11,099,924, consignments to the United States accounting for $5,676,234.

Glue and Gelatin Manufacture in New South Wales.—Although glue has been manufactured in Australia for some years, the production of gelatin has only recently become of importance, a large factory having been established at Botany, near Sydney. Large amounts of the raw materials, such as waste products from refrigerators, tanneries, etc., are available locally, and as they can be handled in a fresh state, the highest grades of glue and gelatin will be produced. The total consumption of glue and gelatin in the Commonwealth in 1913 amounted to 1500 tons.—(*Bull. Dept. Tr. and Com., Can., Nov.* 8, 1920.)

FOREIGN.

Foreign Company News.—*Germany.*—According to the Berlin press, arrangements have been concluded to prolong the existing contracts between the various firms of the dye industry until December 31, 1999; also notices of withdrawal from the I.G. will only be accepted subject to a four-fifths majority vote in general meeting. With reference to the transfer of the nitrogen works at Oppau and Leuna (Merseburg) (*cf.* J., 1920, 399 R), it is reported that the firms concerned will probably endeavour to raise two milliard marks of further capital before the end of 1921.

As the result of an amalgamation between the German firm of Jurgens (margarine manufacturers) with certain Dutch interests, a new company, Deutsches Jurgens-Werke A.-G., has been founded at Hamburg, with a capital of one million marks.

United States.—The American Cellulose and Chemical Co., Ltd., is about to add three new units, at a cost of $200,000 each, to its existing artificial silk plant at Amcelle, near Cumberland, Maryland, bringing the total number of units up to nine, and making the establishment one of the largest of its kind in the world.

An important amalgamation of glass manufacturers is stated to be under consideration. The new company, to be called the Inter-State Glass Co., will command a capital of ten million dollars and fifteen window-glass plants situated in Virginia, Pennsylvania, Ohio, and Oklahoma.

Resumption of Chemical Trade in Austria.—Manufacturers and merchants in Vienna have established an official exchange in that city for trade in chemicals, under the management of Dr. Pollak, president of the Union of Chemical Manufacturers (Bund der Chemo-technischen Betriebe), and with headquarters at the House of Industry, Vienna, District 3. It is anticipated that Vienna will become the natural market of the new States in Eastern and Central Europe.

Trade of Chinese Turkistan.—This province has an area of 46,000 sq. miles and a population of 1,850,000. Despite difficult communications, trade with India has improved of late, largely owing to the suspension of trade with Russia. When conditions become normal in Russian Central Asia, it is anticipated that there will be a large demand for hardware, machinery, cotton goods and prints, patent medicines, drugs, dyes, paper, and many other goods. The province has many undeveloped minerals, including gold, copper, iron, lead, platinum, coal, naphtha, sulphur, alum, ozokerite, marble, gypsum, and emery. The iron deposits near Kizil, in the Yarkland district, are said to offer great possibilities, the ore being of superior quality. —(*Bd. of Trade J., Sept.* 23, 1920.)

French Trade in Vegetable Oils and Oil-bearing Materials.—The appended statistics show the French imports and exports of vegetable oils and oil-bearing materials in 1919:—

	Imports. Long Tons.	Exports. Long Tons.
Vegetable Oils :—		
Sesame	4·1	272·5
Groundnut	3406	1964·2
Rapeseed	1569	245·5
Mustard	1·6	—
Olive (pure)	54288	2405·7
Palm	23,335·5	99·7
Copra, palm-kernel, &c.	9591	413·1
Castor, pulghere	1312·3	518·8
Linseed	20,132·4	1036·3
Cottonseed	4634	39·9
Soya-bean	3783	15·4
Corn	50	—
Other vegetable oils	119·7	329·8
Cacao butter	385·7	125·9
Oil-bearing Materials :—		
Groundnuts	223,244·3	805·2
Soya beans	73·2 (1918)	12·4
Cotton seed	5945·7	51·9
Linseed	100,037·2	562·5
Hempseed	2045·9	33·9
Sesame seed	31,580·5	109·7
Mustard seed and Indian colza	30,100	626·9
Colza seeds (European)	40	7·3
Copra	50,655·1	11·3
Palm nuts	52,653·3	1,118·9
Other oil seeds and nuts	40,597	274·8

The total value of the imports and exports was £53,161,760 and £1,419,400 (taking £1=25 fr.) respectively.—(*U.S. Com. Rep., Sept.* 21, 1920.)

Japanese Trade in Vegetable Oils and Oil-bearing Material.—The Japanese imports and exports of vegetable oils and oil-bearing material in 1919 were valued at about £5,328,801 and £2,273,372 respectively. The principal figures are set out below:—

	Imports. Long Tons.	Exports. Long Tons.
Vegetable Oils :—		
Coconut oil	113	10,444
Soya-bean oil	1604	1724
Linseed oil	166	2772
Castor oil	767	—
Olive oil	119	—
Colza oil	—	5547
Cottonseed oil	—	1364
Groundnut oil	—	3058
Perilla oil	—	605
Sesame-seed oil	—	457
Oil-bearing Materials :—		
Soya beans	168,589	650
Groundnuts	11,130	6460
Sesame seed	10,685	—
Perilla seed	15,671	—
Rape and mustard seed	33,135	3621
Linseed	8595	8539
Hemp seed	5747	—
Cotton seed	34,577	—
All other grains and seeds	2533	184
Copra	1720	—

—(*U.S. Com. Rep., Sept.* 10, 1920.)

The German Potash Industry.—At a meeting of the German Potash Syndicate held on October 14 it was stated that the convention prices made during the war had been renewed for 1921.

Production during the period January-September was 800,000 metric tons of pure potash (K_2O), an increase of 160,000 t. over the previous year; the increase was mainly due to the large agricultural demand in January and February last. Production costs have more than doubled, and the profit is barely above that for 1919. Although prices have not been raised since December, 1919, trade has been slack since May, except with adjacent countries, and the market in Eastern Europe was at a standstill. The prohibition of the export of potash to Poland has closed a market which prior to the war consumed over 100,000 t. (K_2O) per annum. No decrease in the price of potash salts for agricultural purposes is probable as the cost of production is still rising.—(*Chem. Ind., Oct.* 27, 1920.)

Felspar in the United States in 1918.—The quantity of felspar marketed in the United States in 1918 was 88,498 long tons, that is, about 30 per cent. less than in 1917 (*cf.* J., 1918, 476 R). Of the total production, 68 per cent. was sold crude and 32 per cent. ground. The average price of crude felspar increased from \$3·40 per long ton in 1917 to \$4·65 in 1918, and that of ground felspar from \$10·15 per ton to \$12·33 per short ton. The higher prices partly compensated for the decline in output, which was mainly due to scarcity of labour, reduced supplies of fuel to the pottery industry, and lack of transport facilities. The Canadian production of 20,232 short tons in 1918 was almost all exported to the United States (*cf.* J., 1918, 476 R; 1920, 360 R).—(*U.S. Geol. Surv., June* 28, 1920.)

REVIEWS.

THIRD REPORT ON COLLOID CHEMISTRY AND ITS GENERAL AND INDUSTRIAL APPLICATIONS. BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. *Department of Scientific and Industrial Research. (London: H.M. Stationery Office.* 1920.) *Pp.* 154. *Price* 2*s.* 6*d. net.*

The third report of the Committee of the British Association on Colloid Chemistry, like its predecessors, contains a number of very valuable and interesting monographs, which are arranged under two heads, namely:—(1) Classification according to scientific subject, and (2) classification according to industrial process. Thus, under the former head, we have reports on Colloid Chemistry of Soap, Part I., by J. W. McBain; Ultramicroscopy and Solubility of Gases in Colloidal Solutions, both by G. King; Electrical Charge on Colloids and Imbibition of Gels, Part I., by J. A. Wilson. The subjects dealt with under the second head are Imbibition of Gels, Part II., by J. A. Wilson; Colloid Problems in Bread-making, by R. Whymper; Colloid Chemistry in Photography, by R. E. Slade; Collodion in Photography, by H. W. Greenwood; Cellulose Esters, by F. Sproxton; Colloid Chemistry of Petroleum, by A. E. Dunstan; Asphalt, by C. Richardson; Varnishes, Paints, and Pigments, by R. S. Morell; and Clays and Clay Products, by A. B Searle.

The report on the colloid chemistry of soap solutions presents a very clear and very interesting account of the work which has been done, largely by the author of the report and his collaborators, on the constitution of liquids which are of equally great scientific and industrial importance. From this report we learn that all the phenomena of soap solutions point to the existence of a highly conducting, heavily hydrated ionic micelle of the general formula (NaP) (P') $(H_2O)_m$, and it is also pointed out that many colloidal substances of great industrial importance must exhibit similar behaviour and be classed together with soaps as colloidal electrolytes. The experimental evidence in support of the hypothesis of the existence of ionic micelles is fully discussed by the author. An interesting section on the detergent action of soaps concludes the report, and the position is summed up as follows:—"It emerges from all this discussion that there is a number of definite factors in detergent action: first, the necessity of having the soap in solution; second, power of emulsification which goes parallel with low surface tension and the formation of surface films; third, wetting power, which, like the last, is ascribable to the undecomposed soap itself; fourth, the action of soap in forming non-adhesive colloidal sorption compounds with tissue and impurities due sometimes to acid soap, but more often to soap itself, and capable of remaining in stable suspension; fifth and lastly, it is an essential in all cases that the soap should be in colloidal form."

In the first of the two reports contributed by G. King, the determination of the degree of dispersion and the ultra-microscopic examination of colloidal sols is fully discussed, including the various forms of ultramicroscopic apparatus employed. In his second report King deals with the solubility, rate of absorption and of evolution of gases as influenced by colloids, with special reference to physiology and brewing. Provided adsorption and chemical combination do not interfere, colloidal solutions in general diminish the gas solubility. The results obtained with regard to the solution of carbon monoxide and oxygen in blood are interpreted by different authors differently in terms of chemical combination and of adsorption. The experiments of Findlay and King on the influence of colloids on the rate of evolution of gases from supersaturated solution have given results of an unexpected and interesting kind.

An interesting account of the theoretical and experimental work by Procter and by J. A. and W. H. Wilson on imbibition of gels leads to a discussion of the industrial applications of imbibition in the leather industry, in paper making, in photography, and in biology. One would have welcomed a fuller treatment of this section.

The report by R. Whymper on colloid problems in bread-making is one of the most interesting of the series, and calls for attention not only by reason of the positive information which it gives, but also owing to the indications which it affords of the many problems which still await investigation and solution. The properties of the most important materials used in bread-making, starch, gluten, mineral salts, and enzymes are discussed, and attention is drawn to the very great influence which additions of quite small quantities of milk, fat, etc., exert on the physical nature and keeping qualities of bread.

Two reports dealing with photographic problems are followed by a report on cellulose esters, in which the author draws attention to the fact of the close connexion between the viscosity of dilute solutions of cellulose esters and the mechanical properties of the solid product. Such connexion is found only in the case of emulsoids, and is not met with in the case of suspensoids or of crystalloids. This behaviour is of course of great importance also in the production of cordite.

In his report on colloid chemistry and petroleum, A. E. Dunstan pays particular attention to the use of adsorbents, such as floridin and fuller's earth, in the refining of petroleum and of cracked spirit. By the use of these materials the unsaturated compounds and sulphur derivatives are removed. A summary of the report of the United States Navy Department and the Submarine Defence Association on "colloidal fuel" is also given. This report is succeeded by one on the colloidal state of matter in its relation to the asphalt industry, in which, more especially, the importance of the colloidal state for the stability of asphalt pavements is emphasised.

Certainly one of the most interesting and important of the reports is the last, in which the properties of clay are fully and clearly discussed. In it the much debated problem of the plasticity of clay receives adequate treatment, and the various factors which affect the plasticity are considered. The use of colloidal clay as a detergent *per se* or in conjunction with soap also receives due mention, and some of the possibilities in connexion with this application are discussed briefly.

The Report, as a whole, maintains the high standard set by the two preceding Reports, and the various authors deserve the thanks of all who are in any way interested in the study or application of colloids for the excellent summaries which they have presented of different aspects of a subject ever-growing in extent and in importance. The production of these Reports amply justifies the formation of the special committee of the British Association.

Alex. Findlay.

Margarine. *By* William Clayton. *Monographs on Industrial Chemistry, edited by* Sir Edward Thorpe. *Pp.* 187. (*London: Longmans, Green and Co.* 1920.) *Price* 14*s. net.*

In the Introduction the editor explains that the books of this series are not intended to cover the whole ground of the technology of the matters to which they relate, "they are not concerned with the technical *minutiæ* of manufacture except in so far as these may be necessary to elucidate some point of principle." The author, in the Preface, claims the monograph to be the first of its kind in any language which attempts to give a succinct account of the modern process of the manufacture of margarine, and, generally speaking, he is certainly to be congratulated on the manner in which he has carried out the task before him. On going through the book one cannot help feeling that although it is mainly a compilation, it is not the work of a mere compiler, but a systematic selection of really important and up-to-date practical matter extracted by one who obviously has a thorough practical knowledge of the subject with which he deals.

The work opens with an interesting though brief historical survey of the rise of margarine to importance, and the reader is incidentally told that the name should be pronounced with a hard "g." Chapter II deals with the various oils and fats used in the manufacture of margarine, and includes a table of constants, the source of which is not disclosed, but we note that most of the figures are identical with those given in another work. Makers of lard compounds and of margarine will be surprised to hear that the somewhat expensive, hard, brittle substance coconut stearine, is "sometimes employed in margarine, but more often in cooking-fats such as lard compounds." In the above product "stearine" is correctly spelt "stearine," whilst the product from cottonseed oil, p. 10, is twice described as "stearin," though on p. 11 it is referred to as cottonseed "stearine"; and on p. 8 we find a further inconsistency, namely, "coconut *stearin*." These may be spelling mistakes, of which there are a few, such as "dessicated." In describing the various oils it is useful to note that the Lovibond tintometer tints are given in the case of some of the oils, and while on the subject of colour, it is hard to understand a statement that maize oil is used in America for colouring margarine. Chapter III deals effectively with edible hydrogenated oils, and, although it only comprises some six pages, is very full of well-chosen information, and includes references to most of the important patents.

After describing the examination of milk for margarine purposes in chapter IV, the author proceeds in the three following chapters to deal with the manufacture of margarine, illustrating the more important plant referred to by half-tone plates supplied by the plant manufacturers. These three chapters, together with the following one (chapter VIII) on the theory of emulsification, are certainly the best in the book, and in them the writer speaks authoritatively with a realisation of the importance of points bearing upon the really scientific side of margarine making. These chapters are full of references, and although after perusal the inexperienced reader would not be enabled to manufactnre margarine, yet it is not too much to say that no experienced margarine maker could read them without learning something.

Renovated butter is dealt with, and chapter X is concerned with the analysis of butter and margarine, and in the limited space available the author succeeds in touching upon the more important methods of analysis and even describing standard tests and processes with the necessary working details. Unfortunately, under the Kirschner process only 0·1 gm. of silver sulphate is specified instead of 0·5 gm., which is necessary in order that there may be a sufficiently large excess of silver salt present. Many of the tests described in this chapter have been applied to eight samples of margarine mixtures compounded in the laboratory for the purpose, and the analytical data, together with the composition of the mixtures, are given in two very useful tables.

The chapter on deterioration in storage should be carefully studied by both chemists and manufacturers; it is refreshingly up-to-date and full of sound advice. The efficiency, or rather the inefficiency, of certain preservatives is discussed, and we are clearly told that boron compounds are but weak antiseptics, and attention is drawn to the probable disturbances to health which may result from continued small doses of these compounds. Once more we are reminded that rancidity can exist and even develop without any increase of free fatty acidity, and we are led to wonder if in future generations this truth will at last become generally known.

The chemistry of fat nutrition is a subject upon which a whole monograph might easily be written, but the pith of modern theory and a general idea of those substances loosely termed "vitamines" is ably compressed into one small chapter.

The work concludes with a copious bibliography and separate indexes for names, patents, and subjects.

E. R. Bolton.

The Condensed Chemical Dictionary. *By the Editorial Staff of the Chemical Engineering Catalog. Pp.* 525. (*New York: The Chemical Catalog Company.* 1919.) *Price* $5.

This volume is chiefly of interest to non-chemists who may be concerned in the course of their business with chemical substances, though the authors think it will prove invaluable as a time-saver to the chemist. The book gives in alphabetical order most of the chemical substances having any industrial uses, and includes many raw materials.

Wherever possible the matter includes a description of appearance, physical properties, derivation, grading, uses, fire hazard, and railway and shipping regulations.

The first edition is naturally by no means complete, both as regards the substances enumerated and the information given. To the chemist the latter appears skimpy and platitudinous, but no doubt the book will have its uses. The wide range covered makes it quite interesting reading, as a dictionary usually is, to all except those most fully informed. Opening the book at random, we read that "cabbage-seed oil" is used as an illuminant, and has a dangerous fire hazard, and that "verde antique" is a naturally occurring hydrous magnesium silicate. It is likely that a fuller and more mature edition will prove a volume of considerable utility, and it is to be hoped that the publishers will supply it in due course.

OBITUARY.

P. S. U. PICKERING.

The late Percival Spencer Umfreville Pickering was born in 1858, his father being Percival A. Pickering, Q.C., and his mother the daughter of John Spencer Stanhope. On both sides he came of a long line of aristocratic and distinguished ancestors; his mother was the granddaughter of the famous Coke of Norfolk, Earl of Leicester, by his romantic marriage with his young ward. Possessed of ample private means, he might have led a life of ease and social pleasure; but his tastes were not that way. He had a strong bent for scientific investigation, and after leaving Eton he proceeded to Oxford to study chemistry at Balliol. Here his independence of outlook asserted itself, and one of his first published papers was a controvertion of a view expressed by his tutor. He obtained, in 1880, First Class Honours in the science schools, and then moved to Bryanston Square, London, where he fitted up a laboratory; and from 1881 until 1887 he held an appointment as lecturer at Bedford College.

During this period he investigated quantitatively the physical properties of mixtures of sulphuric acid and water, from which he inferred the existence of various hydrates of sulphuric acid. He stoutly opposed the conception of ionic dissociation then being introduced by Arrhenius, and maintained that all the phenomena were readily explicable on the hydrate hypothesis. Had he continued these investigations he would have rendered valuable service as a fearless critic of the young science of physical chemistry.

The whole course of his life was changed, however, by a serious laboratory accident which caused the loss of an eye and greatly endangered his health. He was ordered away from London, and went to Harpenden to recover his health by working as a labourer on the land. He so far succeeded that he was able to resume scientific work, but this time it was on wholly different lines; he gave up physical chemistry and began investigations on fruit trees, parallel to those on agricultural crops carried out by Lawes and Gilbert. The work was financed by the Duke of Bedford and carried out on one of the Duke's farms at Woburn; it began in 1894 and continued till Pickering's death, although for the last two years the Duke ceased to give financial support; money was then found for the purpose by the Rothamsted Committee. The chief results were the ineffectiveness of ordinary fertilisers on fruit trees and the harmful action of grass on trees, and this work was expanded into an important investigation showing that growing plants excrete some unstable substance poisonous to other plants. In addition, there were many other investigations of technical importance on pruning, planting, the composition of Bordeaux mixture, treatment of pests and diseases. Pickering also studied the effects of heat and antiseptics on soil, showing in both cases an increase in soluble matter.

The striking characteristic of his work was its originality: he could take up a subject that had apparently been fully investigated, and within a few days, by a few simple experiments, make some entirely new observation that would throw a flood of fresh light on the whole phenomena. But he was essentially a solitary worker; he had no assistant in the laboratory—not even an attendant. His outlook was always critical, but with a broad and instructed criticism. He never sought honours or social distinctions, yet he was not averse to recognition in scientific circles: he was elected a Fellow of the Royal Society in 1890*, and served three times on the Council of the Chemical Society.

As befitted his descent, Pickering possessed a strong vein of sentiment, and even of romance, which showed itself in many ways in spite of his stern self-repression—in his choice of authors, of artists and above all in his favourite music, in his marriage, once even in a scientific paper, and finally in his wishes for burial in the cliff at Morthoe, in the path of the sun and close to the western sea.

E. J. RUSSELL.

*At the age of 32. By some extraordinary error, several of the newspapers stated in their obituary notices that he was elected at the age of 19. It is possible that the Chemical Society was meant; he joined this at the age of 20.

PUBLICATIONS RECEIVED.

TREATISE ON GENERAL AND INDUSTRIAL ORGANIC CHEMISTY. PART I. *By* E. MOLINARI. *Translated by* T. H. POPE. *Pp.* 456. (*London: J. and A. Churchill.* 1921.) *Price* 30*s*.

TEXT-BOOK OF ORGANIC CHEMISTRY. *By* A. F. HOLLEMAN. *Fifth edition. Pp.* 642. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1920.) *Price* 18*s*. 6*d*.

LABORATORY MANUAL OF ORGANIC CHEMISTRY. *By* H. L. FISHER. *Pp.* 331. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1920.) *Price* 12*s*. 6*d*.

CHEMISTRY OF FAMILIAR THINGS. *By* S. S. SADTLER. *Pp.* 322. (*Philadelphia and London: J. B. Lippincott Co.* 1920.) *Price* 10*s*. 6*d*.

THE ART OF TECHNICAL WRITING. *By* T. A. RICKARD. *Pp.* 178. (*New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd.* 1920.) *Price* 8*s*.

YEAR-BOOK OF PHARMACY AND TRANSACTIONS OF THE BRITISH PHARMACEUTICAL CONFERENCE, LIVERPOOL, 1920. (*London: J. and A. Churchill,* 1920.) *Price* 12*s*. 6*d*.

THE SCIENTISTS' REFERENCE BOOK AND DIARY. 1921. *Twenty-third year of issue.* (*Manchester James Woolley, Sons and Co., Ltd.*) *Price* 3*s*. 6*d*.

UNITED STATES BUREAU OF MINES. *Department of the Interior.* (*Washington: Government Printing Office.* 1920):—

MANGANESE. *By* C. M. WELD *and others.* (*Bull.* 173.) *Pp.* 209. *Price* 30 *cents*.

MINING AND PREPARING DOMESTIC GRAPHITE FOR CRUCIBLE USE. *By* G. D. DUB *and* F. G. MOSES. (*Bull.* 112.) *Pp.* 80. *Price* 20 *cents*.

USES OF STENCHES AS A WARNING IN MINES. By S. H. KATZ, V. C. ALLISON, *and* W. L. EGY. (*Tech. Paper* 244.) *Pp.* 31. *Price* 10 *cents*.

CORRIGENDUM.—In the issue for December 15, p. 415 R, col. 2, 13th line from bottom, in lieu of "carbonisation," read "carbonatation."