PROCEEDINGS

OF THE

AMERICAN

FORESTRY CONGRESS,

AT ITS SESSIONS HELD AT

CINCINNATI, OHIO, IN APRIL, 1882,

AND AT

MONTREAL, CANADA, IN AUGUST, 1882.

Vol. I

WITH A NOTICE OF THE ORGANIZATION OF THE AMERICAN FORESTRY ASSOCIATION UNITED WITH IT AT THE MONTREAL SESSION.

Vol. II 1884 omitted.

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PROCEEDINGS

OF THE

AMERICAN FORESTRY CONGRESS,

FOR THE YEAR 1882.

PRELIMINARY PROCEEDINGS AT CINCINNATI, OHIO.

Among the guests invited by the Government of the United States, to participate in the Centennial Anniversary, of the Surrender of Lord Cornwallis, at Yorktown, Va., in the autumn of 1881, were six officers of the Prussian Army, bearing the name of Von Steuben, representing the family of Baron Steuben, of the American Revolution; and a seventh, Richard Baron Von Steuben, bearing the rank of "Oberforster," in the Prussian Forest Service.

After the celebration at Yorktown, the Von Steubens visited many places in the United States, and among others, Cincinnati, where a public reception was given—most of the prominent citizens of that place participating therein. In a conversation between the Forest Official and Judge Warren Higley and others, the waste and neglect of our American forests was particularly mentioned as a subject deserving of public notice.

This suggestion was followed up by further discussion, and in January, Col. William L. DeBeck and others, began to agitate the question of arousing the public attention to this subject, by holding a convention in that city. A meeting was soon after held at the Gibson House, under a call through the papers, at which a number of prominent citizens took a prominent part. This resulted in the appointment of the following officers for preliminary proceedings:

President: Hon. John Simpkinson.

Vice-Presidents: Hon. Wm. S. Groesbeck, Judge Alphonso Taft, Reuben R. Springer, Esq.; Murat Halstead, Esq.; Richard Smith, Esq.; Ex-Governor R. M. Bishop, Ex-Governor J. D. Cox, Hon. George H. Pendleton, U. S. Senator; Washington McLean, Esq.; Hon. Fred Hassaurek, and Rev. Dr. I. W. Wiley, Bishop Methodist Episcopal Church.

Secretary: Col. W. L. DeBeck.

Advisory Board: Hon. Judge Warren Higley, Hon. Judge J. W. Fitzgerald, Prof. John B. Peaslee, Superintendent Public Schools; Ex-Governor E. F. Noyes, Rev. Dr. Max Lilienthal, and President and Secretary of Association.

SCIENTIFIC BRANCH COMMITTEE.

Chairman: Hon. Judge Warren Higley.

Secretary: Alfred A. Springer, M. D.

Members: Dr. John A. Warder, Prof. F. W. Clarke, Prof. Adolph Leué, Prof. John B. Peaslee, Superintendent Public Schools Rev. Dr. Max Lilienthal, August Leué, Esq.

A county association was formed with representatives in various townships, which interested many persons living in them, and resulted in plans for the adornment of streets and highways by tree planting, and the prominence given to the subject through the press, tended still further to increase this interest. In these publications Col. DeBeck, who was connected, with the press, took a most active part.

It was decided to appoint a National Convention of those interested in the subject of Forestry, to meet at Cincinnati on the 25th of April, 1882, and to continue five days; and applications were made to Congress and to the State Legislatures for aid in meeting the expenses. These efforts met with some encouragement, but did not finally succeed. In the meantime, invitations were sent out to persons throughout the United States and Canada, urging their attendance and co-operation, and Governor Foster, in pursuance of a law passed for the purpose, appointed the 27th day of April, as "*Arbor Day.*"

This day in Cincinnati was to be observed in a particular manner, by the planting of "Memorial Trees," in honor of many distinguished persons living and deceased in *Eden Park*. For this occasion extensive and well arranged preparations were made, and afterwards carried out with precision and success. The business meetings of the Convention were appointed to be held at the Gibson House, and the public meetings at Springer Music Hall. In these arrangements, especially as relating to the ceremonies at Eden Park, and at the Hall, the ladies of Cincinnati took an active part. Banners bearing in green the device of an oak leaf, and the words, "Welcome Foresters," were displayed by thousands, as the appointed day arrived, and committees had prepared a programme of the proceedings and made various arrangements for the occassion.

FIRST DAYS' SESSION OF THE AMERICAN FORESTRY CONGRESS,
MUSIC HALL, CINCINATTI, OHIO,
Tuesday, April 25, 1882.

In accordance with a general publication, and the previous arrangements of the Local Committee, the First Session of the American Forestry Congress, met in Springer Music Hall, at 10 A. M., this 25th day of April, 1882.

On motion of Prof. J. B. Peaslee, Gen. E. F. Noyes, was elected temporary Chairman, and Dr. A. A. Springer, temporary Secretary of the Congress.

On motion of Chairman Noyes, the following gentlemen were appointed a committee for permanent organization: Dr. F. B. Hough, Dr. John A. Warder, Dr. Geo. B. Loring, Gen. C. C. Andrews, Mr. John H. McMacken, Hon. Warren Higley, Dr. J. M. Walden, Prof. Wm. Saunders, Gen. Dubin Ward, and Dr. A. A. Springer. The Congress thereupon took a recess until 8 o'clock, P. M.

EVENING SESSION.

The Congress convened at 8 o'clock, Gov. Noyes presiding, who introduced Gen. Dubin Ward, who in the absence of Mayor Means, welcomed the delegates and other strangers to the city.

Gov. Charles Foster followed Gen. Ward, welcoming the visitors to the hospitalities of Ohio.

The Committee on Permanent Organization, then reported the following Constitution and By-Laws, and permanent officers for the present year.

FIRST CONSTITUTION.

ARTICLE I. This Association shall be known as the AMERICAN FORESTRY CONGRESS.

ARTICLE II. The object of this Congress shall be to encourage the protection and planting of forest and ornamental trees, and to promote forest culture.

ARTICLE III. Any person may become a member of this Congress on the payment of two dollars. The annual assessment on each member shall be one dollar.

ARTICLE IV. The officers of the Congress shall be a President, a Vice-President from each State and Territory in the United States, and for each Province in Canada; a Recording Secretary, a Corresponding Secretary, a Treasurer, an Executive Committees, District Committee, Committee on Annual Meeting, Local Committee.

ARTICLE V. There shall be an annual meeting, which shall be held at such time and place as the Congress may determine.

ARTICLE VI. *Section* 1. All officers of this Congress, except as hereinafter provided, shall be elected annually, at the annual meeting, and shall hold office for one year, and until their successors shall be elected.

Sec. 2. The Presidents of the several State, Territorial and Provincial Associations, shall be the Vice-Presidents of the Congress after the current year.

Sec. 3. The Executive Committee shall be composed of the President, Recording and Corresponding Secretaries of this Congress, one District Delegate from each of the districts hereinafter named, to be appointed by the President and ratified by the Congress, together with the Corresponding Secretary of each State, Territorial and Provincial Association.

Sec. 4. The Corresponding Secretaries of the State, Territorial and Provincial Associations, within each district, shall be a District Committee, of which the respective District Delegate shall be a member, and the Chairman thereof.

ARTICLE VII. *Section* 1. The President shall preside at all meetings of the Congress, and deliver an annual address.

Sec. 2. The Recording Secretary shall keep a record of the proceedings of the Congress, and shall be the custodian of all papers and documents ordered to be preserved, which shall be arranged, for convenience of reference.

Sec. 3. The Corresponding Secretary shall conduct the correspondence of the Congress.

Sec. 4. The Treasurer shall have charge of all funds, and pay out the same on the direction of the Congress, on orders signed by the President and Recording Secretary.

ARTICLE VIII. The following groups of States, Territories, and Provinces, shall comprise the several districts:

1*st District:* The New England States, and the State of New York.
2*d District:* New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, and West Virginia.
3*d District:* Ohio, Indiana, Michigan, Kentucky, and Tennessee.
4*th District:* North Carolina, South Carolina, Georgia, Alabama, and Florida.
5*th District:* Wisconsin, Minnesota, Dakota, Wyoming, and Montana.
6*th District:* Illinois, Missouri, Iowa, Nebraska and Kansas.
7*th District:* Mississippi, Louisiana, Texas, Arkansas, and Indian Territory.
8*th Disiriet:* Colorado, Mexico, Utah and Arizona.
9*th District;* California, Nevada, Oregon, Washington Territory, and Idaho.
10*th District:* Quebec and Maritime Provinces.
11*th District:* Ontario and Western Provinces.

ARTICLE IX. *Section* 1. The Committee on Annual Meeting, shall be composed of the President and Corresponding and Recording Secretaries of the Congress, and the District Committee within whose district the annual meeting of the Congress shall be held, whose duty it shall be to prepare a programme of exercises, and assign to their proper divisions all essays or papers prepared for the Congress.

Sec. 2. The Local Committee shall be appointed by the President at each annual meeting, subject to the ratification of the Congress, and a majority of the members of such Committee, shall reside in the vicinity of the place where the next succeeding annual meeting of the Congress shall be held, whose duty it shall be to make all necessary arrangements for the meeting of the Congress, and the accommodation of the Delegates.

ARTICLE X. The Congress may appoint Delegates to kindred

Associations, and between the annual meetings the President, Corresponding and Recording Secretaries, shall be a Committee, with power to appoint such Delagates.

ARTICLE XI. This Constitution may be amended by a majority vote of the members present, (and voting,) at any annual meeting.

The above Constitution was the adopted, section by section, an article at a time, and affirmatively adopted as a whole. The following officers were then unanimously elected to serve during the ensuing year:

President: George B. Loring, Salem, Mass.

Vice-Presidents: First District—Maine, George Sawyer, (Wiscasset;) New Hampshire, George W. Riddle, (Manchester;) Vermont, M. C. Buckham, (President Vermont University, (Burlington;) Massachusetts, N. H. Egleston, (Williamstown;) Rhode Island, H. G. Russell, (East Greenwich;) Connecticut, Prof. B. G. Northrop, (Clinton;) New York, Horatio Seymour, (Utica.)

Second District—New Jersey, Prof. George H. Cook, (New Brunswick;) Pennsylvania, Thomas Meehan, (Germantown;) Delaware, Wm. H. Purnell, (Newark;) Maryland, Gov. W. H. Hamilton; District of Columbia, John Saul, (Washington;) Virginia, W. H. Wickham, (Richmond;) West Virginia, Hon. Henry G. Davis, (Piedmont.)

Third District—Ohio, John Simpkinson, (Cincinnati;) Indiana, Prof. Ingersoll, (Lafayette;) Michigan, Prof. W. J. Beal, (Lansing;) Kentucky, Cassius M. Clay, (Whitehall;) Tennessee, Prof. J. M. Safford, (Nashville.)

Fourth District—North Carolina, S. D. Kelsey, (Highlands;) South Carolina, Hon. D. Wyatt Aiken, (Cokesbury;) Georgia, Richard Peters, (Atlanta;) Alabama, Dr. Charles Mohr, (Mobile;) Florida, J. G. Knapp, (Limona.)

Fifth District—Wisconsin, W. E. Smith, (Madison;) Minnesota, George L. Becker, (St. Paul;) Dakota, H. M. Thompson, (Lake Preston;) Wyoming, John W. Hoyt, (Cheyenne;) Montana, C. W. Lumbard, (Missoula.)

Sixth District—Illinois, Arthur Bryant, Sr., (Princeton;)

Missouri, S. M. Tracy, (Columbia;) Iowa, Charles E. Whiting, (Whiting;) Nebraska, R. W. Furnas, (Brownville;) Kansas, George C. Brackett, (Lawrence.)

Seventh District—Louisiana, ——— ; Arkansas, Prof. F. L. Harvey, (Fayetteville;) Texas, G. G. Georgeson, (College Station;) Indian Territory, J. Forman, (Muskogee.)

Eighth District—Colorado, Prof. E. E. Edwards, (Ft. Collins;) Mew Mexico, (———;) Arizona, (———;) Utah, J. E. Johnson, (St. George.)

Ninth District—California, Robert E. C. Stearns, (Berkeley;) Nevada, (———;) Oregon, J. B. Dufur; Washington Territory, (———;) Idaho, (———.)

Tenth District—Quebec, Wm. Little, (Montreal.)

Eleventh District—Ontario, D. W. Beadle, (St. Catherines.)

Recording Secretary: W. L. DeBeck, Cincinnati, Ohio.

Corresponding Secretary: D. D. Thompson, Cincinnati, Ohio.

Treasurer: John A. Gano, Cincinnati, Ohio.

The following gentlemen were then elected Presidents of the different Sections:

Section A—"Uses of Forests," Dr. FRANKLIN B. HOUGH.

Section B—"Conservations and Practical Forestry," Dr. JOHN A. WARDER.

Section C—"Beneficial and Injurious Influences of Forestry." Prof. WILLIAM SAUNDERS.

Section D—"Education," Mr. N. H. EGLESTON.

Each President was requested to appoint a Secretary to his own Section, and the following were thus designated, viz:

In Section "A," Mr. WILLIAM LITTLE; in Section "B," Mr. S. W. EMERY; in Section "C," Prof. ROBERT B. WARDER; and in Section "D," Prof. ADOLPH LEUÉ.

The President, George B. Loring, then assumed his position and delivered quite a lengthy address.

Adjourned to the same place.

SECOND DAYS' SESSION, MUSIC HALL,
CINCINNATI, OHIO,
Wednesday, April 26, 1882.

In general session, Gov. Charles Foster and others spoke, and announcements were made as to the arrangements for the day, upon which the meeting adjourned for meeting in Sections, in various rooms assigned for this use in Music Hall. The titles of papers offered for reading and discussion, having been previously printed by direction of the Local Committee, were assigned to the various Sections, as follows:

Papers assigned to Section "A."

1. The Forestry of the Future—FRANKLIN B. HOUGH, Chief of Forestry Divison, Department of Agriculture.
2. The Southern Pine—DR. CHARLES MOHR, Mobile, Ala.
3. The Walnut Tree—WILLIAM H. RAGAN, Clayton, Ind.
4. Distribution of Canadian Trees—A. T. DRUMMOND, Montreal, Canada.
5. Flora of the Black Hills—ROBERT DOUGLAS, Waukegan, Illinois.
6. Pine Forests of Canada—JAMES LITTLE, Montreal, Canada.
7. Arboreal Flora of Arkansas—Prof. F. L. HARVEY, Fayetteville, Arkansas.
8. Pofitable Trees for Florida—Hon. J. G. KNAPP, Limona, Florida.
9. Forests of Michigan—Prof. V. M. SPALDING, Ann Arbor, Michigan.
10. Forest Reserves at the Head Waters of the Ohio—M. C. READ, Hudson, Ohio.
11. Roadside Planting for Utility—CHARLES GARFIELD, Grand Rapids, Michigan.
12. Trees of Texas—T. V. MUNSON, Denison, Texas.
13. Suggestions Regarding Government Assistance—Prof. WM. BROWN, Guelph, Ontario.
14. Historical Sketches of the Development of the Forest Policy in Germany—BERNHARD E. FERNOW, Lehigh's Furnace, Slatington, Pa.

15. Preservation of Timber—Prof. F. W. CLARKE, Cincinnati, Ohio.

Papers assigned to Section "B."

16. The Work of Western Nurserymen, Present and Prospective—S. W. EMERY, Lake City, Michigan.
17. Culture and Management of Our Native Forests—H. W. S. CLEVELAND, Chicago, Illinois.
18. Three-Motion Plan of Planting—ROBERT DOUGLAS, Waukegan, Illinois.
19. The Wild Cherry Tree—Hon. HORATIO SEYMOUR, Utica, New York.
20. Useful Trees of Michigan—Prof. W. J. BEAL, Lansing, Michigan.
21. The Catalpas—J. C. TEAS, Carthage, Missouri.
22. Cheap Hardy Trees for the Prairies—J. T. ALLAN, Omaha, Nebraska.
23. Woody Plants of Ohio—D. L. and JOS. F. JAMES, and Dr. WARDER.

Papers assigned to Section "C."

24. Forests and Health—Dr. DANIEL MILLKIN—Hamilton, Ohio.
25. Climatology and Forestry—Dr. GEORGE L. ANDREW, Laporte, Indiana.
26. Forestry and Rainfalls—A. SAUNDERS PIATT, Mackeheck, Ohio.
27. Torrents and Torrential Floods—D. D. THOMPSON, Cincinnati, Ohio.
28. Evils of Woods Pasture—Dr. J. A. WARDER, North Bend, Ohio.
29. Droughts, Famines and Floods in China—DAVID H. BAILY, Late Consul General of the United States in China.
30. Forest and Rainfall in Ontario—Prof. WM. BROWN, Guelph, Ontario.

Papers assigned to Section "D."

31. The Necessity for a School of Forestry in the United States. Gen. C. C. ANDREWS, St. Paul, Minnesota.
32. What is a Forest-Tree in the Eye of the Law?—GEORGE C. BRACKETT, Lawrence, Kansas.
33. Management and Culture of the Locust—WALDO F. BROWN, Oxford, Ohio.
34. Measures of Locust Trees—Dr. J. A. WARDER, North Bend, Ohio.
35. Culture of the Locust on Long Island—JOHN S. HICKS, Roslyn, Long Island.
36. Educational Means—B. O. M. DEBECK, Cincinnati, Ohio.
37. A Suggestion from the Schools of Bavaria—Prof. R. B. WARDER, North Bend, Ohio.
38. Forest Administration in Germany—ROBERT KUEHNERT, Cincinnati, Ohio.
39. Lessons from Australia and Scotland—Prof. WILLIAM BROWN, Guelph, Ontario.
40. Suggestions Respecting a Text Book on Forestry—Prof. WILLIAM BROWN.

Papers not classified, and some of them read only by Titles, in General Session.

41. Advantages resulting from the Preservation of Forests—BARON RICHARD VON STEUBEN, Forester, German Empire.
42. Forestry in America—ISAAC SMUCKER, Newark, Ohio.
43. Forests and Trees of Northern Georgia—H. C. FREEMAN, C. E., Elijay, Georgia.
44. Woods of Indian Territory—J. FOREMAN, Muscogee, Indian Territory.
45. Growth and Destruction of Forests—Dr. A. C. HUMPHREYS, Galesburg, Illinois.
46. Climatology and Forestry—Prof. C. S. INGERSOL, Lafayette, Indiana.
47. Trees of Southern California—WM. HEAVER, Los Angles, California.

48. Complaint of Diana—Poem—Horace J. Smith, Nordhoff, California.
49. Why Should we Plant Trees?—Dr. A. Eby, Seringville, Ontario.
50. The Poplars and Cottonwoods—Prof. Sereno Watson, Cambridge, Mass.
51. Tree Planting—Simeon Eby, Lancaster, Pa.
52. Wind-Breaks on the Prairies—Hon. C. E. Whiting, Whiting, Iowa.
53. Beneficial Effects of Wind-Breaks—L. B. Wing, Newark, Ohio.
54. State Commissioners and State Arboreta—Prof. W. R. Lazenby, Columbus, Ohio.
55. Timbers in Illinois—G. W. Minier, Minier Illinois.
56. Trees growing upon the Plains of Colorado, how Influenced by Climate, Attitude and Irrigations—D. S. Grimes, Denver, Colorado.
57. Nature's Plan for Reproduction—Leo Weltz, Wilmington, Ohio.
58. "Natur Verjungung"—Prof. Adolph Leué, Cincinnati, O.
9. Colorado Hardy Conifers in Cultivation—Thos. Douglas, Waukegan, Ill.
60. Colorado Conifers in Eastern Nebraska—J. Masters, Nebraska City, Neb.
61. Experiments in Planting on Cape Cod—James S. Fay, Boston, Mass.
62. "Wald Verwuestung, Wald Erhaltung, Kuntsliche Bewaldung"—K. Ludloff, Milwaukee, Wis.
63. Wind-Breaks on the Prairies—Suel Foster, Muscatine, Iowa.
64. Pines of New England—John Robinson, Salem, Mass.
65. Grouping in Forestry—Dr. J. A. Warder, North Bend, Ohio.
66. Sylva and Plantations of Nebraska—Ex-Gov. R. W. Furnas, Brownville, Neb.

67. Nurse-Plants in Forests—Dr. J. A. Warder, North Bend, Ohio.
68. Evergreens on the Prairies—Samuel Edwards, Mendota, Illinois.
69. Planting by Railroads—Robert Douglas, Waukegan, Ill.
70. Iowa's Work in Tree Planting—Prof. J. L. Budd, Ames, Iowa.
71. Cheap Trees as a Shelter for Better Kinds—Dr. J. A. Warder, North Bend, Ohio.
72. Mixed Plantations—Dr. J. A. Warder, North Bend, Ohio.
73. Native Stock for Prairie-Planting—George H. Wright, Sioux City, Iowa.
74. Anti-Miasmatic Influences—F. L. Olmstead, Brookline, Mass.
75. Lessons to be learned from the Forests of Western Asia—Prof. H. S. Osborn, LL. D., Oxford, Ohio.
76. Injurious Insects—Prof. C. V. Riley, Washington, D. C.
77. Forest Insects—Prof. W. Saunders, London, Ontario.
78. Arnold Arboretum—John Robinson, Salem, Mass.
79. Experimental Forest Stations—Prof. A. Leue, Cincinnati, Ohio.
80. Trees of Worship among the Ancient Greeks—Prof. Edward North, Clinton, N. Y.
81. Romance of Forests—Gen. Durbin Ward, Cincinnati, Ohio.
82. Distribution of Conifers in the United States—Dr. George Vasey, Washington, D. C.
83. The Cultivation of the White Mulberry—S. R. Lowery, Huntsville, Ala.
84. Profits of Durable Trees—Dr. A. Furnas, Danville, Ind.
85. Forests and Waters-Supply—Verplanck Colvin, Superintendent Adirondack Survey, Albany, N. Y.
86. Forest-Tree Culture in California—Robert E. C. Stearns, Ph. D., Berkeley, Cal.
87. On the Growth of certain California Forest Trees, and the Meteorological Inferences suggested thereby—Robert E. C. Stearns, Ph. D., Berkeley, Cal.

In the afternoon an address was delivered in Garfield Place, by Hon. H. L. Morey, M. C., after which memorial trees were planted.

Third Day's Session.

Music Hall, Cincinnati, Ohio,
Thursday, April 27, 1882.

The Sections met and continued the reading of papers until the hour arrived for the commencement of proceedings appointed for Arbor Day, arrangements having been made at Eden Park, and the day having been designated as a holiday by proclamation of the Governor, under authority of law. After the planting, addresses were delivered by Dr. Geo. B. Loring, Hon. Cassius M. Clay, and others.

In the evening a reception was given by the ladies of Cincinnati at Music Hall, at which addresses were delivered by Gen. Cassius M. Clay, Gov. E. F. Noyes, and others. The meeting then adjourned till 10 A. M. the next day.

Fourth Day's Session.

Music Hall, Cincinnati, Ohio,
Friday, April 28, 1882.

The Congress met in Sections at 10 o'clock, A. M., Vice-President John Simpkinson presiding. The morning was spent in the reading of papers and in discussions upon Forestry subjects. In the afternoon trees were planted in Washington Park, and addresses delivered by Gen. A. Tafel, Judge Warren Higley, and others. A portion of the members met at Music Hall and continued the reading and discussion of papers.

Fifth Day's Session.

Music Hall, Cincinnati, Ohio,
Saturday, April 29, 1882.

The session was continued, and the time and place of the next meeting were fixed. The Congress agreed to meet at the city of Montreal, Canada, on the 21st and 22d days of August, next.

Mr. WILLIAM LITTLE was appointed as Vice-President, and requested to make such arrangements as might be necessary for the occasion. The following committees were appointed:

1. *To report upon Forest Experimental Stations.*—Prof. A. Leue, Mr. V. Colvin, Dr. F. B. Hough, Dr. Charles Mohr, Mr. D. W. Beadle, Dr. J. A. Warder, and Prof. Wm. Saunders.

2. *To memorialize State Legislatures upon the establishment of State Forestry Commissions.*—Dr. F. B. Hough, Prof. Wm. R. Lazenby, Prof. C. S. Sargent, Dr. J. A. Warder, Prof. Wm. J. Beal, Hon. Cassius M. Clay, and Prof. J. M. Safford.

3. *To report upon Forest Fires and the Injuries to Forests by Cattle.*—Dr. Charles Mohr, Mr. N. H. Egleston, Mr. Henry C. Sigles, Prof. R. C. Kedzie, Hon. Horace Wilson, Mr. V. Colvin, Hon. H. G. Joly, and Prof. Wm. Brown.

4. *To report upon Best Methods of Planting.*—Mr. A. W. Butler, Mr. J. Jenkins, Hon. L. B. Hodges, Dr. A. Furnas, and Mr. Thomas Douglas.

5. *To report upon Forestry Education*—Gen. C. C. Andrews, Prof. A. Leue, Prof. V. M. Spalding, Mr. B. E. Fernow, and Prof. R. B. Warder.

After various resolutions of thanks to the citizens of Cincinnati for the satisfactory manner in which they had originated this meeting, and contributed to its interests, the Congress adjourned, to meet at Montreal on the 21st day of August, next.

MONTREAL MEETING.

Proceedings of the First Day.

Montreal, Canada,
August 21, 1882.

Pursuant to adjournment, at the close of its first meeting at Cincinnati, (April 29, 1882,) the American Forestry Congress met at Montreal, at No. 132 St. James street, in rooms provided by Mr. William Little, Vice-President, and designated as "Forestry Chambers."

Besides a large number who met for the occasion, including many who had joined the society at its first meeting, the following persons attended as representatives of the Ontario Government, viz; Mr. James Mills, Prof. William Saunders, Mr. P. C. Dempsey, Mr. D. W. Beadle, and Mr. Thomas Beall.

The Department of Crown Lands of Ontario was specially represented by Mr. G. B. Couper, Superintendent of Woods and Forests for the Province.

The Hon. Alfred Pare, Superintendent of Woods and Forests of the Province of Quebec, by letter dated August 19, 1882, informed the Committee of Arrangements that E. E. Tache, Esq., Assistant Commissioner of Crown Lands; A. J. Russell. Esq., Crown Timber Agent, Ottawa; Charles E. Belle, Esq., Crown Timber Agent, Montreal; and Eugene Renault, Esq., Crown Timber Agent, Montmaguey, had been named as the representatives of the Government of that Province at the Forestry Congress.

The hour of meeting being agreed upon as at 2 o'clock, p. m., and the President being absent, the Congress was called to order by Dr. Franklin B. Hough, and the Hon. H. G. Joly, of Quebec, was chosen temporary President.

The Secretaries elected at the first meeting not attending, and both having resigned, Dr. Franklin B. Hough, of Lowville, N. Y., was chosen temporary Secretary.

The Treasurer elected at the first meeting having resigned, Dr. CHARLES MOHR, of Mobile, Ala., was chosen temporary Treasurer.

The temporary President briefly announced the plan of organization, and the distribution of subjects for discussion in Sections.

Upon motion, the following members of the Congress were appointed a committee to confer with a committee of the American Forestry Association upon the question of consolidation of the two organizations, viz: Dr. CHARLES MOHR, Mr. BERNHARD E. FERNOW, and Prof. WILLIAM SAUNDERS. The general session then adjourned until 10 o'clock to-morrow morning, and the meeting resolved itself into Sections.

A programme had been prepared before the session commenced, bearing the following list of papers, which had been entered for reading. In several instances in which the authors were absent, they were read by the Secretaries.

PAPERS ENTERED FOR READING.

1. Forest Fires—JOSEPH S. FAY, Wood's Holl, Mass.
2. The Distribution of Hard-Wood Trees in the Gulf Region of the Southern States—Dr. CHAS. MOHR, Mobile, Ala.
3. Tree Planting by Railroad Companies—F. B. HOUGH, Ph. D., Lowville, N. Y.
4. The Rational Method of Tree Planting—N. H. EGLESTON, Williamstown, Mass.
5. The Russian Mulbery—D. C. BURSON, Topeka, Kan.
6. The Larix Europea, (European Larch,) its Quick Growth, Adaptability, Propagation and Culture—DAVID NICOL, Cataraqui, Ont.
7. The Coppice for the Village and Town—M. C. READ, Hudson, Ohio.
8. Forest Trees most suitable for Streets, Lawns and Groves—J. BEAUFORT HURLBURT, Ottawa, Ont.
9. The Destruction of Forests and Tree-Planting—JOHN DOUGALL, Editor of New York *Witness*.

10. The Introduction of Trees and Shrubs at the Ontario Experimental Farm—Prof. William Brown, Guelph, Ont.
11. A few Thoughts on the Necessity for a Certain Portion of each Farm being left in Forest—J. Beaufort Hurlburt, LL. D., Ottawa, Ont.
12. Forest Economy of Canada—Stewart Thayne, Ottawa, Ont.
13. Experimental Plantation of the Eucalyptus, near Rome—Franklin B. Hough, Ph. D., Lowville, N. Y.
14. Conditions of Forest Growth—Bernhard E. Fernow, Slatington, Pa.
15. Lessons to be Learned from the Forests of Western Asia—Prof. H. S. Osborn, Oxford, Ohio.
16. Borers in Forest Trees—Rev. Thomas W. Fyles, Cowansville, Quebec.
17. How Farmers may grow Forest Trees from Seed—D. W. Beadle, St. Catharines, Ont.
18. On the Growth of Black-Walnut Timber in Ontario—Thomas Beall, Lindsay, Ont.
19. On the Growth of Poplar Trees for the Manufacture of Paper and Charcoal—W. Saunders, London, Ont.
20. A few Practical Remarks from the Lumberman's Standpoint—J. K. Ward, Montreal.
21. Oaks of Hardin County, Ohio—W. F. English, Mount Victory, Ohio.
22. Tree-Planting for Railroads—Dr. John A. Warder, North Bend, Ohio.
23. Timber-Trees of the Black Hills—Robert Douglas, Waukegan, Ill.
24. Remarks on the Canadian Cultivation of the *Catalpa speciosa*—Robert Burnet, Pictou, N. S.
25. The Coniferous Trees of the United States and Canada—Dr. Geo. Vasey, Botanist of Department of Agriculture, Washington, D. C.
26. Black-Locust Growths—Dr. John A. Warder, North Bend, Ohio.

27. Experiments in Tree-Planting on Cape Cod—Joseph S. Fay, Wood's Holl, Mass.
28. The Ash—Arthur Bryant, Princeton, Ill.
29. Larchmere, a Plantation on Drifting Sands—Dr. John A. Warder, North Bend, Ohio.
30. Three-Motion Plan of Planting—Robert Douglas, Waukegan, Ill.
31. Extensive Planting by Shelter-Belts—H. M. Thompson, Lake Preston, Dak.
32. Classification of Oaks—Dr. John A. Warder, North Bend, Ohia.
33. A Western Greeting—James T. Allan, Omaha, Neb.
34. Forest-Tree Plantation—B. F. Peck.
35. Trees, Tree-Planting, &c.—J. A. Mathewson, Little Metis, Quebec.
36. Planting on the Plains, &c.—H. M. Pennel, Russell, Kan.
37. Timber Culture a National Necessity—D. C. Scofield, Elgin, Ill.
38. Rural Improvement—B. G. Northrop, Clinton, Conn.
39. The Commercial Value of Pruning—John S. Hicks, Roslyn, N. Y.
40. Apology for the Pioneers—John W. Caldwell, Cincinnati, Ohio.
41. Living Fence-Posts—Willian H. Ragan, Clayton, Ind.
42. Roadside Tree-Planting—W. A. Hale, Sherbrooke, Que.
43. Letter upon Forestry—D'Ailly, Malvern, Ark.
44. Fungi Injurious to Forest Trees—Byron D. Halsted, New York.
45. Forests in Connection with Water, as Aids to Climatic Amelioration—T. T. Lyon, South Haven, Mich.
46. Forests of the United States, as shown by the Census of 1880—N. H. Egleston, Williamstown, Mass.
47. Forest-Cultural Survey, &c.—General William Burns, U. S. A.
48. Economic Tree-Planting; How and Where?—B. Gott, Arkona, Ont.

49. The True and False in Aboriculture—William Robb, Montreal, Que.
50. The Mills of West Fork—J. Jenkins, Winona, Ohio.
51. Individual Effort in Preserving and Propagating Trees Dr. Reginald A. D. King, Compton, Que.
52. Profitable Forest Culture—C. E. Thorne, Springfield, Ohio.
53. What to Plant for Forest Trees, for Groves and for Wind-Breaks—Suel Foster, Muscatine, Iowa.
54. Canada's Forests, and her Future as a Steel-Producer—Edward Haycock, Ottawa, Ont.
55. Climatological Range and Geographical Distribution of Forests, and the Climates Favorable to them—J. Beaufort Hurlburt, LL. D., Ottawa, Ont.
56. Plan of Instruction in an American School of Forestry—Prof. Adolph Leue, Cincinnati, Ohio.
57. The Relation of Forests to Agriculture—A. G. Humphreys, M. D., Galesburg, Ill.
58. Forestry from a Hygienic Standpoint—Henry Howard, M. D., Montreal.
59. Some Notes and Remarks on the Denudation of our Forests—G. L. Marler, Montreal.
60. How the Forests of the Eastern Townships was Broken up—A Brief History—Rev. T. W. Fyles, Cowansville, Que.
61. "Woodman, Spare the Tree."—The Forestry of the Niagra Section J. R. Martin, Cayuga, Ont.
62. Jessup Collection of Forest Products in Museum of Natural History, Central Park, New York—Prof. A. S. Bickmore, New York.
63. Legislation upon Forestry—P. J. U. Beaudry, Beauharnois, Que.
64. On the Needs of Forestry—E. McGillivray, Ottawa, Ont.

PROCEEDINGS IN SECTIONS.

Section A.

President: Dr. FRANKLIN B. HOUGH.

Secretary: WILLIAM LITTLE.

The papers numbered 1, 2, 3, 4, 5, 6, 7, 8, and 9 on the programme were read and discussed.

Section B.

President: Dr. JOHN A. WARDER.

Secretary: Hon. E. H. SPRING RICE.

The papers numbered 22, 24, 27, 30, and 36 on the programme were read and discussed.

Section C.

President: Prof. WILLIAM SAUNDERS.

Secretary: THOMAS S. TYLER.

The papers numbered 39, 40, 49, 52, and 60 on the programme were read and discussed.

EVENING SESSION.

Pursuant to public notice, a meeting was held at Queen's Hall, at 8 o'clock, P. M., at which the public generally were invited. The hall had been tastefully decorated for the occasion, with rare potted plants in bloom, and upon the tables were arranged boquets of rare exotics. Conspicuously behind the President's chair was the legend, "Woodman, Spare the Tree," and on either side were shields bearing the words, "American Forestry Congress, 1882," surrounded by the English and United States flags, entwined.

Cards of invitation bearing the device of the *Maple Leaf*, and printed upon very thin plates of wood, had been issued in great numbers. The city band played several pieces of music while the audience were taking their seats.

His Honor MAYOR BEADRY, presided, wearing the insignia of his office, and after a few words of welcome, introduced the Hon. H. G. JOLY, who addressed the meeting. This was followed by an address by Dr. FRANKLIN B. HOUGH. Mr. D. W. BEADLE and others had been invited to speak, but the lateness of the hour prevented.

PROCEEDINGS OF THE SECOND DAY.

FORESTRY CHAMBERS, MONTREAL,
Tuesday, August 22, 1882.

The Forestry Congress met in general session at 10 o'clock, pursuant to adjournment, the Hon. H. G. JOLY, presiding.

Prof. WILLIAM SAUNDERS, from the Committee upon Consolidation, presented the following resolutions, which were adopted:

Resolved, That whereas, in the year 1875 an association was formed under the title of *The American Forestry Association*, having for its objects the collection and dissemination of information on the subject of Forestry, and the awakening of an interest in the public mind, of which association Dr. JOHN A. WARDER, of Ohio, was elected President; *And whereas*, That association, especially through the labors of its President, who has been most untiring in his efforts, and has spared neither time nor means in the zealous prosecution of his labors for the advancement of the science of Forestry, has been an important agency in calling into existence the society known as the *The American Forestry Congress.*

And whereas, The American Forestry Association is desirous of uniting with the American Forestry Congress, and thereby forming one society for the prosecution of the objects common to both;

Therefore, this Committee of Conference hereby recommends that the present members of the American Forestry Association be received as members of the American Forestry Congress, and that the funds in the treasury of the American Forestry Association be applied in payment of its own expenses.

Mr. BERNHARD E. FERNOW offered the following resolution, which was adopted:

Inasmuch as the Constitution of this Congress has been found not to meet the wants of its aims, in vital points, therefore

Resolved, That a committee of five members be appointed by the Chair to revise the Constitution, so as to adapt it to the wants of the Congress.

The Chairman appointed Mr. BERNHARD E. FERNOW, Dr. FRANKLIN B. HOUGH, Dr. JOHN A. WARDER, Mr. WILLIAM LITTLE, and Dr. CHARLES MOHR as such committee, and desired them to report in General Session to-morrow morning.

Upon motion, it was resolved that paper No. 20, upon the printed programme, entitled "*A few Practical Remarks from the Lumberman's Standpoint*," by Mr. J. K. WARD, of Montreal, be taken from its order and read in General Session. Mr. WARD then read his paper, which led to a discussion, upon the subject of "Forest Fires," in the course of which Dr. GEORGE B. LORING, President of the Congress, appeared and assumed the chair.

Dr. CHARLES MOHR, chairman of a Special Committee appointed at the Cincinnati meeting to report upon the subject of "Forest Fires" and "Injuries from Cattle," then read the following

REPORT.

Since the last adjournment of this Congress I have been prevented from communicating with other members of the committee, and find myself unprepared for presenting the results of joint deliberation. I will, however, venture to submit a statement of some facts that have come under my own observation in the lower portion of the Gulf States, and more particularly bearing upon the lumbering interests of the pine region.

Of these, as in other forests, it may be said, that fires have raged from year to year, causing much greater destruction than all of the past and present lumbering operations combined. The Indians practiced the setting of fire to woods before the settlement by whites began, partly for the driving of game, and partly for the removal of undergrowth that hindered its pursuit. The white settlers in preparing the wilderness for cultivation, acquired a habit of destruction to the utter disregard of the wants of the present and the future, which still continues

to a most needless extent, and to the great injury of private interests and of public welfare. Other fires are set through negligence, but one of their chief causes in early spring every year, is the intentional setting of fires to obtain a fresh growth of grass for the half-starved stock that has been roaming through the woods in the winter months.

This practice is wide-spread, and is persistently followed, notwithstanding the remonstrance of those who wish to follow a better usage, and who suffer most from this barbarous custom. To protect himself, the farmer who would do otherwise, must burn off around his own premises, when wind and weather permit. The lumbering operations of the country continually increase the danger, by leaving great quantities of waste inflamable products upon the ground, which seldom escape the flames, thus greatly extending the waste; but still greater injuries result from the fires set in the production of naval stores. In order to protect the boxed trees from running fires, it is customary to rake away the rubbish from around them and to set it on fire. On a windy day, such fires, escaping all limits, spread over hundreds of square miles, destroying all the Pine seedlings and younger growth.

These fires greatly injure the growth of the trees that survive, as will appear upon comparing the annual layers, in trees exposed, and in those protected, the former being so thin that they can scarsely be distinguished, while the latter are several times as thick.

Another most injurious effect is the burning out of the organic material in the soil, rendering it sterile upon the surface, to the destruction of the finer and more nutritious grasses, and able to produce only the coarser and more deeply rooting species. The second growth of scrubby Black-Jack and Turkey Oak that appears prevents the pines from getting started, and the leaves that fall from these oaks become fuel for ground fires, until the surface becomes utterly barren for any growth.

The Long-Leaved Pine is not necessarily succeed by a deciduous growth, but where the soil is suited to its wants, a vigorous growth of the same comes up where it has been cleared away; but where it is not as rich the Oaks above-mentioned and the Mocker-Nut will, if the fires are kept out, soon cover the ground, and in a few years they will become groves.

Individual efforts for the prevention of these evils can do nothing, and it is only by judicious legislation that relief can be had. The injuries from the unrestrained range of cattle are

scarcely less than those from fires, as well from browsing, as from breaking and tramping down. These damages are less apparent in a pine forrest, because the leaves are not eaten, but the loss even there is enormous, and constantly runs to ruin. The most effectual remedy against this evil is an efficient stock-law, that shall compel the owners of cattle from ranging over the land of others. But hitherto, although such a law has been introduced in some counties, it has met with great opposition in Alabama. The measure has been earnestly discussed in Mississippi. In South Carolina, from information received through Dr. Ravenal, such a law was first introduced as optional to the counties, but its benfits became so apparent, that it has since been extended to the whole State. The opposition which came chiefly from the poorer population of the low country was gradually disappearing, and they were becoming reconciled to its operation, as the benefits became evident. Such a measure will confer the greatest benefit upon the country, and will give an impetus to the prosperity of the farming interests.

Afternoon Session—August 22.

The Congress assembled after recess, pursuant to adjournment. Mr. D. W. Beadle moved the following resolution, which was adopted:

Resolved, That this meeting shall be considered in the history of this Association as its first annual meeting, and that members enrolled at this time shall be considered as original members of the organization.

The President, Dr. Loring, having called the Hon. H. G. Joly to the Chair, delivered an address.

The following papers were then read in General Session:

17. How Farmers may Grow Forest Trees from Seeds; by D. W. Beadle, of St. Catharine's, Ont.

18. On the Growth of Black Walnut Timber in Ontario; by Thomas Beall, Lindsay, Ont.

28. The Ash; by Arthur Bryant, Princeton, Ill.

31. Extensive Planting of Shelter-belts; by H. M. Thompson, Lake Preston, Dak.

58. Forestry from a Hygienic Standpoint; by Dr. Henry Howard, Montreal.

During the discussion that ensued upon the reading of this paper, the President withdrew, and the Hon. H. G. Joly resumed the chair, and presided until final adjournment.

19. On the Growth of Poplar Trees for the Manufacture of Paper and Charcoal; By Prof. William Saunders, London, Ont.

63. Legislation upon Forestry; by P. J. U. Beaudry, Beauharnois, Que.

42. Roadside Tree-Planting; by W. A. Hall, Sherbrooke, Que.

53. What to Plant for Forest Trees, for Groves, and Wind-Breaks; by Hon. Suel Foster, Muscatine, Iowa.

61. "Woodman, Spare the Tree"—The Forestry of the Niagra; by J. R. Martin, Cayuga, Ont.

14. Conditions of Forest Growth; by Bernhard E. Fernow, Slatington, Pa., (now of Oxford, N. J.)

The remainder of the papers upon the programme were read only by their titles, excepting No. 62, which was withdrawn by the author for reading at the session of the American Association for the Advancement of Science.

Evening Session.—August 22.

A public meeting was held at Queen's Hall, at which the Hon. John Eaton, U. S. Commissioner of Education, made remarks, and the Hon. George B. Loring, delivered an address.

Proceedings of the Third Day.

Forestry Chambers, Montreal,

Wednesday, August 23, 1882.

Upon assembling at half-past nine o'clock, the Hon. Geo. Bryson, from the committee appointed the day previous, to report upon the subject of forest fires, presented the following:

This committee recommends the following measures:

1. The reservation of all Pine and Spruce lands unfit for settlement, for lumbering purposes exclusively.

2. The prohibition of the burning of brush by settlers in the

vicinity of Fir trees during the months of May, June, September and October.

3. The division of the timber country into districts, and the appointment of a sufficient number of police, the superintendents of which force to have ample magisterial powers, and whose duty it would be to detect and punish offenders, and to provide for the extinguishment of fires.

4. The cost of maintenance of this protective force, might partially be met by the imposition of a moderate tax on the parties owning or leasing large areas of forest property, or cojointly with the respective governments interested in its preservation.

Mr. B. E. Fernow, from the committee appointed to prepare amendments to the Constitution, presented the following draft of a new Constitution, which was read and adopted:

CONSTITUTION OF THE AMERICAN FORESTRY CONGRESS.

Article I. This Association shall be known as the American Forestry Congress.

Article II. The objects of this Congress shall be the discussion of subjects relating to tree planting; the conservation, management and renewal of forests; the climatic and other influences that affect their welfare; the collection of forest statistics, and the advancement of educational, legislative or other measures tending to the promotion of these objects. It shall especially endeavor to centralize the work done and diffuse the knowledge gained.

Article III. Any person may be elected a member of this Congress upon the recommendation of two members and the payment of two dollars. The annual fee shall be one dollar.

Article IV. The officers of this Congress, to be elected at the annual meeting, as follows: President, First Vice-President, Second Vice-President, Recording Secretary, Corresponding Secretary, Treasurer.

ARTICLE V. The President shall preside at all meetings of the Congress in General Session, and deliver an annual address at the close of his term.

ARTICLE VI. The Vice-Presidents, Secretaries and Treasurer, shall constitute an Executive Committee for the transaction of such business as may be required by this Constitution, or by a vote of the Congress.

ARTICLE VII. The Recording Secretary shall keep a record of the proceedings of the Congress, and shall be custodian of all documents, books and collections ordered to be preserved.

ARTICLE VIII. The Corresponding Secretary shall conduct the correspondence of the Congress.

ARTICLE IX. The Treasurer shall have charge of all funds, and pay out the same on the direction of the Executive Committee.

ARTICLE X. The Congress at any regular meeting or its Executive Committee, in the intervals between its meetings, may appoint such local or special committees as may be deemed proper, and shall define their duties.

ARTICLE XI. The annual meeting of the Congress shall be in the month of August or September, at such times and places as shall be determined by a vote in General Session.

ARTICLE XII. At the close of each annual meeting there shall be an election of officers for the ensuing year, and they shall remain in office until others are chosen. In cases of vacancies occurring in the intervals between the annual meetings, they may be filled by the Executive Committee, until others are selected. In case of absence of an officer at a regular meeting his place may be deemed vacant.

ARTICLE XIII. The officers of States, Territories, Provinces, or Local Forestry Associations, or their delegates, or the de-

legates of any government may participate in the proceedings of the Congress as Honorary Members.

ARTICLE XIV. This Constitution may be amended by a two-thirds vote of the members present at any annual meeting.

Mr. D. W. BEADLE, then presented the following By-Laws, which were by a vote of the Congress, adopted:

BY-LAWS.

1. Papers or abstracts of papers to be read must be sent two weeks before any meeting, for classification, to the Corresponding Secretary.

2. The following classification of subjects is adopted for the reading of papers:

Section A. Forest Planting, Forest Management, Forestry Proper, Preservation of Forests.

Section B. Forest Economy, Technology and Statistics.

Section C. Applied Science and Climatology, General Topics.

3. Contributors who are present shall have the preference in reading their papers.

4. Any member shall be entitled to the privilege of using any books or documents, not of record, at the discretion of the Recording Secretary.

An election was then had for officers to supply the vacancies occasioned by resignation, and the following named persons were chosen to serve for the ensuing year, it being the will of this Congress that the office of President be not deemed vacant, inasmuch as but four months had elapsed since his election:

First Vice-President: Hon. H. G. JOLY, of Quebec.

Second Vice-President: Dr. JOHN A. WARDER, of North Bend, Ohio.

Recording Secretary: Dr. FRANKLIN B. HOUGH, of Lowville, New York.

Corresponding Secretary: Mr. WILLIAM LITTLE, of Montreal.

Treasurer: Mr. JOSEPH S. FAY, of Woods Holl, Mass.

On motion of Dr. F. B. HOUGH, the following resolution was adopted:

Resolved, That the Executive Committee be, and hereby is authorized and directed, to designate the time and place of the next annual meeting of this Congress, and to appoint the Local Committees, and make such other arrangements as may be necessary for that occasion.

Upon motion of Mr. J. S. HICKS, the following resolution was adopted:

Resolved, That the Executive Committee appoint referees to prepare papers upon the following subjects, and send them to the Corresponding Secretary like other papers:

1. Legislation in relation to Forest Fires.
2. Prevention and Control of Forest Fires.
3. Management of Burned Forests, and effect upon the Soil and Forest Growth.
4. Distribution of the White Pine.
5. Technology of the White Pine.
6. Forest Management of the White Pine.

Mr. ELEAZER WRIGHT, presented a verbal statement concerning recent measures that had been adopted, and that were in course of execution in Middlesex County, Mass., in forest-tree planting.

The thanks of the Congress were voted Mr. Wright, for this communication.

Mr. D. W. BEADLE, presented the following preamble and resolution, which were adopted:

Whereas, Many sections of our country are not represented in the American Forestry Congress, therefore,

Resolved, That the organization of Local Forestry Associations be encouraged by this Congress, and that our Constitution and papers be sent to persons interested in Forestry in these sections.

On motion of Dr. JOHN A. WARDER, it was

Resolved, That the thanks of this Congress are due, and are hereby tendered to Mr. C. E. Belle, Crown Lands Agent of Lower Ottawa Agency, Province of Quebec, for the opportunity

here afforded us for inspecting his large and beautiful collection of woods of Canada, elegantly prepared.

Upon motion of Mr. H. G. JOLY, it was

Resolved, That the interest shown by the ladies of America, in the work of this Congress, is most gratifying, and an encouragement to further exertions on our part.

On motion of Mr. WILLIAM LITTLE, it was

Resolved, That the thanks of this Congress are hereby expressed to the Geological Survey of Canada, for the present of a large a nearly complete series of the Maps and Reports of the Gelogical Survey of Canada, for preservation in the archives of this Congress.

Mr. WM. LITTLE, presented the following letter, which was read and ordered to be filed, and the thanks of the Congress were returned therefor:

CLUB HOUSE, MONTREAL,

AMATEUR ATHELETIC ASSOCIATION,

August 22, 1882.

DEAR SIR: The Directors of this Association have much pleasure in tendering the use of their Club House to the members during their stay in the city. Our library is extensive, and may, perhaps, prove useful.

Your obedient servant,

HORACE S. GIBBS, Secretary.

Upon motion of Mr. WM. LITTLE, it was

Resolved, That the thanks of this Congress are due to those gentlemen who have contributed papers to be read at this meeting, but who could not attend. It affords encouraging evidence of a growing and wide-spread interest in the subject of forestry, that promises the happiest results.

Mr. D. W. BEADLE, moved the thanks of the Congress, to Mr. H. G. Joly, for his services in presiding at this meeting—which motion being put by the Secretary, was unanimously adopted.

Mr. B. E. FERNOW, offered the following resolution, which was adopted:

The American Forestry Congress in closing its labors at Montreal, cannot adjourn without expressing its gratitude to the authorities of the Government, who have done so much to render our meeting successful. It therefore,

Resolved, That our thanks are due to the Governments of Ontario and Quebec, for the interest taken by them in sending Delegates to this Congress, for the purpose of aiding in our proceedings, and of reporting upon them.

Upon motion of Mr. JOHN S. HICKS, it was

Resolved, That we express our thanks to the Mayor of Montreal, and to its citizens generally, for the interest taken by them in our proceedings on this occasion.

Upon motion of Mr. W. HUDSON STEPHENS, it was

Resolved, That we return thanks to the Press, who have so kindly reported our proceedings, and who have published in full, many of the papers read during our meeting.

Upon motion of Mr. WM. LITTLE, it was

Resolved, That our thanks are due to the various Railway, Steamboat and Telegraph Companies, that have afforded facilities to our members in their attendance at this meeting, and especially to the following: The Grand Trunk, Great Western, Vermont Central, Delaware & Hudson, Intercolonial, Canadian Pacific, North Shore, South Eastern, Detroit, Grand Haven & Milwaukee, Flint and Pere Marquette, and Cincinnati Southern (C. N. O. & T. P. R. Co.) Railway Companies. The Richelieu and Ontario Navigation Company, and The Northwestern Telegraph Company.

Upon motion of Mr. LITTLE, the thanks of the Congress were voted to the Montreal Horticultural Society, for copies of its reports for distribution, and to Mr. John Lowell, for the use of his valuable library of Directories.

Upon motion of Dr. JOHN A. WARDER, it was

Resolved, That we are particularly indebted to Mr. JAMES LITTLE, of this city—the Nestor in American Forestry, for the earnest and persistent efforts that he has made, from an early period, in the discussions that have so largely contributed to the diffusion of knowledge upon the dangers that threaten our timber supplies, and that have in no small degree tended to the formation of public opinion that now finds expression in the efforts of the American Forestry Congress.

Upon motion of Dr. F. B. Hough, it was

Resolved, That we, in the most especial manner, express our thanks to Mr. William Little, Vice-President of this Congress, for the earnest, energetic and efficient manner, in which he has by his personal labors, his influence and his means, secured every preparation for our meeting that could be foreseen, and that have rendered it a complete success.

Mr. Little, in a very feeling manner expressed his thanks particularly on behalf of his farther, Mr. James Little, for the resolution that had been passed concerning him.

The Congress then adjourned to meet as the Executive Committee might appoint, in August next.

Franklin B. Hough,
Recording Secretary.

[The Recording Secretary deems it properly a part of the history of the Montreal Session of the American Forestry Congress, that due mention should be made of the services of Mr. William Little, in connection with the occasion, in the preparations that were made, and the work that was done.

Besides the very large amount of correspondence which it involved, he provided for the use of the Congress a whole suite of furnished rooms at "Forestry Chambers," for the sessions—the hire of Queen's Hall for two evenings, and all the printing needed before and during the meetings. He also secured the printing of a large edition of two numbers of the *"Montreal Herald,"* making in all sixteen folio pages, exclusively devoted to these proceedings. For these andot her expenses, no claims were presented to the Society, and no aid was asked from his fellow citizens. Very many of the members attending were also placed under personal obligations to him for aid in securing accommodations at a time when the hotels were crowded, and for other attentions which strangers cannot readily secure.]

THE AMERICAN FORESTRY ASSOCIATION.

[In order to render this first publication of the American Forestry Congress complete, we present the following account of the *American Forestry Association*, which was united with it by resolutions, at Montreal, on the 22d of August, 1882.—H.]

In the year of 1875, a call was circulated among persons interested in Forestry, inviting them to sign for the appointment of a meeting, with the object of forming an organization for the promotion of this subject.

In pursuance of this call, a large body of intelligent men met on the 10th of September, of that year, at Chicago, and organized what is known as "THE AMERICAN FORESTRY ASSOCIATION." At this meeting, Dr. JOHN A. WARDER, of Ohio, was chosen President, and Prof. HENRY H. MCAFEE, Secretary.

At the Chicago meeting, a Committee on Correspondence and Statistics, consisting of thirty-five gentlemen residing in different States and Territories was named, with T. J. ALLAN, of Nebraska, as Chairman, the points to be investigated and reported upon being as follows:

1. Estimates of the area of woodland in square miles or acres, and average age of the trees.

2. Estimates of their productiveness per acre, in cubic feet of lumber and cords of fuel.

3. Lists of native trees and woody plants, with local and botanical names and their special value in the arts.

4. Location of species relative to elevation above the sea, to soil, etc.

5. Natural grouping and consociation of species, etc.

6. Numbers, kinds and acres of artificial forests planted, and the areas protected from cattle, in order to encourage the natural reproduction of trees.

was stated, the objects of the Society were, mutual improve-

At this meeting the Association did not adopt a Constitution, and it adjourned to meet at the Centennial, at Philadelphia, in September, 1876. In the circular issued for that meeting, it ment in the art, and diffusion of information upon the subject of Forestry, and the fostering of all interest of forest-planting and conservation on this continent.

In pursuance of the call, a meeting was held at the Judges' Pavilion, upon the grounds of the Centennial Exhibition at Philadelphia, September 15, 1876.

President JOHN A. WARDER, of Ohio, called the meeting to order, and briefly stated the object of the occasion to be, to complete the organization, and to devise means for promoting its objects. For want of time a portion only of his address was read.

A communication was received from the American Forestry Council,* proposing that measures be taken for uniting the two

* It may be proper here to state briefly what is referred to. Soon after the *American Association for the Advancement of Science*, at its session at Portland, Maine, in 1873, had taken action in the appointment of a committee to memorialize Congress and the State Governments upon the importance of measures for the protection and renewal of our forests, and, (as the writer was informed by the chief mover in the proceedings in this note mentioned,) as a direct sequence of the discussions at Portland, the subject was introduced at the meetings of the Farmers' Club of the American Institute, in New York City. Their reports show that papers were read upon various occasions during the fall and winter following. (*Thirty-Fourth Report of American Institute, N. Y. Assem. Doc. No.* 153, 1874, *pp.* 147, 154, 157, 163, 167, 175, 180, 195, 199, 210.)

On the 14th of October, a committee consisting of Geo. May Powell, of New York; Col. A. D. Robertson, of Minnesota; and S. Edwards Todd, of New Jersey, was appointed, and a week afterwards Prof. Henry E. Colton, of Georgia, was added, for the promotion of this object. Early in the winter of 1873–4, a memorial was adopted for presenting to Congress, with the draft of a Bill, (*N. Y. Assem., Doc.*, 1874, *No.* 153, *pp.* 180, 195, 199,) which, so far as we can learn, were not then presented. This committee, or persons connected with it, assumed the name mentioned in the text with the design of organizing an independent society upon a very expensive plan. In the subsequent proceedings none of the names mentioned appear, excepting the first, nor have we knowledge of further proceedings until the summer of 1876. In August of that year, the following card of invitation was issued:

organizations, when, upon motion, the subject was referred to a committee consisting of A. G. HUMPHREYS, of Illinois; J. J. HARRISON, of Ohio; and JOHN SAUL, of Washington, D. C.

A committee on organization was appointed to prepare and report a Constitution and By-Laws. A call for reports from States was made, but none of the Vice-Presidents reported.

A paper was then read by Dr. FRANKLIN B. HOUGH, of New York, upon "The Duty of Government in the Preservation of Forests."* Remarks were made upon this paper by Mr. THOMAS MEEHAN, of Pennsylvania, in which he expressed the view that we should not depend upon Government, but upon private enterprise in extending tree-culture. A short discus- was had upon the species most desirable for cultivation. Mr. G. HUSMANN, of Missouri, called attention to the Osage Orange, as perhaps the most desirable. He also regarded the Western Catalpa, Box-Elder, Red Cedar, Scotch and Austrian Pines as very desirable.

Mr. BURNET LANDRETH, of Pennsylvania, gave by request of the President, some account of the Osage Orange tree planted by his father many years ago.

Mr. J. E. SNODGRASS, of Virginia, remarked that he had

"You are invited to attend the National Forestry Convention, under the auspices of the American Forestry Council, at Sea Grove, Cape May Point, N. J., September 7th and 8th, 1876. As concerning climatic influences for the benefit of the life and health of the people, forests are of such importance, that irrespective of the vast material and more tangible interests involved, we cannot afford longer to delay thorough, general, and systematic investigation of the subject."

This card bore the names of several well known and worthy citizens, but the principal mover was Mr. Powell. Reduced railway and hotel rates were secured, and from the announcements in the daily papers it might be expected that an immense crowd would be in attendance. The writer of this note having a special invitation, attended, and was one of a party of *three persons* who were all that to his knowledge went for the purpose of attending the meeting. By inviting in the guests, a small gathering, (of perhaps twenty persons,) was had in the parlors of one of the hotels the first evening, and sundry papers were read and discussed. The draft of a Constitution had been prepared, but was not presented.—H.

*Printed in the *Lowville Times*, New York, of October 15, 1876.

observed the Ailanthus, both in Virginia and at Philadelphia, and regarded it among the most desirable of trees on account of its rapid growth.

Prof. H. H. McAfee, of Iowa, read extracts from a paper giving an account of Forestry in his State.*

The Committee upon Consolidation reported, recommending the Executive Committee of this Association to meet with the Council at its next meeting on the 21st, and, if possible, effect a union. This report was adopted.†

A paper was received from J. J. Harrison, of Ohio, upon "The Forest Trees of Northern Ohio," which, from want of time, was not read. A report was received from W. C. Flagg, Vice-President for Illinois, a part of which was read.

Mr. Burnet Landreth gave, by request, an account of certain experiments in forest planting in Virginia, which he had caused to be printed.‡ He began planting in 1871, and designed to cover 7,000 acres. He is clearing off the native growths and planting as the ground is cleared. He has 320,000 Black Locust, 100,000 Black Walnut, 25,000 Cotton wood, 30,000 Persimmon, and 30,000 Larch trees, and intended to experiment upon the cultivation of the Sumac for a tanning material.

The Committee on Organization reported a form of Constitution and By-Laws, which were read and adopted, as follows:

CONSTITUTION.

Article I. This Association shall be known as the American Forestry Association.

Art. 2. Its objects shall be the protection of the existing forests of the country from unnecessary waste, and the promotion of the propagation and planting of useful trees.

*Printed in the *Patron's Helper*, Des Moines, Iowa, December 6, 1876, under the title of "Forest-Tree Culture."

† We are not aware that the Council had a meeting on the day mentioned, or afterwards.

‡"Address delivered before the American Forestry Association by Burnet Landreth, Chief of the Bureau of Agriculture, Centennial Commission, September 15, 1876;" 800, p. 10.

ART. 3. Its members shall consist of all persons paying an annual fee of one dollar into the treasury.

ART. 4. Its officers shall consist of a President, a Vice-Preeident from each State, Territory, and Province of the country; a Secretary, and a Treasurer; and the President, Secretary, and Treasurer shall constitute an Executive Committee.

ART. 5. Its meetings shall be held biennially, and at such other times as the Executive Committee may deem necessary.

ART. 6. This Constitution may be amended at any regular meeting by a majority vote.

BY-LAWS.

It shall be the duty of the President to preside at all meetings, to deliver an address at the regular meetings on the subject of the promotion of Forestry, and to call meetings of the Executive Committee when he may deem it necessary.

It shall be the duty of the Vice-Presidents to gather statistics in regard to Forestry in their several States, Territories, and Provinces, report the same at the regular meetings of the organization, and in general to promote in their several localities the objects of the Association.

It shall be the duty of the Secretary to conduct the correspondence, keep the records, and prepare the proceedings for publication.

The Treasurer shall receive and disburse the funds of the Association, on the written order of the President and Secretary, and he shall give such bond as the Association may require.

These By-Laws may be amended at any regular meeting by a majority vote.

The Committee on Organization also reported the nomination of officers for the coming two years as follows:

For President: Dr. JOHN A. WARDER, of Ohio.

For Secretary: Prof. HENRY H. MCAFEE, of Iowa.

For Treasurer: Dr. FRANKLIN B. HOUGH, of New York.

These officers being declared duly elected, and there being no further business before the Association, it adjourned.*

* The Secretary of the Association emigrated to Nevada in the winter of 1877–8, and died there in March, 1878. The writer is unable, for this reason,

In January, 1880, a meeting of the Association was held at Washington, D. C., upon the call of the President, and a memorial was adopted recommending to Congress the appointment of a Commission for the purpose of obtaining information upon the subject of Forestry in Europe. This meeting was adjourned to the call of its President, which was next issued March 10, 1882, inviting its members to meet at Cincinnati, Ohio, April 25–29, 1882. Many of those who had participated in the former proceedings did so, and assisted in the organization of the AMERICAN FORESTRY CONGRESS.

On the 18th of May, 1882, another call was issued by President WARDER to members and and all others interested in the objects of the Society, to meet at Rochester, N. Y., on Tuesday, June 29th, the day preceding the annual meeting of the American Nurserymen's Association, for the discussion of forestal topics, and for reorganization by the election of officers and other business. A meeting was accordingly held, at which was adopted the fellowing

CONSTITUTION.

ARLICLE 1. This Society shall be known as the AMERICAN FORESTRY ASSOCIATION, and shall seek to promote the interests of Forestry and to disseminate information connected therewith.

ART. 2. The officers shall be a President, a Vice-President, a Secretary, a Corresponding Secretary, and a Treasurer, who shall constitute an *Executive Committee*, with power to act on behalf of the Association. There may also be one Vice-President elected for each State, Territory, and Province in North America. The term of office shall be for one year, or until their successors are appointed.

ART. 3. Meetings shall be held annually, or at such times and places as the Executive Committee may direct, for the presentation of papers for discussion, and for practical measures relating to Forestry.

to consult any records he may have kept. The above is made up from the notes of the writer, made at the time, and is believed to be substantially full and correct.—H.

ART. 4. Any person recommended by a member of the Executive Committee may be elected to membership on the payment of two dollars. The annual dues shall be one dollar.

ART. 5. The Executive Committee shall have full authority to act for the Society in any emergency.

ART. 6. This Constitution may be altered at any regular meeting by a two-thirds vote of the members present.

By-Laws to be framed as needed.

The meeting elected the following officers:

President: GEORGE B. LORING, of Massachusetts.

Secretary: JOHN JENKINS; of Winona, Ohio.

Corresponding Secretary: ROBERT B. WARDER, Cincinnati, O.

Treasurer: D. W. BEADLE, St. Catharine's, Ontario.

First Vice-President: JOHN A. WARDER, of Ohio.

And Vice-Presidents for several States and Provinces. They thereupon appointed a committee, consisting of NORMAN T. COLEMAN, of Missouri; E. MOODY, of New York City; and D. W. BEADLE, of Ontario, to confer with the American Forestry Congress with a view of uniting the two organizations.

[The subsequent proceedings at Montreal, resulting in a union as above contemplated, will be found on page 21 of this publication.]

On the 14th of September, 1882, Dr. WARDER, late President of the *American Forestry Association*, by circular informed the members of that body of the recent action and union, requesting them to accept the situation, and to remit their annual dues of the current year to Dr. CHARLES MOHR, of Mobile, Alabama, who had been appointed Treasurer of the *American Forestry Congress.*

MEMBERS

OF THE

AMERICAN FORESTRY CONGRESS.

[Those marked (*a.*) belong to the AMERICAN FORESTRY ASSOCIATION.]

Abbe, Cleveland, Washington, D. C.
Adams, C. K., Montreal.
Addie, James, Huntingsville, Quebec.
Allan, James T., (*a*) Omaha, Neb.
Anderson, Charles, Kuttawa, Ky.
Andres, S. J., Montreal.
Andrews, C. C., St. Paul, Minn.
Augustine, H., (*a*) Normal, Ill.

Bambach, G., Ripley, O.
Barnard, E. A.
Barnard, S., Table Rock.
Barry, Patrick; (*a.*) Rochester, N. Y.
Baskerville, P. (M. P.,) Ottawa, Ont.
Beadle, D. W., (*a*) St. Catharines, Ont.
Beal, Prof. W. J., Lansing, Mich.
Beall, Thomas, Lindsay, Ont.
Bear, S. J., Dayton, O.
Beaudry, J. Alphonse D., Montreal.
Beaudry, J. L., (Mayor) Montreal.
Beaudry, P. J. U., Beauharnois, Que.
Bell, D. Pembroke, Ont.
Bennett, Jno. P., Woodlyn, Pick'y Co., O.
Bissell, W. S., (*a.*) Pittsburgh, Pa.
Blaiklock, F. W., Montreal.
Bock, S., Miamisburg, O.
Booth, J. R., Ottawa, Ont.
Brackett, G. B., Denmark, Iowa.
Brackett, G. C., (*a.*) Lawrence, Kan.
Bronson, E. H., Ottawa, Ont.
Bryant, Arthur Sr., (*a*) Princeton, Ill.
Brown, Prof. William, Guelph, Ont.
Bryson, Hon. George, Ft. Coulonge, Que.
Buchanan, W. J., Montreal.
Budd, Prof. Joseph L., (*a*) Ames, Iowa.
Buell, A. A., Montreal.
Burckhardt, L., Cincinnati, O.
Bureau, Hon. J. O., St. Remi, Que.
Burnett, Robert, Pictou, N. S.
Butler, Amos W., Brookville, Ind.

Calkins, E. A., Burlington, Iowa.
Campbell, George W., (*a.*) Delaware, O.
Chabert, M. L'Abbe, Montreal.
Chaffers, Hon. W. H., St. Cezaire, Que
Chambers, A. H., Montreal.
Charleton, E. F., Quebec.
Church, Hon. L. Ruggles, Montreal.
Clay, Hon. Cassius M. Whitehall, Ky.
Cochran, J. W., (*a.*) Blue Island, Ill.
Colman, Hon. N. J., (*a.*) St. Louis, Mo.
Costigan, Hon. John, Ottawa, Ont.
Crandall, A. R., Lexington, Ky.
Crebassa, J. B., Sorel, Que.
Cullman, John G., Cullman, Ala.

Dana, George, Belpre, O.
Davis, Franklin, (*a.*) Baltimore, Md.
Dean, Harmon, Sidney, O.
DeBeck, William L., Cincinnati, O.
Dempsey, P. C., Trenton, Ont.
Denton, John W., London, Ont.
DeZouche, George C., Montreal.
Dougall, James, Windsor, Ont.
Douglas, Robert, (*a.*) Waukegan, Ill.
Douglas, Thomas, (*a.*) Waukegan, Ill.
Drolet, Gustave A., Montreal.
Drummond, A. T., Montreal.
Dunlop, H. L., (*a.*) Champaign, Ill.

Earle, Frank, (*a.*) Cobden, Ill.
Earle, Parker, (*a.*) Cobden, Ill.
Eaton, Hon. John, (U. S. Com'r. of Education,) Washington, D. C.
Edwards, Samuel, (*a.*) Mendota, Ill.
Edwards, William C., Rockland, Ont.
Egleston, N. H., Williamstown, Mass.
Ellsworth, Lewis, (*a.*) Napierville, Ill.
Ellwanger, George, (*a.*) Rochester, N.Y.
Emery, S. M., (*a.*) Lake City, Minn.

Fair, John, Montreal.
Fay, Joseph S., Woods Holl, Mass.
Fell, Jesse, (*a.*) Normal, Ill.
Fernow, Bernhard E., Oxford, N. J.
Foley, M. S., Montreal.

Forbes, Prof. S. A., (*a.*) Normal, Ill.
Foster, Suel, (*a.*) Muscatine, Iowa.
Francis, L. C., (*a.*) Springfield, Ill.
Freeman, H. C., (*a.*) Alto Pass, Ill.
Furnas, Allen, (*a.*) Danville, Ind.
Furnas, Hon. Robt. W., (*a.*) Brownville, Nebraska.

Galusha, O. B., (*a.*) Morris, Ill.
Gamble, James A., Cincinnati, O.
Garand, Remi J., Montreal.
Gaston, A. H., (*a.*) Lacon, Ill.
Gault, M. H., (M. P.) Montreal.
Geiger, H. R., Springfield, Illinois.
Gianelli, A. M. F., (Italian Con.) Mont.
Gilbert, A. M., Ross, Ohio.
Gordon, James, Ottawa, Ontario.
Graves, H. C., (*a.*) Sandwich, Illinois.
Grimes, D. S., (*a.*) Denver, Colorado.

Haines, J. S., (*a.*) Germantown, Penn.
Hall, T. D., Montreal
Hammon, A. C., (*a.*) Warsaw, Illinois.
Hammon, George W., Boston, Mass.
Harvey, Prof. F. L., Fayetteville, Ark.
Hatheway, Elmon L. (*a.*) Otsdawa, N.Y.
Hatheway, Mrs. P.V., (*a*) Otsdawa, N.Y.
Haycock, Edward, Ottawa, Ontario.
Heaver, William, (*a.*) Los Angeles, Cal.
Heneker, R. W., Sherbrooke, Ontario.
Hicks, John S., (*a.*) Roslyn, N. Y.
Hill, David, (*a.*) Dundee, Illinois.
Hincks, Sir Francis, Montreal.
Hingston, Dr. William H., Montreal.
Hodges, Leonard B., (*a.*) St Paul, Minn.
Hoopes, Josiah, (*a.*) West Chester, Penn.
Hough, Franklin B., (*a.*) Lowville, N.Y.
Howard, Dr. Henry, Montreal.
Hughes, Charles, Montreal.
Humphreys, A. G., (*a.*) Galesburg. Ill.
Husman, George, (*a.*) Napa, Cal.

Jenkins, J., (*a.*) Winona, Ohio.
Joly, Hon. H. G., Point Platon, Que.

Keefer, Thomas C., Ottawa, Ontario.
Kelsey, S. T., (*a.*) Highlands, N. C
Kinney, D. F., (*a.*) Rock Island, Ill.
Knapp, J. G., (*a.*) Limona, Florida.
Kramer, William, Dayton, Ohio.
Kuehnert, Robert, Cincinnati, Ohio.

Latour, L. A. H., (M. A.) Montreal.
Lazenby, Prof. W. R., Columbus, Ohio.
Leclere, Georges, (*Supt. Council Ag.,*) Montreal.
Leué, Adolph, Cincinnati, Ohio.
Lindley, J. V., (*a.*) Greensboro, N. C.
Little, Ch. B , Montreal.
Little, James, Montreal.
Little, L. G., Montreal.
Little, William, Montreal.
Logue, Charles, Maniwaki, Quebec.
Loring, Hon. George B., Salem, Mass.
Lowery, Samuel R., Huntsville, Ala.
Lynch, Hon. W. W., (*Com'r. Crown Lands.*) Quebec.

McConnell, Dr J. B., Montreal.
McConville, P. W., Joliette, Quebec.
McKinstry, B. W., (*a.*) Grant Park, Ill.
McLaurin, John, East Frampton, Que.
McRae, George, Montreal.
McWhorter, Tyler, (*a.*) Aledo, Ohio.
Mailhot, Hon. H. G., Three Rivers, Ont.
Mailhot, Rev. N. E., Sutton, Quebec.
Mann, W. H., (*a.*) Gilman, Ill.
Manning, Jacob W., (*a.*) Reading, Mass.
Marler, George L., Montreal.
Martin, J. R., Cayuga, Ontario.
Martin, Richard, Hamilton, Ontario.
Massue, Hon. L. H., Varennes, Quebec.
Masters, J., (*a.*) Nebraska City, Neb.
Meehan, Thomas, (*a.*) Germantown, Pa.
Meyer, C. H., Fond-du-Lac, Wis.
Meyncke, Oscar, Brookville, Ind.
Mills, James, (*Pres. Ag. College,*) Guelph, Ontario.
Mills, W. B., Beaufort, N. B.
Minier, G. W., (*a.*) Minier, Illinois.
Minkler, S. G., (*a.*) Oswego, Illinois.
Mohr, Charles, Mobile, Alabama.
Moody, E. S., (*a.*) Lockport, Illinois.
Mooney, J. H., Montreal.
Morton, J. Sterling, (*a.*) Nebraska City, Nebraska.
Morse, George H., Burlington, Vt.
Mousseau, Hon. J. A., (*Premier.*) Mont.
Munderloh, William C., Montreal.
Manson, T. V., (*a.*) Denison, Texas.
Murdock, Albert L., (*a.*) Boston, Mass.

Neally, Green C., (*a.*) Burlington, Iowa.
Nelson, W. T., (*a.*) Wilmington, Ill.
Normand, J. B., Three Rivers, Quebec.
Normand, T. E , Three Rivers, Quebec.

Ogilvie, Hon. A. W., Montreal
Orton, Edward., Columbus, Ohio.
Ouimet, Hon. Gedeon., Quebec, Ont.

Papineau, J. G., Montreal.
Pearson, J. M., (*a.*) Godfrey, Ill.
Peffer, P. G., Pewaukee, Wis.

Pennington, Dr. L. S., (*a.*) Sterling, Ill.
Pentland, Francis, (*a.*) Lockland, Ohio.
Periam, Jonathan, (*a.*) Chicago, Ill.
Perley, W G., Ottawa, Ontario.
Petersen, P. S., Chicago, Illinois.
Piatt, J. Sauters, (*a.*) Mock-a-check, O.
Plumb, J. C., (*a.*) Milton, Wisconsin.
Pope, Hon. J. H , (*Minister of Agriculture.*) Ottawa, Ontario.
Proctor, John R., Frankford, Ky.
Quinn, Francis A., Montreal.
Ray, Jackson, Montreal.
Raymond, H. C., (*a.*) Council Bluffs, Iowa.
Riley, Prof. C. V., (*Dept. Ag.*) Washington, D. C.
Ritchie, William, Three Rivers, Quebec.
Rob, William, (*City Auditor.*) Montreal.
Roots, B. G., (*a.*) Pamaroa, Illinois.
Ross, W. Gerand, St. Nicholas, Quebec.
Ross, Hon. J. J., St. Anne de la Perade,
Russell, A. J., (*Crown Timber Agt.*) Ottawa, Ontario.
St. John, J. W., Hamilton, Ohio.
Saul, John, (*a.*) Washington, D. C.
Saunders, Prof. William, London, Ont.
Scofield, D. C., (*a*) Elgin, Illinois.
Scofield, L. K., (*a.*) Freeport, Illinois.
Scott, D. W., (*a.*) Galena, Illinois.
Scott, Dr. W. S., Southampton, Ont.
Seeley, Prof. H. M., Middlebury, Vt.
Senecal, L. A., Montreal.
Shanley, Walter, Montreal.
Shepard, Otis, Boston, Mass.
Simpkinson, John, Cincinnati, Ohio.
Simpson, W., Montreal.
Smith, Charles, Marion, Ohio.
Smyth, Ex-Gov. Frederick, Manchester, New Hampshire.
Spalding, Prof. V. M., Ann Arbor, Mich.
Springer, Alfred, Cincinnati, Ohio.
Spring-Rice, Hon. E. H., Montreal.
Starnes, Hon. H., Montreal.
Starr, J. W., Steele City, Neb.
Steele, Robert W., Dayton, Ohio.
Stephens, W. Hudson, Lowville, N. Y.
Stewart, Dr. J. T., (*a.*) Peoria, Ill.
Stickney, J. S , (*a.*) Wauwatosa, Wis.
Stout, Henry Oursler, Adams Co., O.
Studer, Jacob H., Columbus, Ohio.

Taché, E. E., (*Assist. Com. Crown Lands.*) Quebec.
Taft, J., Cincinnati, Ohio.
Tallant, Dr. J F., (*a.*) Burlington, Iowa.
Teall, J. L., Pervins Mills, Ohio.
Teas, E. Y., (*a.*) Dunreith, Indiana.
Teas, J. C., (*a.*) Carthage, Mo.
Thayne, Stewart, Ottawa, Ontario.
Thistle, W. R., Ottawa, Ontario.
Thomas, F. Walferston, Montreal.
Thompson, D. D., Cincinnati, Ohio.
Thompson, M. H., (*a.*) Lake Preston, Dakota.
Thorne, W. R., Ottawa, Ontario.
Thorne, W., Springfield, Ohio.
Torrence, C. E., Montreal.
Townshend, Prof. N. S., (*a.*) Columbus, O.
Tracy, W. W., Detroit, Michigan.
Trowbridge, G. W., (*a.*) Glendale, O.
Trudel, Hon. F. X. A., Montreal.
Turner, J. B., (*a.*) Jacksonville, Ill.
Ulbricht, Geo. Alfred, Dresden, Saxony.
Vasey, Dr. George, (*Botanist D. of Ag.*) Washington, D. C.
Walbank, W. McL , Montreal.
Walker. J. A., Montreal.
Ward, J. K., Montreal.
Warder, Dr. John A , (*a.*) North Bend, Ohio.
Warder, Prof. Robert B., North Bend, Ohio.
Watrons, C. L., (*a.*) Des Moines, Iowa.
Watson, William, (*a.*) Brenham Tex.
Weltz, Leo., (*a.*) Wilmington, Ohio.
Whiting, C. E., (*a.*) Whiting, Iowa.
Whitney, A. R., (*a.*) Franklin Grove, Ill.
Whitney, N. S., Montreal.
Williams, H. H., (*a.*) Galesburgh, Ill.
Wilson, Hon. Horace, Columbus Ohio.
Wilson, H. W., Boston, Mass.
Woodbury, C. H., New York.
Wright, Elizur, Boston, Mass.
Wright, George H., (*a.*) Sioux City, Iowa.
Wright, T. W., Montreal.
Wurtele, Hon. T. S. C., (*Prov. Treas.*) Montreal.
Zimmermann, C. D., (*a.*) Buffalo, N. Y.

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Names omitted in the preceding list.

Burson, D. C.,—Philadelphia, Pa.

Clarke, Robert,—Glendale, Ohio.

Comegys, Dr. C. G.,—Cincinnati, Ohio.

Coursler, Henry,—Stout's, Adams Co., Ohio.*

Gano, John A.,—Cincinnati, Ohio.

McNamara, Thos.,—Hartwell, Ham Co., Ohio.

Miller, Jos. W.,—College Hill, Ohio.

Sohn, John Wm.,—Hamilton, Ohio.

Tice, Jerome, Elenor—Clermont, Co., O.

Waldén, Rev. John M.,—Cincinnati, O.

Wright, Jos. F.,—Mt. Healthy, Ohio.

*Instead of the name given on page 43, 2d line from bottom, in first column.

C.

PROCEEDINGS

OF THE

AMERICAN FORESTRY CONGRESS

FOR THE YEAR 1883.

Vol. II

The Congress met at the State House, in St. Paul, August 8th, 1883.

The meeting was called to order by the Hon. GEORGE B. LORING, President of the Congress, at ten o'clock a.m.

Upon motion of F. P. BAKER, of Kansas, a resolution was passed for the appointment of a committee upon the order of business, to consist of three persons appointed by the chair.

Mr. F. P. Baker, Mr. G. W. Minier and Hon. H. G. Joly, were appointed as this committee.

Hon. H. G. JOLY moved a resolution, which was adopted, as follows :—

"*Resolved*, That a committee be appointed with instructions to draft resolutions concerning the great loss suffered by the American Forestry Congress by the death of Dr. J. A. Warder, one of its vice-presidents, since its last meeting."

The Chair appointed Hon. H. G. Joly, Dr. F. B. Hough, and Rev. N. H. Egleston, as this committee.

Upon motion of Rev. N. H. EGLESTON, a resolution was offered, expressing the regrets of the Congress upon the death of the Hon. Leonard B. Hodges, of St. Paul; and upon motion of Mr. G. W. MINIER, the name of the late Arthur Bryant, Senr., of Princeton, Ill., was included. It being suggested that there might be other names worthy of mention, the resolution was further amended and passed, instructing the committee above named, to include such as they might deem worthy, and instructing the secretary to transmit certified copies of these resolutions to the families of the deceased persons.

Mr. R. W. FURNAS, of Nebraska, offered the following resolution :—

Resolved, That Article VI. of the Constitution be amended by inserting the word "president," so that it should read as follows :—

"ART. VI. The president, vice-presidents, secretaries, and treasurer, shall constitute an executive committee, for the transaction of such business as may be required by the Constitution, or by a vote of the Congress."

This resolution having been adopted, another was offered by Mr. FURNAS, to further amend by striking out the words "the close of," from Article XII. of the Constitution, so that it should read as follows:—

"ART. XII. At each annual meeting there shall be an election of officers for the ensuing year," etc.

This being adopted, Mr. J. S. HICKS, of New York, moved a resolution directing the appointment of five persons in addition to those appointed by the Constitution, to serve as an executive committee; which was adopted.

Mr. J. G. KNAPP, of Florida, offered a resolution for the appointment of a temporary treasurer, in the absence of Dr. Charles Mohr, the treasurer, which was adopted, and Mr. J. Fletcher Williams, of Saint Paul, was appointed.

Mr. R. W. FURNAS offered a resolution, which was adopted, directing the president to appoint a committee of three upon organization; whereupon Mr. Furnas, of Nebraska; Mr. B. G. Northop, of Connecticut; and Mr. J. H. Morgan, of Ontario, were appointed.

Mr. BAKER, from the committee on order of business, reported the following rules for the present session, which were adopted:—

"1. That until all work be disposed of, the Forestry Congress meet every day at ten in the forenoon, two in the afternoon, and half-past seven in the evening.

"2. That all the papers prepared by members present be read according to the alphabetical order of the writers' names.

"3. That the titles of the papers sent by absent members be read, and that on motion of any member, the Congress will decide whether such paper be read at length or not.

"4. After the reading of each paper, the subject matter will be open to discussion, no member being permitted to occupy the attention of the Congress more than ten minutes.

"5. That privilege be granted to this committee to make any further report, should it be deemed necessary."

Upon motion, offered by the Rev. N. H. EGLESTON, and adopted, the chair was directed to appoint a committee to report upon the best methods of Tree Planting; whereupon the Rev. N. H. Egleston, of D. C.; Mr. George W. Wright, of Iowa, and Prof. W. B. Lazenby, of Ohio, were appointed.

The following named persons were then elected members of the Forestry Congress, upon recommendation of two members, viz.:—

J. H. Morgan, of Amherstburg, Ontario.
Edward Daniels (Curator Acad. Science), of Saint Paul, Minn.
B. G. Northop, of Clinton, Conn.
George H. Wright, of Sioux City, Iowa.
J. Fletcher Williams, of Saint Paul, Minn.
F. P. Baker, of Topeka, Kansas.
Warren Higley, of Cincinnati, Ohio.
William R. Marshall, of Saint Paul, Minn.
Dr. J. H. Bryant, of Saint Paul, Minn.
Eugene Seeger, of Saint Paul, Minn.
Ferdinand Harrsen, of Saint Paul, Minn.
J. L. Budd, of Ames, Iowa.

The hour of twelve meridian having arrived, the Congress took a recess until two o'clock p.m.

Afternoon Session, August 8th.

The hour of two o'clock having arrived, the President took the chair, and announced the presence of Gen. George L. Becker, of Saint Paul, President of the Minnesota State Forestry Association, who addressed the Congress with a speech of welcome, on behalf of the Association, as follows:—

PRESIDENT BECKER'S ADDRESS.

Mr. President, Gentlemen of the American Forestry Congress:—

It is both a pleasure and a privilege to address such a body of men as is assembled here to-day. You are on the border of these great boundless plains stretching, as our great American poet has said:—

"In airy undulations far away,
As if the ocean, in its gentlest swell
Stood still, with all its rounded billows,
Fixed and motionless for ever."

They are the plains and the prairies which were known to our old geographers, and familiar to the most of us in our boyhood days, as "the Great American desert." We have lived to see stretched out on every side over them the iron rail, and the mighty electric wire; and we see these plains becoming covered by a large population who are constantly developing the fact that they are rich in all that adds to the dignity and the comfort of man. When I first came to Minnesota I started out with this proposition: that God had never made such a country as this without providing everything necessary for the use of the human family, and I argued from that, that sooner or later we would find our deposits of coal here for our use. After thirty years we haven't found the coal. I am still a believer in the proposition that I then maintained; but whether we are to discover our means of lighting and heating this vast territory in the unknown powers which yet lie undeveloped in the electric force, or in the decomposition of gases in the air we breathe, or by the more laborious process of tree planting, I am unable to say; but that the means are here ready at our hand when we discover them, I haven't the slightest doubt at all. The Minnesota State Forestry Association has been in existence a number of years. It is not large in numbers; not influential in its members. It has been teaching the A B C of forestry literature to our people, just as the schoolmaster teaches the schoolboy. To begin with, we had to encounter unbelief, ignorance and prejudice. The average settler of the prairie did not believe that trees would grow there. He thought that if trees had been intended to grow there they would be there, and it seemed almost like flying in the face of Providence to think of planting trees on the prairies. But a little leaven has leavened the whole loaf, and I believe that the settler who plants himself upon the prairie without contemplating a tree plantation that will grow, is the exception rather than the rule.

There is one earnest man whom we miss to-day. He whose life was devoted to this work is dead. He died in the early spring, in the midst of his great purpose of planting trees along the line of the Northern Pacific. I refer to Mr. Leonard B. Hodges, our late Secretary. He was the author of our pamphlet of which we have published several editions—the Tree Planting Manual. He was an honest man, a good citizen and a true friend, and he gave an impetus to tree planting which all other forces combined never gave to tree planting in this State. He was himself a learned and practical tree planter. Better than any man I ever knew, he illustrated the truth that,

"Vast and sudden deeds of violence,
Adventures wild, and wonders of the moment,—
These are not they which generate
The calm and blissful and enduring mighty."

His body lies in a beautiful cemetery near our town. His monument, more enduring

than brass and harder than marble, is in the long lines of trees which line the railroads of this State and the groves that dot our prairies; and they will tell for generations to come of his practical and patient labours. I need not say to you, gentlemen, that we shall be glad to listen to your discussions. We shall study them with great care, and we shall hope to derive from them great inspiration and wisdom for the fu

At the conclusion of his address he introduced to the meeting the G
nesota, Governor HUBBARD, who welcomed the Congress in the followi

Gentlemen of the American Forestry Association:—

I extend to you a hearty welcome to our State. I assure you, gentlemen, that you have come among a people who appreciate the great importance of the interest in whose behalf you are labouring, and who wish to aid you by their efforts, as well as to profit themselves thereby. It is most appropriate that Minnesota should be selected for the place of your meeting at this time. Our people for several years past have given much attention to the subject of tree culture, and the prairies of one State to-day bear witness of what may be accomplished by an earnest and systematic effort to perpetuate and preserve the growth of our forest trees. The encouragement given by legislation, national and State, to the promotion of timber culture, supplemented by the intelligent action of your body, and of our State Association, has made forestry a prominent feature in the agricultural industries of the west, and has made habitable and indeed hospitable many otherwise dreary and desolate wastes. Your efforts, gentlemen, are entitled to cordial recognition. Your work is a great public benefaction. The people of the North-West, and of Minnesota especially, as I have said, realize the value of the interest you are seeking to promote, and they bid you, gentlemen, a most cordial welcome to our State, whose broad area already illustrates the great good you are doing.

To this welcome President LORING replied:—

I am sure I express the sentiment which animates you, when I say that the cordial welcome we have received here is grateful to this Congress. I am sure no State in this Union could have been more appropriate than this in which we meet, for the consideration of one of the most important subjects that can be brought before the minds of those who are interested in the prosperity and industry of the United States—the care and preservation of the forests to which Minnesota has given such careful and accurate attention, both by her Forestry Association on the one hand, and by her State deliberators and members of Congress on the other.

The discussions were then opened by the reading of the President's annual address, which will be found to be full of valuable information.

PRESIDENT LORING'S ADDRESS.

GENTLEMEN,—When I had the honour of addressing an assembly of those interested in promoting the cultivation and preservation of forests in this country, and in ornamenting our cities and towns by the planting of trees in their parks and along the highways, now a year ago, I dwelt largely on the value and importance of providing in every way for the gratification of our refined tastes and for increasing the popular sense of beauty. I did this as preliminary to the more practical work which called that assembly together, and as an appeal to the strongest motive man has to engage in the business of providing for his wants and surrounding himself with the comforts and luxuries which prosperity secures. At this time I propose to confine myself strictly to the condition of forests in this country, and to such suggestions as may occur to me with regard to their increase, preservation, and economical use.

And first as to the increase of our forests. In this work both nature and art are engaged. The "forests primeval" meet man wherever he advances to the occupation of new lands best adapted to feed and clothe him, and best fitted for agricultural labour and production. His primary work is to remove this great vegetable growth, whose condition indicates the quality of the soil he proposes to cultivate. If he pauses in his work the

forests return to their accustomed place. In the older States many acres which half a century ago were used for pasturage or tillage are now covered with forest growths, and many timber lands which have once supplied the forest products are now hastening to supply a new crop. The acreage of woodland is undoubtedly increasing in those sections where farming has become unprofitable either through the exhaustion of the soil or through a change in the locality and demands of the markets. In the strictly lumbering States this is also true. While the deserted, remote, and mountain farms in Massachussetts are rapidly "growing up to wood," the woodlands of Maine and Michigan and many another lumbering State are growing a new crop, which in a quarter of a century will be more valuable than the original growth, although much reduced in size. The young pine and spruce forests of the north, covering acres of land once occupied by their sturdy progenitors, are full of promise and beauty. In other sections of the country, lands, which have for ages been bare of trees while exposed to annual prairie fires, and under the protection of man, producing rapid growths of wood. As the settler guards his fields against fires and cattle, trees spring up, and especially along the water-courses may be seen forest belts where an entire absence of trees had been the law for many generations of men. Wherever the land is protected, therefore, whether it be the location of old forests, or bare spots adapted to tree-growing where the forests have been hitherto unknown, nature is busily engaged in producing wood, and in bringing back the forest growth which welcomes advancing man as he goes on in his work of civilization.

In addition to this natural increase, much has been done in many of the States in tree-planting, and much more ought to be done. The establishment of "arbor days" and the inducements held out by legislation have operated very favourably on the work of what is called village improvement, and on an agricultural attention to the cultivation of trees as a crop. And this business has increased with very considerable rapidity in some of our best farming States. In Minnesota, for instance, the number of acres planted on "arbor day" in 1878 was 811; in 1882 the number was 1,184; and the whole number of acres planted increased from 18,029 in 1878, to 38,458 in 1882. Work similar to this is done in Iowa, Nebraska, and Dakota, as well as in Ohio, Michigan, Illinois, and Kansas. In Nebraska, the number of acres of cultivated woodland has reached 107,438, as against 19,695 acres of natural increase. These are small beginnings, it is true, but they are entitled to our most careful consideration as the commencement of an enterprise which, when properly conducted, will undoubtedly constitute an important branch of American agriculture.

Tree-culture ought now to receive our most careful attention. It is time that the skill which has been applied to the cultivation of our great cereal crops, to cotton, rice, tobacco, and all the profitable products of the soil, such as grass, and vegetables, and fruits of every description, should be applied also to the growing of wood as a farm product. To the choice of forest trees adapted to each locality; to the selection of land which can most properly be devoted to trees, considering its fitness or unfitness for any other crop on account of quality and situation, whether near to or remote from farm buildings, whether useful or not for pasturage and tillage; to the best methods of cultivation, whether by seeding or planting from nurseries; to the best method of securing a speedy return—to all these points the attention of practical and investigating farmers should be carefully and systematically turned. The profit of the crop can, I presume, be no longer questioned. Waste lands enclosed and left to nature have produced in wood a very large return for the investment. Why should not land subjected to the well-directed art of the cultivator produce just as good a result? For the purpose of encouraging this enterprise it is important that Government should lend its aid in every legitimate way until the wood crop is recognized exactly as are the great staple crops of the country. If a bounty is legitimate and useful in any case, it certainly would be in this. The protection against lawless invasion thrown around our grain fields and gardens should also be extended to our woodlands, protection against depredation, wanton fires, and stray cattle. The rifling of a forest should be as penal an offence as the rifling of an orchard. Over forest-covered public lands and over forest plantations, against the careless destruction of the settler on the one, and the trespass of the outlaw on the other, should the strong arm of the law be constantly and vigourously extended.

THE VALUE OF THE INDUSTRY.

In order that I may impress upon you the value of this industry I will ask your attention to its extent in our country, which covers such a vast area. I do this in order to impress upon your minds not only the value but the great importance of husbanding our resources in this direction in view of the constantly increasing demand for our forest products in all their variety. The forest lands of the United States amount to less than one-fourth of the entire area. The proportion of wooded area is less than in eastern, northern and central Europe, and is very unequally distributed. Norway has two-thirds of its area wooded, Sweden six-tenths, Russia nearly one-third, and Germany nearly one fourth. The countries having less forest areas, arranged in order of proportion, from eighteen down to five per cent., are Belgium, France, Switzerland, Sardinia, Naples, Holland, Spain, Denmark, Great Britain, and Portugal

Originally the southern, middle and eastern States were entirely wooded, except a large portion of Texas, and a few small prairies in the south-west. Small areas of mountain glades among the Alleghenies might also be excepted. Ohio and eastern and southern Indiana were wooded, and the northern portions of the lake States.

West of the line of prairies running south-west through Indiana, Illinois, Missouri, to the Indian territory, the central prairies, the drier plains, and much of the southern belt of the Pacific slope are destitute of wood. The streams in all the great region are more or less fringed with trees of some sort, and the higher mountains on the protected sides have a thin covering of forest. In the deep valleys of the western slope of the Sierra Nevadas are forests of extraordinary density filled with soft-wooded evergreen trees of enormous size, the wonder and admiration of the practical woodman. Here the *Sequoia gigantea*, or big tree, flourishes in isolated patches, while the coast range is the home of the *Sequoia sempervirens*, or redwood.

From North Carolina to Louisiana nearly six-tenths of the farm area is wooded, though much of the area thinly, and part of it has been culled and is in second growth. Including unoccupied areas, not in farms, which are in forest, something like three-fourths of the entire south is wooded.

There are counties in the south that were ten years ago almost unbroken forest. More than nine-tenths of the area of Brunswick, North Carolina, were then wooded, and almost as large a proportion of Beaufort, Craven, Onslow, New Hanover, and Bladen. A similar preponderance obtained in Williamsburg, Georgetown, and Lexington, in South Carolina; and in Camden, Charlton, Clinch, and others in Georgia. In all of the gulf States such districts were found. Less than two per cent. of Newton County, in eastern Texas, was cleared. To-day the proportion of woodland is but little less. On the farm areas of Georgia the percentage of forests has increased from fifty-five to fifty-nine on account of taking two or three millions of primitive forests into the farm area. In Florida, from the same cause, it has increased from sixty to sixty-six per cent. The decline has been from sixty-one to fifty-eight in Mississippi; from fifty-seven to fifty-five in Louisiana. It has increased from forty-two to forty-four in Texas; and nearly one hundred counties show from ten to eighty per cent in wood. The wealth of the forest growth is scarcely appreciated in large districts of the south. There are districts where clearings are yet made yearly by girdling the trees in the summer for planting among the boles standing bare and blackened. Every winter a log-rolling disposes of the trunks that fall, until decay and fire have cleared the field. And it is not long since a sprinkling of black walnut rails could be seen in the worm fences which still surround the fields of corn and cotton, and probably a few can yet be found.

Comparing the census returns of 1870 and 1880 we find a decrease of woodlands in farm areas in Michigan from forty-one to thirty-two per cent; in Minnesota from twenty-one to fifteen, and in Iowa from sixteen to eleven per cent. In Nebraska tree-planting has changed the record from three to ten per cent. From the increase of farms in the wooded area Wisconsin has thirty-one instead of twenty-nine per cent. The comparison is thus tabulated:

States.	1880.			1870.		
	Acres in farms.	Acres in woodland.	Per cent. of farm lands.	Acres in farms.	Acres in woodland.	Per cent. of farm lands.
Michigan	13,807,240	4,452,265	32	10,019,142	4,080,146	41
Wisconsin	15,353,118	4,768,046	31	11,715,321	3,437,442	29
Minnesota	13,403,019	2,030,726	15	6,483,828	1,336,299	21
Iowa	24,752,700	2,755,290	11	15,541,793	2,524,793	16
Nebraska	9,944,826	321,566	3	2,073,781	213,374	10
Totals	77,260,903	14,327,893	18	45,833,865	11,592,054	25

The belt including latitudes 37° to 41° through which runs the Ohio River extended westward across the Mississippi River, shows a decrease from 34 to 26 per cent,; greatest in Ohio and Indiana, as follows:

States.	1880.			1870.		
	Acres in farms.	Acres in woodland.	Per cent. of farm lands.	Acres in farms.	Acres in woodland.	Per cent. of farm lands.
Kentucky	21,495,240	10,106,072	47	18,660,106	9,134,658	49
Ohio	24,529,226	5,982,507	24	21,712,420	6,883,575	32
Indiana	20,420,983	5,935,308	29	18,119,648	7,189,334	40
Illinois	31,673,645	4,935,575	16	25,882,861	5,061,578	20
Missouri	27,879,276	10,137,790	36	21,707,220	8,965,229	41
Kansas	21,417,468	991,187	5	5,656,879	635,419	11
Totals	147,415,838	38,088,439	26	111,739,134	37,869,793	34

In the eastern section, Maine shows an increase from new farms in Aroostook county and other northern counties, but it has been denuded of heavy timber and left for new growths, and therefore makes a deceptive showing. New York shows a decrease from 26 to 22 per cent., and Pennsylvania from 32 to 29, as follows:

States.	1880.			1870.		
	Acres in farms.	Acres in woodland.	Per cent. of farm lands.	Acres in farms.	Acres in woodland.	Per cent. of farm lands.
Maine	6,552,578	2,682,296	41	5,838,058	2,224,740	38
New Hampshire	3,721,173	1,296,529	35	3,605,994	1,047,090	29
Vermont	4,882,588	1,503,467	31	4,528,804	1,386,934	31
New York	23,780,754	5,195,795	22	22,190,810	5,679,870	26
Pennsylvania	19,791,341	5,810,331	29	17,994,200	5,740,864	32
Totals	58,728,434	16,488,418	28	54,157,866	16,079,498	30

Taking the States by groups the inequality of forest distribution is strikingly shown. The following statement divides the woodlands reported on farm areas as follows:

States.	Acres in farms.	Acres in woodlands.	Per cent. of farm land.
New England	21,483,772	7,315,730	34
Middle	47,592,113	11,993,317	25
South Atlantic	90,117,393	49,339,653	55
Gulf and Southern	112,004,983	59,078,032	53
Ohio Valley and Lake	137,473,231	42,360,123	31
Trans-Mississippi	97,397,289	16,236,559	17
Pacific	21,339,316	3,115,924	15
Rocky Mountain	8,673,738	816,406	9
Totals	536,081,835	190,255,744	35

CHANGES BY YEARS.

The following tables give a list of the States showing changes of ten years, both in farm and woodland areas:

States and Territories.	Acres of woodland.	Per cent. of farm lands.
Maine	2,682,296	41
New Hampshire	1,296,569	35
Vermont	1,503,467	31
Massachusetts	1,004,099	30
Rhode Island	182,666	35
Connecticut	646,673	26
New England	7,315,730	34
New York	5,195,795	22
New Jersey	708,092	24
Pennsylvania	5,810,331	29
Delaware	279,099	26
Middle	11,993,317	25
Maryland	1,634,019	32
Virginia	9,126,601	46
North Carolina	13,868,086	62
South Carolina	7,255,121	54
Georgia	15,269,225	59
Florida	2,186,601	66
South Atlantic	49,339,653	55
Alabama	10,430,727	55
Mississippi	9,144,323	58
Louisiana	4,557,332	55
Texas	15,851,365	44
Arkansas	7,861,409	65
Tennessee	11,232,876	54
Gulf and Southern	59,078,032	53
West Virginia	6,180,350	61
Kentucky	10,106,072	47
Ohio	5,982,507	24
Michigan	4,452,265	32
Indiana	5,935,308	29
Illinois	4,935,575	16
Wisconsin	4,768,046	31
Ohio Valley and Lake	42,360,123	31

States and Territories.	Acres of woodland.	Per cent. of farm lands.
Minnesota	2,030,726	15
Iowa	2,755,290	11
Missouri	10,137,790	36
Kansas	991,187	5
Nebraska	321,566	3
Trans-Mississippi	16,236,559	17
Colorado	44,117	4
Arizona	13,399	10
Dakota	80,264	2
Idaho	11,892	4
Montana	3,678	1
New Mexico	219,224	35
Utah	2,305	0·4
Washington	437,696	31
Wyoming	510	0·4
Indian	3,321	18
Rocky Mountain	816,466	9
California	1,672,810	10
Oregon	1,424,417	34
Nevada	18,697	4
Pacific Coast	3,115,924	15
United States	190,255,744	35

Of the value and importance of the forests covering these areas let me say: Next to the white pine of the northern forests, the most valuable tree is undoubtedly the *Pinus australis*, or long-leafed pine of the southern coast lands, forming a belt of varying breadth, up to 100 and 150 miles from the Atlantic and Gulf shores. It is the Georgia pine of builders, preferred for flooring and heavy frame-work, and is still found in pristine vigour and abundance over a large area from Norfolk to Galveston. These pine lands are now eagerly sought for by American and English capitalists, are rapidly taken up for manufacturing operations or on speculative account, and are rising in value. They have been held for many years by the general government at prices ranging from 12½ cents to $1.25 per acre, the former being for lands that had been opened to market for a certain period. This is the turpentine pine of North Carolina, where the business of distilling turpentine and making tar and resin has long been profitable. It is also carried on, though in isolated enterprises, in other portions of this coast belt.

TURPENTINE PINE.

The products of the year ending April, 1880, are thus estimated by Mr. A. H. Van Bokkelen:

States.	Turpentine.	Resin.
	Gallons.	*Barrels.*
North Carolina	6,279,200	663,907
South Carolina	4,593,200	333,940
Georgia	3,151,500	277,500
Florida	1,036,350	68,281
Alabama	2,005,000	158,482
Mississippi	250,000	20,000
Louisiana	250,000	20,000
Total United States	17,560,300	1,542,110

The Southern pine will come into still greater prominence as railroad and steamboat lines extend facilities for transportation, which is now being done with great rapidity.

THE SUPPLY OF PINE.

The condition of the pine-lumber supply of the United States in connection with the statements I have made is interesting. The destruction of this tree by fire and the axe of the settler and lumberman is very great. Together with the spruce it is being rapidly consumed, and I think the following figures will show that the supply is to be obtained hereafter by allowing an exhausted region time to recuperate, while the comparatively uncut sections are resorted to for filling the demands of the market. Investigations recently made show that the supply of pine in New Hampshire and Vermont is exhausted, and that the spruce lumber, at the rate the cutting is now going on, will last in the former State but seven years, and in the latter but four. In the State of Maine the pine will last four years and spruce fifteen years. In South Carolina the pine forests will last fifty years at the present rate of cutting; in California, 150 years; in Arkansas, 300 years; in Pennsylvania, fifteen years; in Georgia, eighty years; in Louisiana, 100 years; in North Carolina, fifty years; in Wisconsin, twenty years; in Michigan, ten years; in Minnesota, ten years; in Mississippi, 150 years; in Alabama, ninety years; in Florida, thirty years; in Texas, 250 years. That the exhausted forests in this list of States can be restored in time there is no doubt; and every means of cultivation and protection should be applied by the people and the Government, both State and Federal, each in accordance with its own jurisdiction.

FEARS OF A TIMBER FAMINE UNFOUNDED.

We should not forget, however, that while the demand for timber is imperative and increasing with increase of population, requiring the fostering care of the Government and the enlightened enterprise of timber-growers in promoting the progress of forest culture, there may be danger of assuming too hastily a prospective timber famine, and fabulous prices for fuel, even with the foregoing striking estimates before us.

It should be remembered that thus far the exhaustion of lumber relates mainly to the white pine. It may be found, when the great pineries shall be cut over, that the outcome is greater than was assumed, and that isolated patches of pine in mixed forests, and the second growths and remnants from first cuttings, may suffice to delay the threatened famine.

The black walnut, culled from western forests to meet a limited though important demand, is really becoming scarce on the northern side of the Ohio valley; but on the southern, along the foot-hills and in the valleys of the Appalachian range, it is abundant and almost untouched. It grows rapidly in the western States even beyond the Missouri, and it is destined to be the source of wealth to the future tree-grower.

The millions of acres of existing forests on this great eastern chain of mountains have not yet been considered in the statistics of forestry here presented. Their resources have never been measured, are yet comparatively unknown, and almost untouched by the axe of the woodman. As railroads penetrate these mountain fastnesses in the Virginias, the Carolinas, Kentucky and Tennessee, bonanzas of forest production will respond to the call of enterprise, and enrich the proprietor woodsman and manufacturer. In addition to this, the white pine of Minnesota is estimated at 6,100,000,000 feet exclusive of isolated timber in birch lands and amidst other hard-wood growth. In Michigan the estimates for the lower peninsula cover 7,000,000,000 feet in the Saginaw district; 8,000,000,000 on the streams flowing into Lake Huron, and 14,000,000,000 on those flowing into Lake Michigan. The upper peninsula contains 6,000,000,000 more, making 35,000,000,000 feet in the principal pine districts of Michigan.

The great pine forests of Wisconsin are estimated to contain 41,000,000,000 feet of lumber, the largest proportion in the Chippewa and Wisconsin districts. They cover an area of 22,500,000 acres. The northern border of the pine area is less productive than the areas of lower latitudes. The cedar swamps of Wisconsin scattered through the pine belt are estimated to cover 1,365,000 acres, and to contain 62,800,000 posts, telegraph poles, and railroad ties. There are also large supplies of tamarack, and spruce, and valuable oak timber, especially in Dunn, Pierce, and Saint Croix counties, and other hard woods are abundant through the southern border of the wooded districts.

The united area of the States south of Maryland and the Ohio river is more than 500,000,000 acres containing nearly 400,000,000 acres of forest lands. The farm area of these States is 228,000,000 acres, containing 123,000,000 acres of woodland. Denude any portion of this forest surface, and trees spring up spontaneously and grow rapidly. There are millions of acres of young forests in the South in which the corn-hills are almost as prominent as when the waving corn occupied the surface. Nature abhors a vacuum of broom-sedge, the first growth of abandoned fields, and speedily replaces it with a forest of pines. Intelligent landowners of this region have estimated an average growth of a cord of wood per acre each year, or twenty cords of wood per acre in twenty years.

Is there immediate danger then of scarcity of fuel in a country where more than two-thirds of the entire area is wooded; and when nature is so kind and so prolific in forest farms, cannot the supplementary hand of man aid in providing even a sufficiency of timber for the wants of coming generations?

PRESERVATION OF FORESTS.

But notwithstanding this somewhat encouraging view, much remains to be done for the preservation of our forests. The waste by careless cutting, by fires, by settlers clearing the land for agricultural purposes, is enormous. Thus far this has not been checked to any great degree. Local and federal legislation, diffusion of knowledge, the manifest destruction of valuable property have not yet been able to bring the forests within the pale of well-protected possessions under the law. Often has the remedy been pronounced by those who have devoted their lives to the study of this industry, and often have laws been passed which seemed to afford a remedy for the existing evil. But still the work of destruction goes on. It now remains, as it seems to me, for the public mind to be brought to a true understanding of the value of the property itself, and of the disaster which would attend its destruction. That protection can be secured in the States by associations like this, by practical men engaged in planting trees and preserving their woodlands, by bounties for successful tree-culture, by the distribution broadcast of bulletins and pamphlets, there can be no doubt. On the best method of legislation it is not easy to decide. Bounties based on exemption from taxation have not had the desired effect, the tree-planting having served more as a mode of evading taxation than as a means of developing an industry under the stimulus of protection. And of one county in Iowa it is said "the experience of the board of supervisors justifies them in the opinion that forest culture in our county would advance as rapidly without as with the exemption laws." On the other hand the State auditor declares that:— "There can be no question but that this law of our State has greatly stimulated the planting of forest trees and orchards too;" and that "if advantage could be taken of its popularity by inducing planters to set out a better class of trees, such as ash, walnut, etc., more good would thereby be accomplished." Connecticut, Dakota, Nevada, Pennsylvania, Rhode Island, Texas and other States, have all passed Acts encouraging tree-planting, either by bounty or exemption. Encouragement has also been largely offered by agricultural associations in most of the States, and great attention has been given to the proper selection of trees for each locality. The introduction of new varieties of forest trees has been carefully considered also; and the habits of trees, native and foreign, have been made matters of the most diligent study, both by those who are governed by scientific zeal and those who are engaged in developing a practical industry. Of the efforts of the Federal Goverment to preserve and develop the forests on the public lands of the United States much has been said.

THE TIMBER CULTURE ACT.

On the working of the Timber Culture Act it is unnecessary for me to dwell. But I think I can, with profit, submit some suggestions. made by the Land Office, with regard to "timber depredations" and the laws to prevent them. On this point the Land Commissioner, in his report of 1882, says:

"While much has been accomplished in the direction of suppressing the unlawful cutting and removing of timbers from the public lands, I am of the opinion that bet-

ter results can be obtained in the future; particularly so if some general and comprehensive law could be passed, clearly defining who may take timber from the public lands, the purposes for which it may be cut and removed, and prescribing the punishment for unlawfully cutting, removing or in any way wantonly destroying or injuring any timber growing, or being upon any of the public lands, or in any way causing or inciting such trespass. Such law should also establish the terms and conditions upon which any compromise or settlement should be authorized. A law of this nature would be more generally understood and comprehended than the several different enactments relating to this subject now in force, and could be more easily and evenly administered."

This is recommended because it is difficult to get competent and reliable special timber agents under the existing laws, and because the offences are committed too often under cover of the homestead entries fraudulently made for the purpose of securing the timber on the lands. I think the difficulty in this matter lies in the fact that no value is set upon the timber itself as a piece of Government property. It has been assumed that Government does not desire to make the timber a source of revenue or profit, and that in the survey of lands no discrimination should be made on the score of existing resources. This policy may be wise and necessary, but it is not thrifty. Early in the history of the Government public lands were sold, as in the case of the sale to the Ohio Company in 1787, for the purpose of replenshing the public treasury. And while Congress has exercised great liberality in the donation of lands for various enterprises, still the fact remains that this landed possession is of greal financial importance. The time is gone by when the standing timber of the country, either on public or private domain, can be considered an obstruction to be removed by the axe and fire to make way for crops of another description. There is a value attached to it equal to that of any crop known—a value which should in some way be considered in the transfer of public lands to settlers and purchasers. Whenever in any way a recognized value is attached to the timber itself, be it large or small, its protection and preservation by the Government becomes a natural consequence, and wanton destruction by the axe and fires may be prevented. Government now offers a bounty for planting trees by its timber act, and makes no adequate provision for the preservation of the valuable forests standing on unoccupied lands. It seems as if this case might be met by some form of legislation.

The Timber Culture Act was passed March 3, 1873, amended March 13, 1874, and again June 14, 1878, since which date 75,045 entries have been made, of the aggregate of 93,246, since the first passage of the Act. The area covered by these entries is 13,677,146 acres, of which 4,890,802 are in Dakota, 3,594,775 in Kansas, and 2,338,155 in Nebraska. In 1882 the entries amounted to 2,566,686 acres, more than half of which were in Dakota. The distribution of the aggregate entries is as follows:

States and Territories.	Entries.	Acres.
Arizona	88	11,866.08
Arkansas	3	231.92
California	1,245	168,413.53
Colorado	1,101	153,373.87
Dakota	31,178	4,890,802.15
Idaho	1,089	141,903.25
Iowa	640	55,151.51
Kansas	24,854	3,594,775.49
Louisiana	28	3,417.85
Minnesota	10,866	1,510,382.56
Montana	497	63,273.25
Nebraska	16,463	2,338,155.60
Nevada	30	4,120.00
New Mexico	87	11,619.13
Oregon	1,570	232,954.86
Utah	137	16,144.59
Washington	3,332	476,841.52
Wisconsin	1	40.00
Wyoming	37	3,679.21
Totals	93,246	13,677,146.37

THE NECESSITY OF PRESERVING AND REPLANTING FORESTS.

In the report of R. W. Phipps, Esq., of Toronto, on "The necessity of preserving and replanting forests," I find a sketch of forests and their management in other countries, to which I call your attention as one of the most comprehensive statements we have on this subject. His sketch, which is here abridged, is taken from an extensive report of Captain Walker, a gentleman who passed nine months on the continent, by direction of the English Government for that purpose.

From Mr. Phipps I learn that in Hanover there are 900,000 acres of forest, under Government or State management, belonging to the church and to municipalities. The care and working of these forests costs about $650,000 annually. The receipts therefrom are $1,500,000, and the profit is about $850,000, about $1.50 per acre per annum. The officers in charge are a forest director, an over-forest master, 20 forest masters, 112 over-foresters having charge of districts of seven or eight thousand acres each, 403 assistant foresters. A systematic plan for the management of the forest is adopted.

After a forest has, by thinning, planting, and so forth, been gradually got into perfect order, the system of natural reproduction forms a great part of the German method. It is as follows:—

The rotation and periods are fixed in the working plan. For beech it is, in Hanover, 120 years, divided into six periods of twenty years each, that is to say, when the forest has been brought into order there should be nearly equal areas under crop of trees in each of the six periods, from one year to twenty, from twenty to forty, and so on. When a block arrives in the last period, felling is commenced by what is called a preparatory clearing, followed by a "clearing for light" in the first year after seed has fallen, with the object of (1) preparing the ground for the seed, (2) allowing it to germinate, (3) affording light to the young seedlings. If there is a good seed year and sufficient rain, the ground should be covered with seedlings in two or three years after the first clearing; but it is better generally to wait for a second year, and aid nature by hand-sowing, transplanting from patches of many to barer spots, and turning up the turf to give the seeds a better chance of germinating.

When the ground is well covered, the old trees are felled and carefully removed, so as to do as little damage as possible to the new crop, and the block recommences life, so to speak, nothing further being done till the first thinning. The time allowed between the first and final clearing, is from eight to fifteen years. * * * In these forests can be seen all the periods of growth—nurseries and schools for seedlings.

In Prussia there are twenty millions of acres of forests, ten millions of which are private, and the remainder, with which we have more to do, state, communial, and ecclesiastical. Of these the income is $14,000,000, and the expenses $7,500,000, leaving $6,500,000 clear. The forests in Prussia as in Hanover form part of the finance department, and are presided over by an overland forest-master and ministerial director, aided by a revenue councillor and joint ministerial director, and a numerous council or board. There are two forest academies, one near Berlin and one in Hanover.

There are twelve provinces in Prussia, divided into thirty circles, each having an over-forest master. These represent the forest department in local administrations, which as a board represents the forest interest in the government.

In order to be a forest-master, the lowest of the gazetted appointments, five years without pay are required to be given in study, with but meagre pay when employed, yet candidates are numerous.

In some provinces the Prussian Government has certain rights concerning the management of private forests; in others, none.

In Saxony the state forests are nearly 400,000 acres, worked at an expense of $500,000, receiving $1,750,000, leaving a clear rental of $3 per acre. The expenditure is planting, draining, roads, improvement of inferior woods, felling, transport, killing insects, etc. About 5,000 are planted yearly, at an average cost of $7.50 per acre. The official establishment resembles that of Hanover. There is a forest academy at Tharandt with a separate staff of professors.

In Bavaria the state forests cover 3,000,000 acres. They return, after paying all expenses, about $1.50 per acre per annum. About 30,000 are planted or sown annually, taking 35,000,000 plants and 1,000,000 pounds of seed. Persons found guilty of breach of forest rules have been punished by enforced labour in the woods. Private forest rights are being bought up by the government. The system of management is much the same as that previously described.

In Austria the state forests have been largely sold to meet state necessities, but there still remain nearly 2,000,000 productive acres, which yield, however, after expenses are paid little over twenty-five cents per acre. The existing establishments of forestry are not uniform, but there are about 1,200 employes, of whom twenty-two are forest-masters. Scientific forestry is not so far advanced here as in Germany, but officials are busily introducing a reorganization, by means of which, there is no doubt, it will be on a par with other states. The Austrian crown forests have been neglected. There has been till now no attempt at rotation of blocks, or working in periods. The present director is trying hard to change matters for the better. He is planting up many bare or ill-covered tracts, where natural reproduction is impossible, owing to the absence of standard trees.

In the Grand Duchy of Baden there is a most interesting private forest belonging to the Prince of Furstenburgh, in the Black Forest. There are about 72,000 acres in charge of eighteen foresters and over-foresters, who have many subordinates.

The administration of the forests in France is entrusted to the ministry of finance, and the head of the department is the director-general, assisted by two administrators, one charged with the management of the forests and the sale of the products, the other with the police of the forests and the forest laws. The forests under the management of the bureau (state or commerce) are about 7,500,000 acres. Also, there are in France 15,000,000 acres of private forests. The sawmills in the forests are usually owned by the government, and hired at a certain rate to the wood merchants, who buy the cuttings. The school of forestry at Nancy is said to be one of the best in the world. The French Government have, at great expense, replanted vast and almost barren districts; they have also established great forests along the sea shore where formerly the sand threatened to destroy whole departments, and have averted the evil.

In Russia, the government own about 330,000,000 acres of woods, and other parties 150,000,000. About forty per cent. of the country (Russia in Europe) is timbered. The immense government woods have been placed under the care of the minister of public domains, who has a director of the forest department; and the organization of the service is very complete. Two special schools of agriculture and forestry have been established; one at St. Petersburg, and one near Moscow.

Italy has over 5,000,000 acres of communal forests, over 6,000,000 of private forests, and only 500,000 acres of state forests. One-fifth of the land is in forest.

In Switzerland, the waste of forests has been more rapid and destructive than any other country in Europe, and in none, perhaps, has this been followed by more disastrous results. Public attention has, however, been thoroughly awakened, and active measures are in progress to remedy, as far as may be, these evils. The cantons which have charge of these operations have for some time at great expense, been constructing works to control the streams, and planting trees wherever practicable.

The description of the forests in the British Isles, as given by Captain Walker, from whom Mr. Phipps obtained his facts, is most interesting, and shows, as do those to which I have already referred, that the business of forestry is entitled to the most careful consideration of states and individuals.

VARIETY AND AGE.

In the practical work of planting forest trees there would seem to be a propriety in following the example of nature and giving variety, mixing trees of early maturity with those of great longevity, that the former may be cut when the great size of the latter should command an ampler space. Thus after the usual consecutive thinning for hoop-poles, fence posts, railroad ties, or other purposes, the mature trees of the genus of least longevity could be taken out, leaving the veterans of the plantation to mature their more valuable crop of heavy timber.

In this connection the consideration of the proper age for cutting with profit is important. Mr. Michie reports his recent observation of a plantation in Great Britain sixty-five years old, partly cut down, in which eighty-five per cent of a growth of mixed hard woods was deceased from over ripeness. The plantation should have been cut at fifty years. The proprietor all this time was losing a part of the value of his wood, and losing the growth of fifteen years of young trees. He cites an example of a ash growth the root cuts of which were "tough as whalebone" at fifty-five years, while at seventy-five all toughness had disappeared, and more than half its value lost. It should have been cut down and replanted at the age first named. The ash should have a clean and straight stem, and be cut while yet in rapid growth and full vitality.

In England, the larch, ash, and poplar are ripe at fifty to sixty years, while the oaks planted among them may continue to grow one hundred to one hundred and fifty years, and a second crop of the earlier maturing species be matured among the oaks. Mr. Michie places the mature age of the elm at eighty to one hundred years.

METEOROLOGICAL INFLUENCES.

The influence of forests on rainfall has been so frequently and exhaustively discussed that little of value can here be added. From ten thousand observations made in Parana the mean annual temperature of the forest soil was found to be 21° lower than in the open field, and the mean annual temperature of the atmosphere of the forest 10° lower than in the open field. Relative moisture was found to be six per cent. greater than in the open field, nine per cent. in summer and five in the other seasons. In the mountain regions the difference was greater than at lower elevations.

It is not necessary to assume that forests induce a heavier rainfall, or even to show that they influence locally the distribution of rain, to prove their beneficence in regulating the moisture available for the use of agriculture. The foliage of forests resists the violence of storms, breaks the force of the rainfall which percolates through the covering of leaves and moss, and is absorbed by the humus beneath to be given out by the slow process of retarded evaporation, the surplus finding its way to the springs deep in the earth. In an open field the storm beats with unbroken violence upon a surface impacted and hardened under the rays of the sun, fails to penetrate the soil, and rushes on in turbid streams down the slopes to swell the brooks and rivers, and instead of refreshing the earth scarifying and wasting it.

The world is full of examples of once verdant and productive areas which have become burned and blackened deserts. The gradual desiccation of the once green and productive islands of the West Indies, Santa Cruz and Saint Thomas, which has been progressive for many years, is the result of the destruction of primitive forests. The little island of Curacoa, where rich plantations, beautiful villas, and terraced gardens have given place to aridity and desolation, because of the export of its valuable timber, is a striking illustration of the changes wrought by forest destruction. The entire coast of the Mediterranean, once the garden of the world, has been blighted into comparative barrenness by the denudation of the forest areas. A portion of this territory, the Karst region of southern Austria, bordering on the Adriatic, has been the scene of extensive reafforesting work by the Austrian Government. Centuries ago it was covered with magnificent oak forests, and furnished piles and ship-building timber to Venice during her brilliant maritime career. So dense was the forest upon the Istrian coast that a squirrel could traverse it for miles on the branches of the trees. It was plundered systematically by Venetian spoilers, till the whole region was reduced to barrenness and poverty. For a score of miles north of Trieste the soil itself was washed away by the floods after the exportation of timber had been followed by relentless fires, leaving the bare rock in rugged masses as the sole covering of the surface. The work of restoration, commenced nearly twenty years ago, was one of exceeding difficulty. Exposure to sun and rain had exhausted the fertility of any remaining forest humus; the underlying masses of chalk were seamed and honeycombed with cavities requiring a mixture of underlying clay to sprout either grass-seed or tree-seed. Millions of trees were annually supplied by the Government nurseries of Austrain pine, ash, larch, and other varieties,

and year after year the slow and patient effort has been continued with results that promise the ultimate renovation of a vast area of several hundred thousand trees, though the blasted district is yet a scene of comparative desolation, requiring millions of treasure and years of patient labour to restore a tithe of its profusion of forest wealth.

The productive capacity of the United States is due not alone to the great fertility of its central areas but, in a large measure, to the amount and reasonable distribution of the rainfall. The lower latitudes, the Southern States, where high temperatures prevail and evaporation is greatest, have a rainfall of forty, fifty and sixty inches annually, with a liberal distribution through the summer months. The lake region and the Ohio basin have less, yet a good supply, suited to more temperate conditions, a lower temperature and less evaporation. Yet the droughts that occasionally prevail, and which are most severe on the borders of the wooded belt, as in Texas, Kansas, Missouri, and Illinios, should admonish us to avail ourselves of the local benefits of forests in the equalization and conservation of the rainfall actually received.

Some of the States have less than the rule of the Duke of Burgundy requires: "One-third to the hunter, two-thirds to the husbandman." The rule of William Penn, one acre in woods for five acres cleared for agricultural lands, exclusive of the wooded hills and mountain forests, was not materially less. Yet Vermont, Massachusetts, and Connecticut in New England have less than a third of the farm lands in forest; New York, twenty-two per cent.; New Jersey, twenty-four; Pennsylvania, twenty-nine; Delaware, twenty-six; Ohio but twenty-four per cent.; Michigan, thirty-two; Indiana, twenty-nine; Illinois, sixteen. These are originally wooded States, except a part of Indiana and Illinois.

The necessity of a careful and accurate cultivation and restoration of our forests is now recognized by all. For three-quarters of a century we have been busily engaged in the business of lumbering; the time has now come when we must turn our attention to the business of forestry. The great wood crop, which nature lavished on our ancestors, has been so diligently gathered that all our ingenuity will be taxed to continue the necessary supply for the growing wants of a rapidly increasing population. It is to this point that this Association should especially turn its attention. It is to this point that I have directed the work of the Forestry Division in the United States Department of Agriculture for the development of the forest industry of this country.

Mr. JOLY, from the committee appointed upon resolutions concerning deceased members, then offered the following resolutions:—

"*Resolved*, That the American Forestry Congress has suffered an irreparable loss by the untimely death of one of its Vice-Presidents, Dr. J. A. Warder.

"*Resolved*, That while Dr. Warder has endeared himself, by his genial and hearty manners, to all those who have had the privilege of knowing him personally, he has at the same time gained their admiration by the untiring energy and great talent with which he has advocated for so many years past, the cause of Forestry.

"*Resolved*, That the loss of such an earnest and devoted man can be considered as a public loss, and that, while his colleagues lament it as such, they feel at the same time, what a void it must have left in his home circle, and deeply sympathize with his family.

"*Resolved*, That the Recording Secretary of the Forestry Congress be requested to send a copy of the foregoing resolutions to Dr. Warder's family."

Also the following resolutions, from the same committee:—

"*Resolved*, That the Forestry Congress desires to express its sense of loss on the death of Hon. L. B. Hodges, of this city. Mr. Hodges had been known for many years, not only as one greatly interested in the subject of forestry, but as one who, by his earnest activity, had done much to interest others in the subject. He was the pioneer in the forestry movement in the State of Minnesota. He was also one of the first to propose and aid in the organization of the Minnesota Forestry Association. By his writings, and his practical exemplifications of tree-planting, he had become a recognized authority on the subject both in this country and in Europe. His death was a loss to

the country at large, but his labours in behalf of Forestry will speak for him, and bear good fruit, after his personal labours were brought to an end.

"*Resolved*, That the Recording Secretary be directed to send a copy of the above resolution to the family of Mr. Hodges."

Also the following resolutions, from the same committee:

"*Resolved*, That this Congress feels it to be a duty it owes to men who, like the late Arthur Bryant, have forethought to discern, and courage to express their convictions on the conservation of our forests,—to express regret for their death, and while we feel that men of his age have done their work, we nevertheless deplore the vacancy in our ranks.

"*Resolved*, That the Recording Secretary be instructed to send a copy of the above resolution to the family of Mr. Arthur Bryant."

Remarks upon the above resolutions having been made by Mr. Geo. W. Minier, of Ill.; the Hon. J. B. Grinnell, of Iowa; Hon. W. Higley, of Ohio; Prof. Daniels, of Minn.; Ex-Gov. Marshall, of Minn.; Hon. Ignatius Donnelly, of Minn., and Mr. D. W. Beadle, of Ontario, the resolutions were passed by a rising vote.

Mr. BAKER, from the committee on Order of Business, made the following supplementary report, which was adopted:—

"1. That all committees appointed at the Montreal meeting be requested to report at the opening of the morning session, on Thursday.

"2. That immediately after the reports of the above committees, Judge Higley present his report on the State Association of Ohio, and then, that F. B. Hough, of New York, make such statement as he desires on the steps which have been taken toward organizing a State Association in that State.

"Reports of committees:—

Mr. B. G. NORTHROP presented the following resolution, which was adopted:—

"*Resolved*, That the U. S. Commissioner of Agriculture be requested to call a meeting of the representatives of associations and institutions interested in Forestry, at the Department of Agriculture, during the ensuing winter."

Dr. HOUGH offered the following resolution, which was adopted:

"*Resolved*, That a committee of three be appointed by the Chair to prepare the form of a certificate of membership, and a device for a seal for the American Forestry Congress."

Dr. Hough, Prof. Leué, and Prof. Northrop, were appointed as this committee.

Mr. ELIZUR WRIGHT, of Mass., presented the following resolution, which was adopted:

"*Resolved*, That a committee of three be appointed by the Chair to consider and report upon the probable effects that will ensue, should the plans proposed for damming the upper waters of the Mississippi, for the creation of reservoirs, be carried into effect."

MR. Elizur Wright, of Mass.; Gen. Geo. L. Becker, of Minn., and Hon. J. B. Grinnell, of Iowa, were appointed.

Mr. FERNAS, from the Committee on Organization, reported the following list of officers for the coming year, which report was adopted:—

For President, Geo. B. Loring, of Massachusetts.
" *1st Vice-President*, H. G. Joly, of Quebec.
" *2nd Vice-President*, Geo. L. Becker, of Minnesota.
" *Recording Sec'y.*, N. H. Egleston, of Dist. Columbia.
" *Corresponding Sec'y.*, B. E. Fernow, of Pennsylvania.
" *Treasurer*, Charles Mohr, of Alabama.

Executive Committee.—B. G. Northrop, of Connecticut; Warren Higley, of Ohio; J. G. Knapp, of Florida; J. S. Hicks, of New York; J. L. Budd, of Iowa.

The hour for recess having arrived, Mr. Baker announced the order of business for the evening session, and the Congress adjourned till 7.30 p. m.

Evening Session, August 8th.

The hour for meeting having arrived, the President called the house to order, and requested Vice-President Joly to assume the chair.

Mr. D. C. Burson, of Topeka, Kan., read the following paper: —

FOREST TREE PLANTING AS AN INVESTMENT.

More able tongues have talked; more gifted minds have thought; more ready pens have written upon the great future necessities of forest tree planting. But all the talking thinking and writing, have so far availed comparatively little. Why is it? Because too many look upon it as an act of benevolence, thinking they must metamorphose themselves into a philanthropist before they can set out a grove of forest trees. While a few perchance, will set it out with a feeling of pride; while others may do it for honour or fame. But is benevolence, philanthropy, pride, honour or fame, the motive power that impels the progressive car in this the nineteenth century? No! It is money,—the love of money, or the anticipation of money. Then let us consider tree planting in its true light; a light that will illumine the mind of every American citizen. The light of money making. Yes! if we do that, we strike the keynote, whose music will vibrate throughout the length and breadth of our western plains. Our capitalists, east, west, north or south, all invest their money for the purpose of increase; their sole object is to accumulate. Our merchants do not invest their money in drygoods and groceries, and work and worry over their business for the sole purpose of accommodating their friends and neighbours with the necessaries of life. The capitalist does not invest in bank or railroad stock with the spirit or feeling of a philanthropist. Vanderbilt, Garret, or Gould does not extend railroads over our plains, or along our valleys, for the purpose of assisting the poor granger to get his few bushels of corn or wheat to market. The millionaire who has his palatial mansion, and is enjoying all the comforts of life, does not invest his surplus capital in corner lots, fine dwellings or massive blocks, for the purpose of beautifying the city or giving his poor neighbour a home. We do not invest in electric lights or telephone stocks to make the blind see, or the deaf hear. But in each and everyone of these investments, the one great object is to make money. Then if this is the motive power in everything that is progressive, it is folly to look at tree planting in any other light. And in that light alone; yes in that electrofying light, we shall for a few minutes consider tree planting. For we think without being in the least egotistical, we have the power to show that forest tree planting will make a safer investment, and bring in larger and more satisfactory returns than any other business that man can embark in. But in this enterprise you cannot sow and reap the same year; you sow in your prime, and reap in your decline, and to the benefit of your children who follow after. And to illustrate this point and to show it in the most practical light, we will take a kind and thoughtful parent; who has a bright and promising son of five summers, in whom he takes a great interest, and wishes to see comfortably started in business when he attains the age of twenty-one. Having five thousand dollars which he wishes him to have at that time—sixteen years hence—and wishing it to increase as fast as possible in that time, he very naturally asks himself, "how shall I invest it so that it will not only be safe but increase in the greatest ratio?" Government bonds are safe; but then the interest is so very small that his capital would only increase about three thousand dollars in the sixteen years, even at compound interest. He next investigates a real estate mortgage bearing six per cent. interest. In this he finds his capital would only be about ten thousand when he wants to use it, but the father being desirous of a large increase, looks beyond bonds and mortgages, and beholds the treeless plains of the great west, which is fast settling up by the industrious emigrant; he sees that building material, especially fence posts and railroad ties are in great demand, and that demand is fast increasing, while the material is decreasing in an equal if not a greater ratio. He beholds a glorious future for the tree planter, his mind is now fully made up; he will invest his five thousand dollars in western lands and forest trees. He selects forty acres of good tillable land, for which he pays

eight hundred dollars ; and encloses it with a good substantial fence, for which he pays two hundred dollars more, leaving four thousand dollars of the capital yet uninvested. He now puts the entire forty acres under a good state of cultivation, preparatory to setting out in forest trees. He is somewhat at a loss to know what species of trees to plant, but he decides that it must either be, Catalpa, white Ash, Russian Mulbury or black Walnut, but as his land is situated south of forty-four degrees north latitude, and fence posts and railroad ties being in the greatest demand and the most profitable of any wood he can raise ; and the Catalpa having no superior for that purpose, (the timber lasting a century) and being a hardy tree and a fast grower, he decides that that shall be the tree. By adopting the usual plan of setting four by four feet each way, it will require twenty-seven hundred trees per acre, or one hundred and eight thousand to set the forty acres. He finds that to prepare the ground, buy or raise the trees, set them out and cultivate as long as they require any attention, it will cost about one hundred dollars per acre, or the remaining four thousand dollars. He has now the entire capital invested. Let us look for the returns. The weeds and grass being kept down, he will let nature take her course, do her own trimming and pruning until they are eight years old. Of course the results are only imaginary, based upon the knowledge and experience of others, but we propose to be very liberal in our estimates. We will in the first place calculate on a loss of twenty-five per cent., that is we will suppose that by the extreme changes of climate, twenty-eight thousand have either died or been so stunted as to be worthless, which leave just eighty thousand good thrifty trees eight years old. It now becomes necessary to remove one-half of them, or forty thousand. Each tree making at least one good fence post. A Catalpa post, even an inferior one will always bring a good price, say twenty-five to thirty-five cents, but we will put them down at twenty cents each ; calculating that the remaining timber of the trees being utilized for fire wood, will pay for cutting and removing the posts. We now have forty thousand posts at twenty cents each, making a total of eight thousand dollars. The remainder of the trees are left standing eight years longer or until the son attains his majority, and is ready to start in business. The father puts the axe-men at work to remove them and convert them into ready cash. We of course have again to let imagination, experience, and precedent do the calculations. We cannot take isolated cases and make comparison or we will estimate too largely, for we have heard of Catalpas sixteen years old, being twelve to fourteen inches in diameter, which would make two or three railroad ties, or ten or twelve fence posts, but as we would sooner be below than above, we will say that there can be realized on an average four good posts per tree, or one hundred and sixty thousand posts, which at twenty cents each, would amount to thirty-two thousand dollars ; added to what we have from the first thinning we have a grand total of forty thousand dollars, or over forty per cent. per annum for the entire time.

Now I know that these results look incredulous, especially to a person who has never given the subject any thought ; but the experience of many under the sound of my voice to-day will bear me witness in these statements, and claim that even greater results can be attained, while others who have been reared in the woods, cradled in a sugar trough, and, per chance, housed in a hollow tree, and spent the prime of their lives in cutting and burning valuable timber with no conception of its value, may say that twenty cents for a fence post is an enormous price, and the average farmer cannot afford to buy them. Well for the benefit of that class, let us make a large reduction and put a Catalpa post that will last a hundred years at the same price of a Cottonwood that will not last two years—ten cents each—and yet we have twenty thousand dollars, or about twenty per cent. per annum, two or three times as much as could be realized in bonds or mortgages. But it is unnecessary to make any such reduction. Ten millions of Catalpa fence posts could be sold in Kansas to-day at twenty-five cents each, and as many railroad ties at double the price of an oak.

In making the above calculations, we have said nothing about the land after the timber had been removed, neither have we said anything about taxes, so we will allow one to offset the other.

We have also confined ourselves to dollars and cents, and said nothing about the pleasure and comfort derived from shade and windbreaks. But the mission of this article

is not to picture the beauties and pleasures of forest groves, or to calculate the untold value it sustains to fruit orchard, grain field, or pasture lots, but it is to show just how many dollars and cents can be realized in a certain number of years, by raising timber for commercial purposes.

Discussion followed, in which the following persons participated viz. :—Mr. Suel Foster, Prof. Northrop, Mr. Burson, Mr. Minier, Prof. Lazenby, Dr. Hough, Mr. Hicks, Mr. Thayne, and Mr. Deam.

Prof. ADOLPH LEUÉ, of Cincinnati, O., read the following paper :—

FORESTRY EXPERIMENTAL STATIONS.

Forestry is both a science and an art. As an *art* it embraces the methods of planting, sowing, cultivating and managing forests for profits; this may conveniently be called *practical forestry*. As a *science* it investigates the principles upon which practical forestry is or should be based, and this may in contrast to the former be termed *scientific forestry*. Practical and scientific forestry are however inseparable and must go hand in hand, unless the former become a mere drudgery and the latter an abstract science. This conception of forestry makes a simultaneous development of both practice and theory imperative.

Now, it is a fact that under the existing circumstances in this country the nearest future of our forests will depend upon our farmers, who almost exclusively constitute the owners of property that is available for forest culture. In order, therefore, to make a development of this kind possible, either our farmers must be educated in science, or our scientists must become farmers. This, however, is impracticable, if not impossible.

Of this problem but one solution seems possible. As practical and scientific forestry, so the farmer and scientists must join hands. As soon as the farmers of our land begin to take an interest in the endeavours of forestry associations and scientists in the actual work of planting, cultivating and managing forests, we may hope for a system of forestry that shall be worthy of the name and reflect credit upon American foresters.

When that system is fully developed we shall have a thorough knowledge of *forest botany*, or the natural history of all forest trees that grow or may be grown in our land, and of all other plants that are either injurious to the growth of forest trees or that are of economic value to forests; we shall be well acquainted with *forest zoology* or the natural history of all the species of the animal world which are either injurious or beneficial to forest and forest trees; we shall understand the true nature of the forest soil, *i.e.*, we shall know what may and what may not be grown on a given soil; we shall know which are the best methods of cultivating and managing forests in the way most profitable; we shall have a minute knowledge of forest usufruct, *i.e.*, we shall be able to tell the various uses of all the different forest products and how to obtain them; we shall be informed as to the influence of forests upon climate in the widest sense of the word, and know in what ratio the forest should stand to cleared lands.

An examination in each and all of these points, profitable as it might be, would, I fear, not be very agreeable. Let us, therefore, make no further inquiries as to what we ought to know, but consider the means of developing that system.

One of the most conspicuous tendencies of advancing civilization is to place the various mechanical arts upon a scientific basis. The beneficial influence of this tendency is most strikingly seen in the history of the development of agriculture. From the earliest time upwards to the beginning of the present century, it was a mere empirical art, resting solely upon the traditional maxims of experience, without any visible signs of progress whatever. But when in the first part of the present century Liebig and others subjected those ancient maxims of experience to a series of scientific investigations, a new era began to dawn upon this most important occupation of mankind. Since then such investigations have been carried on in schools of agriculture, which have been

founded in all civilized countries, and have reached the highest point of perfection in the agricultural experiment stations. The results are most gratifying; for by means of these scientific investigations and systematic experiments agriculture has been elevated to the dignity of an exact science.

This hasty glance at the history of the development of agriculture plainly indicates the course to be pursued in the attempt to raise forestry, the younger sister of agriculture, to the same dignity. A very successful beginning has already been made in Germany and Austria, where the idea of forestal experiment stations originated. The great importance which the governments of those countries attach to these stations is seen from the fact that Germany alone expends about $30,000 annually for the maintainance of the same; and from the other that their number has been at a steady increase. Switzerland, Italy, Spain, and even Russia, are following the examples of Germany and Austria.

After this brief consideration of what should be done and of what is being done abroad, the question naturally arises: What are we doing in this matter, and what are we going to do?

There has certainly been no want of agitation on this subject, for the establishment of forestal experiment stations in this country has been talked of at different times and places; resolutions have been passed by societies of various descriptions, but to no effect. Such resolutions addressed to the Congress of the United States or to the General Assembly of the individual States, will, I greatly fear, be of no use, unless we accompany such resolutions with a practical plan upon which such stations may be organized. A resolution, accompanied by such a plan, has some chance of receiving a favourable recognition. If this plan, in addition to its being practical, should have the advantage of involving no great expenses, a favourable action on the part of our legislative powers may confidently be expected.

A still better course of proceeding seems to be, not to wait for legislative action, but simply to adopt that plan and then carry it into effect. This, gentlemen, has been the Ohio way of doing, for it may not be generally known that the establishment of a Forestal Experiment Station in Ohio has been resolved upon.

A detailed history of the development of Forestal Experiment Station in Ohio does not come within the narrow frame of this discourse, but briefly told it is this: A plan on which such station might be organized was proposed in a meeting of the Ohio State Forestry Association, held in the early part of last May, discussed in several meetings, found practical, and adopted July 21st.

The object of this Forestal Experiment Station in Ohio is the development of a system of forestry adapted to the wants of Ohio.

The station shall consist of a centre and an unlimited number of primary and secondary stations.

The centre of this station shall be the Ohio State Forestry Association, which shall appoint a director whose duty shall be—

(1.) To preside at all the meetings of the Committee on Forestal Experiment Station.

(2.) To ascertain the wants of forestry in Ohio and to institute the necessary experiments and investigations; in this he shall consult with the committee.

(3.) To prepare plans of experimenting and to devise formulas for recording the work performed at the primary stations.

(4.) To represent the Ohio Forestal Experiment Station both at home and abroad.

(5.) To attend to all the correspondence connected with the station.

(6.) To report to the Ohio State Forestry Association at each annual meeting in January the work performed at the station, and to give an account of the money expended in experimenting and investigation, and of all other expenses of the station.

(7.) To keep the society informed of the progress of experimental foresty elsewhere.

(8.) To submit at the annual meeting an estimate of the probable expenses of the station for the ensuing year.

The *primary stations* shall consist of at least three acres of ground each, which shall be devoted to experimenting; and the experiments on the same shall be made according to a definite plan, agreed upon by the committee on Forestal Experiment Station.

The *secondary station* shall be devoted to general investigations; such as analysis of soil, the study of forest botany and forest zoology, testing the vitality of seeds of forest trees, determining the comparative value of forest products, such as tanbark, charcoal, etc., testing the adaptability of wood for mechanical and technical purposes.

The director of the Forestal Experiment Station, the superintendents of the primary stations and all having a secondary station, shall constitute the committee on Forestal Experiment Stations. This committee shall meet at least once a year.

Each primary and each secondary station that may be adapted for forestal meteorological observations shall be provided with the necessary instruments for such observations.

The Ohio State Forestry Association shall appoint a finance committee, of which the director of the station shall be a member.

How can this plan be carried into successful operation? is the next important question. The nearest future of our forests depends, as I have already stated, upon our farmers, who almost exclusively constitute the owners of property that is available for forest culture. They are, therefore, the first to reap the benefit of a rational system of forestry; are thus directly interested in Forestal Experimental Stations, and should on that account do their part to make the enterprise a success. By direct inquiry it has been ascertained that there is a sufficient interest amongst our rural population to encourage the Ohio State Forestry Association in its endeavours. We already have the promise of four of our most intelligent and well-known farmers and arboriculturists that they are ready and willing to devote any reasonable amount of land for experimenting in forestry and to carry out the experiments. Ohioans, as a rule, are not slow to discern what may prove to them an advantage. The performing of an experiment is to him who undertakes it, an excellent school of forestry, which not only charges no tuition, but rewards him with at least a nucleus of a forest, which will greatly enhance the value of his farm. We do, therefore, not anticipate any difficulties in our endeavour to dot the whole State of Ohio with primary stations.

It is, however, not only the farmer who will be benefited by our experimental station; the followers of the mechanic arts are interested in more than one way.

(1.) An abundance of forests and a cheap method of raising them will have material effect upon the prices of the raw forest products, which in many instances almost entirely constitute the material upon which such industry depends.

(2.) One of the objects of the Forestal Experimental Stations is to find new uses for the various forest products, and new forest products for certain purposes.

It is, therefore, to their own advantage if these several industries aid the association to make this department of the station a success. The fact that we have the promise of one secondary station, with fair prospects of more, assures us of success in the mechanical division of our station.

We have had some grave apprehensions as to the scientific department, which, as we proceed, will be made to consist of a *chemical*, a *physical*, a *botanical* and a *zoological* division. But there seems to be no reason why we should entertain any fears whatever. We ask scientists to aid us, and as a recompense we offer the material for researches, and to publish the result of such investigations. We also contemplate to offer prizes for certain investigations.

As our great object is to hasten the development of a system of forestry adapted to the wants of Ohio, we justly demand that our primary stations be located within the boundaries of that State. The secondary stations, however, which are of general interest, may be located anywhere in the United States, in Canada, or even in Europe, if it should be of advantage.

We contemplate to commence this work as an association, not because we believe it to be the best or only course, for we are persuaded that as this is pre-eminently a subject of general interest, it is the duty of the State to institute and to carry out such experiments, but we intend to take the initiative, because we feel the great need of such an institution, and because we desire to illustrate the practical working of the same. Such station or stations may be established as separate State institutions, and superintended or directed by a State forester or commissioner of forestry, or they may be attached to agricultural colleges as a special institution.

Whatever may be said against this plan of organizing forestal experiment stations, let it be remembered that it may, and indeed will, be perfected as we proceed to carry it into operation. With its defects it has some advantages which may thus be summed up :—

(1.) It is adapted to our circumstances.

(2.) It is exceedingly simple.

(3.) It enables us to perform the experiments where they are most needed.

(4.) It gives us the very best force that can possibly be obtained for primary as well as secondary stations.

(5.) It is cheaper than anything of the kind that has yet been proposed.

(6.) It fills all the demands that can reasonably be made on a station.

(7.) It is a plan that makes a simultaneous development of scientific and practical forestry possible.

Discussion followed, in which the Rev. Mr. Egleston, Mr. Minier, Mr. Higley, Dr. Hough, Prof. Lazenby, Prof. Leué, Prof. Northrop, and Commissioner Loring, participated.

Dr. Franklin B. Hough, of Lowville, N.Y., read the following paper :—

FORESTRY EDUCATION.

By T. B. Hough, Ph.D.

Using the term "education" in its broadest sense, as the imparting of knowledge in any mode or form, and assuming that knowledge is indispensable to success in any pursuit in life, we may be allowed to consider some of the means by which instruction can best be given in matters relating to forestry, in order to secure the greatest advantages to the greatest number who may have occasion and opportunity to apply this knowledge.

The special schools of forestry in Europe are, in some instances, elementary, and almost wholly practical in their character, and are intended for no higher purpose than to prepare young men to serve as foremen of working parties, and as forest guards. They are expected to know when the work entrusted to their care is well done ; to see that there is no needless waste of material or of time ; and if the work is done by a contractor, but subject to their inspection, they are expected to know whether the terms of the contract are faithfully observed. They must be taught the protection of game, and the prevention of trespass and spoilage, in whatever form it may be attempted, and must understand enough of the first principles of administrative law to draft a formal complaint as the first step in a prosecution, whenever this may become necessary within the district under their charge. It is only in extraordinary cases that persons thus trained find opportunities for advancement, and they reach the highest point of their ambition when they have done their work well.

But the schools for technical instruction in forestry, of which we find some thirty or more under the patronage of government, in various countries in Europe, have a much higher mission. They take their students after they have finished a course of study in the public schools, and sometimes besides this after they have had a period of actual service in forest labours, under skilled direction, and they endeavour, with this beginning, to impart a course of theoretical and practical education that is carefully adapted to meet the future wants of the forest officer in every grade of the service, and quite as special and technical in its nature as in our naval and our military academies. When this course is completed they are not always then sure of immediate appointment, but must wait for a vacancy in the service. The place once secured, there is great certainty of its permanence, and a reasonable prospect of advancement as circumstances may favour, or as talent may deserve.

I have thus briefly sketched the object and the motives that lie at the foundation of forestry education in Europe. They apply to countries having large tracts of woodland, in charge of a government or belonging to great hereditary estates, and they are carefully

and well devised to meet the wants of these countries, by preparing skilled agents for the management of the interests concerned.

With us, a difference of laws, and in the tenure and inheritance of property, and the perfect freedom to every owner of land in the management of his own estate, must necessarily occasion a wide departure from these methods of special education in its relations to forestry, in order to adapt it to the wants and requirements as they exist among us. I will therefore invite your thoughts to certain points to be considered in connection with forestry education in our own country, and enquire as to the duties that may arise in providing the kind and degree of instruction that will be of greatest practical service.

And first, we may remark, that we do not for the present, and perhaps for many years to come, require a class of persons who have been specially trained to the degree that is deemed necessary in the better class of forest schools in Europe, because such persons could not find employment either in charge of public or private forests at the present time. In a journey through Europe and in visiting many of these schools in 1881, I made inquiries about students from America, and so far as I could learn there had been but one from their first beginning, and this one had but recently entered at Thavand. Of the very few graduates who have come to America, everyone has, I believe, been obliged to seek other employments ; and upon quite a number of occasions in which students or recent graduates have asked my advice about the opportunities for professional employment in America, I have in every case discouraged them from coming, unless prepared to seek some other pursuit than systematic forestry. A time may come when it will be desirable to seek for men well versed in science, who are capable to conduct series of observations at an experimental station, or to manage the forests upon the public domain, should they be put under regular management, as I have urged in my reports, but that time is not yet.

I am well aware that this measure of the establishment of special schools of forestry has been urged upon Congress, and that Saint Paul has been mentioned as a proper place for its location. It certainly might as well be there as anywhere. But let me enquire: Where would the graduates, if trained to the highest degree and fitted to accomplish all that those can who leave these schools in Europe, be able to find employment ? Neither the general nor the state governments have any systems of forest management needing their services. There may be a few railroad companies who would employ one, but this is not certain, and as to private estates, I know of none upon which such a person would be likely to find an engagement. A time may come when this want may arise, but it has not yet arrived.

Should experimental stations come to be established, they should of course have men of the highest qualifications ; and they would need a considerable amount of hand-labour. In this, preference might be given to young men wishing to acquire skill in planting, and thus these places might become in time the nuclei of schools of practical forestry, but these too belong to the future. Let us then return back to the present, and consider what are the existing needs of the country in the matter of forestry education, and how they can best be supplied.

If we do not need a high degree of special training for a few, we certainly do need a certain amount of instruction of a practical kind for a greater number. We can altogether dispense with the whole of what is taught in the forest schools of Europe, upon the jurisprudence and the administration of forest codes, and the adjustments of rights of common usage. We can leave out what they teach concerning the protection of game. There is a great deal taught concerning "*aménagement*," that is, the working of a forest through a future given period, upon plans first carefully studied, and which, when once adopted, must be observed to the end, which do not find application in American forestry. There are studies in topography and engineering, drawing of maps, construction of reservoirs, dams, and various hydraulic operations, including leveling for drainage, the building of sawmills and the like, which, however useful, do not necessarily require more than is now taught in our best institutions in courses of study already in operation.

Let us now come to consider what we do want, and how this want can be best supplied, and in this we will begin at the lowest and broadest stage of education, with what our children should learn in their families and in the common schools.

They should be impressed with the idea that the woodlands are not less useful to human welfare than the cultivated fields; and that like them they should be protected from injury or waste, as well from fires as from other causes. They should be made to understand that the birds nesting in our groves are, almost without exception, our friends, and therefore entitled to protection. Under a competent teacher they can be interested in little schemes of planting and rural adornment around the schoolhouse and at home, and this without the formalities of a lesson from books, or under the semblance of a task imposed upon the unwilling, but rather as a reward of merit. These first ideas so easily instilled into the minds of children, leave the most durable impression, and remain through after-life, at least in the way of pleasant recollections of happy hours, and they may and should create a sympathy with nature that the hard realities of life can never wholly efface.

A skilful and competent teacher might now and then by way of pastime, require the scholars to bring in specimens of woods, and leaves, and flowers, and fruits, and ask them to tell all they knew or could find out about them. The uses of things might be explained, and some idea of the order and harmony of nature thus imparted, might awaken observation, and a habit of inquiry, and a desire for knowledge, that might have otherwise lain dormant. An hour or two in a week devoted to this kind of teaching by object lessons, would bring about the best results, and the school boards could well afford to pay something above the current wages to the teacher who could do it well.

This simple and elementary instruction might not go far in the way of education in forestry, but it would be a good beginning, as far as it did go it would be in the right direction. In mountain rills the source may be small, and a feeble obstruction may give the first direction to the stream that finally becomes the river. It would at least impart some knowledge of the names of things, and impress the truth that every part of a created object has its uses, and that nothing is formed in vain.

We have been obliged, in speaking of the teachers of our primary schools, to use the words "skilful and competent," preceded by an "if," because it is painfully evident that they do not apply to them all. And this leads us directly to the next point we have to consider, namely: That our Normal Schools, where these teachers are prepared, do not as yet afford that instruction upon these subjects, that should impart that skill and competence that we need. There should be introduced in the way of classroom recitations, or by lectures, or otherwise, a little practical instruction upon the ways by which the children of a common school may be interested in these habits of observation and inquiry, and instructed in the rudiments of knowledge about the productions of nature which are around them. This is done already to some extent in various normal schools, and it might be done with profit and to a further extent in them all.

The cabinets of these normal schools, should contain specimens of woods, and of the leaves, blossoms and fruits, and the students might be exercised in distinguishing the different species by the bark, the wood, and the general habit of growth, of the trees of common occurrence around them. The grounds of such institutions should have labelled specimens of living trees, grouped in their natural relations, and in as great a variety as their extent, and the soil and climate would permit. Some correct ideas might also be imparted, as to the time and method of planting, the requirements of particular kinds of trees, and the like, and the classes of young men might be taught in a practical way, some of the first lessons in forest economy that are most useful in after life, or that might be again imparted when they go forth to teach. In these lessons, instruction might be given as to some of the relations that exist between forests and the climate, the incidental benefits conferred by woodlands upon agriculture, and some of the economies that may be practised in the planting and care of trees.

Our high schools and academies might in like manner and to an equal or greater extent, impart instruction upon things useful to be known, and with the very best effect. Under zealous and competent teachers the students might be interested in the formation of collections of various kinds, and be taken occasionally upon little excursions into the woodlands, where opportunites for practical instruction are afforded on every hand. This method of education by means of excursions under the guidance of teachers, which is quite common in certain schools in Europe, and is a prominent one in all schools of

forestry, should be more generally practised among us, and no summer term should pass in these institutions without one or more of them being had.

In the various grades of schools that have been noticed, an arbor day should never be allowed to pass without being duly celebrated, with ample preparations beforehand, and it would add not a little to the interest in the custom, if the care and protection of particular trees were assigned to particular ones of the number, who would be expected to give their charge all needful attention by watering in a dry time, through the first season, and by such further attention as their wants might require.

In the various grades of instruction, suitable prizes might be offered for proficiency and merit, and the best results shown in a county or a state, should be rewarded by distinguished mention in the official reports.

Passing from these institutions of the middle class, to those of higher grade, we come to the colleges and universities of the country. Some of these from their location, or on account of their special object, may offer no opportunity for instruction in forestry in any form; but with much the greater number, more or less might be done, without burdening the course of study as already prescribed, or requiring more time than is now allowed.

In the course of instruction in chemistry, botany, natural history, physics, mathematics, meteorology and the like, the application of these sciences to questions in forestry might be noticed, as opportunity occurred. A course of lessons in the class-room might be prescribed, as is already done in several of our colleges, as at Dartmouth, and in the Michigan University. The remarks already made concerning collections for the cabinet, and a labeled arboretum, might apply on a more extended plan, corresponding with the more enlarged field of operation and greater opportunity; and no class should graduate without hearing at least one course of a dozen lectures by a person thoroughly qualified for presenting a concise general outline of the whole subject of forestry.

I have thus briefly presented the leading features which I think might be grafted upon our existing system of education, without creating new institutions, or much enlarge the operation of existing agencies. The plan I propose would embrace the whole country, and include in its operation every person who is to become in a few years an owner of the lands upon which our forests must in future be grown. It is no doubt imperfect, but it would be a fair beginning, and its details could be modified from time to time, as experience might suggest. It applies chiefly to the young, but this is the class that learns. It is often said, and there is too much truth in the saying, that a man in middle life or in old age can learn nothing. But these men are passing away, and our greatest hope depends upon our ability to prepare those who are to come after them, to discharge their whole duties, as well in this as in every thing, in such a manner as to do full justice to themselves as to the commonwealth whereof they form a part.

Discussion followed, in which Mr. Foster, Judge Higley, Prof. Budd, and Mr. Minier, participated.

The hour for adjournment having arrived, the Congress adjourned until to-morrow, at 9 o'clock a.m.

Second day, Morning Session, August 9th.

The hour for meeting having arrived, the President assumed the chair, and the Congress proceeded with the reading of reports from committees as previously arranged.

Prof. Adolph Leué, from the committee appointed at the Cincinnati session, in April, 1882, to report upon Forestal Experiment Stations, presented a report, as follows:

Report of the Committee on Forestal Experiment Stations.

In consideration of the existing circumstances of this country, as—

1. The absence of state forests;

2. The want of trained foresters ;

3. The non-existence of forest academies ; and,

4. The comparatively little importance which the Legislatures of almost all the States have attached to experimenting in Forestry ;—

Your committee most respectively submits the following :

I. That the members of this Association individually urge, in their respective States, the necessity of establishing experiment stations.

II. That this Association, as a body, or through a committee, memorialize the General Assemblies of their respective States, and in this memorial urge upon these bodies the need of such stations, and the practicability of establishing them in various places in each State.

III. That the Ohio plan of organizing such stations, on account of its being exceedingly practicable and thorough, be recommended as the most suitable to our circumstances.

IV. That the Forestal Experiment Station, consisting, as it does in Ohio, of a centre, of primary and secondary stations, may centre most appropriately in the agricultural colleges.

V. That a standing committee on Forestal Experiment Stations be appointed for the ensuing year.

(Signed) ADOLPH LEUÉ, *Chairman*,
FRANKLIN B. HOUGH.

Upon motion of Prof. R. B. WARDER, the above report was accepted and adopted.

Upon motion of Mr. J. H. MORGAN, the Congress resolved that the memorial provided for in the report be also addressed to the Governments of the Dominion and the Provinces of Canada.

The Chair appointed Prof. A. Leué, Mr. J. H. Morgan, and the Rev. N. H. Egleston, as such committee.

It was further ordered that a committee upon Forestal Experiment Stations be appointed, and the following persons were named as this committee, viz : Rev. N. H. Egleston, Mr. R. W. Furnas, Prof. Wm. Saunders, Mr. Leo Weltz, Mr. Warren Higley, Prof. R. B. Warder, and Prof. Adolph Leué.

Dr. FRANKLIN B. HOUGH, from the committee appointed at the Cincinnati session, in April, 1882, to memorialize State Legislatures upon the establishment of State Forestry Commissions, presented a report, as follows :

REPORT UPON THE ESTABLISHMENT OF STATE FORESTRY COMMISSIONS.

The undersigned, being members of the American Forestry Congress, appointed to prepare a memorial upon the establishment of State Forestry Commissions, having consulted as opportunity offered, would respectfully recommend the following draft of a communication, which, if approved by the Congress now in session, might be addressed to the Governors of the several States (and with proper change in the direction, to the Governments of Canada), with the request that the same be transmitted to their respective Legislatures for consideration.

FRANKLIN B. HOUGH, *Chairman*,
WILLIAM R. LAZENBY.

To His Excellency, the Governor of——————:

SIR :—The American Forestry Congress, having, by a committee of its members, prepared a memorial to the Legislatures of the several States of the American Union, and to the Provincial Parliaments of Canada, upon the subject of establishing State and Provincial Forestry Commissions, adopted the same, after due deliberation, at its session held in the city of Saint Paul, Minn., on the 9th day of August, 1883, and as to the former, requested the Commissioner of Agriculture to transmit the same to the Governors of the

several States, with the request that it might be referred to their respective Legislatures for consideration.

The inclosed communication is addressed to you in pursuance of this intention, with the request that, if approved, you will refer the same to the Legislature at its next session, with such recommendations as you may deem proper concerning it.

Very respectfully, your obedient servant,

———————.

To the Honourable the Legislature of the State of————:

The American Forestry Congress would respectfully invite the attention of your Honourable Body to the importance of giving early attention to measures tending to the maintenance of our forest supplies.

The very important relations that exist between a due proportion of woodlands an our agricultural welfare, resulting from their influence upon climate; their protection from drying winds and their effect in the equalization of water supply, for navigation, hydraulic power, and the use of cities and towns, are worthy of serious attention, and present questions that may properly claim the notice of a legislative body.

It is well known that in every country upon the continent of Europe, systems of forest management, originating from necessity, have grown up, and that codes and regulations for protection, working, and restoration have been devised, and matured as experience led, until they have become, in a great degree, adapted to the conditions and wants of their inhabitants, and to the requirements of their governments, in matters o timber supply.

Although, from the differences that exist between the American States and the countries of Europe, as well with respect to the tenure of the land as the structure of the laws, which would prevent any one of the European codes of forestry from being applied in America, still there are strong reasons for urging the adoption of carefully devised measures for promoting the maintenance and renewal of our forest supplies.

Since in the States and Territories of the United States, as well as in the Provinces of Canada, most of the settled portions of the country belong in fee-simple to private owners, who are usually the actual occupants; and since the entire cost and care of management of the woodlands upon these estates must devolve upon these owners, it is evident that there can be no more effectual means devised for promoting this object, than by the diffusion of correct ideas among the owners of these lands, with reference to the forest interests of the country.

In the case of fisheries, another element of national wealth, in which our citizens, in their individual capacity, have a great interest, although the Government itself can scarcely be said to have property, it has been found that great public benefits have been derived from the information obtained and disseminated through the agency of State Fishery Commissions.

The investigations made by Government in this matter, have been far beyond the means of individual enterprise, or even of associated private effort, and the operations of breeding, stocking distant waters with improved species, protection, maintenance, and restoration, which have been carried on, in a large degree, under the patronage and intelligent direction and advice of State Commissions appointed for this purpose, have greatly enhanced the value of our inland fisheries, and promise still greater benefits in the future. These Commissions of Fisheries exist in all the principal States of the American Union, and in Canada, and their benefits are realized more and more every year, as we learn their results.

In the case of our woodlands, we find in matters of public policy, and the promotion of the common interest, a strong resemblance with the case above cited. Information is to be collected; investigations are to be made upon questions before unknown; the introduction of new species is to be encouraged; improved and economical methods are to be made known, and the public interest is to be awakened and maintained.

Although it would be obviously inexpedient and improper to confer authority upon a commission with respect to the control and management of private property, unless in

exceptional cases where a public interest was concerned, there are many ways in which it could very greatly promote the general welfare, among which we may specify the following:—

1. It might institute and conduct experimental stations, either upon lands specially acquired for the purpose, or with the concurrence of institutions of learning, where facilities exist, and the conditions are favourable. We would especially mention the colleges for instruction in agriculture and the mechanic arts, in the several States, formed separately or in connection with colleges already existing, under a grant from Congress, as proper places for aiding in these experiments. The co-operation of individuals might doubtless be secured in many cases. These experiments should embrace, as well questions of culture and management, for the discovery of best methods, as matters of scientific interest, including the study of the local climate in its relations to Forestry.

2. It might establish nurseries for the supply at cost, or otherwise, of approved species of young trees, especial care being taken to offer those only which afforded the best prospect of success, and the most useful product. These young trees (or in some cases tree-seeds), should be accompanied by plain and simple directions for their care and management, and the persons receiving them should be requested to report the results.

3. It might stimulate competition by the offer of prizes, for plantations remarkable for their extent or excellence, or for success in overcoming difficulties in planting.

4. It might reward the authors of approved essays, tending to make known improved methods, or to awaken an intelligent interest in Forestry, or to disseminate useful information upon any subject therein, calculated to promote the general welfare.

5. It might collect statistical and scientific facts, having reference to Forestry in its various economic and scientific relations, with the view of furnishing information in answer to private inquiry, or by way of public reports.

6. It might promote an interest in the subject by the holding of public meetings, addresses, and the discussion of subjects relating to Forestry and rural economy.

7. It might establish at its central office, a reference library, and collections for illustrating the various subjects pertaining to Forestry; and it might very materially aid, by advice and otherwise, in the formation of similar means of reference and information, at institutions of learning, and other agencies of public utility.

8. And, finally, it could carefully study the subject of Forestry, as it may grow in importance, with the view of recommending for legislative action such measures as may be deemed proper for meeting the wants of the country in this matter, as it comes to be better understood.

It is presumed that intelligent, capable, and public-spirited citizens might readily be found in every State, who would be willing, without pay, to give reasonable attention to this subject, by attending stated meetings of a board, their actual expenses being paid. With a capable and intelligent secretary, devoting his whole time to his duties, upon reasonable pay, we might confidently expect that such a board would in due time become a centre of influence, and an important agency for good; sustaining the expectations that gave it being, and abundantly repaying its cost in an advancement of the public welfare.

Upon suggestion by the President, that this memorial might be transmitted from the Department of Agriculture, with its suggestions tending to give it greater effect, upon motion of Dr. Hough, seconded by Prof. Northrop, it was so referred, and the report was accepted and adopted.

The Hon. H. G. Joly, of Quebec, from the committee appointed to report upon Forest Fires, and the injuries to Forests by cattle, made a partial verbal report. He stated that copies of the report of the committee appointed at the last session of the American Forestry Congress (August, 1882), for the purpose of drawing the attention of Government to the question of protection to the forests, were sent to the Federal and to the Provincial Governments of Canada, several of whom took immediate action. Ontario passed a law for the encouragement of the planting of forest trees, and voted a consid-

erable sum for that purpose. Quebec passed a law, as recommended by the Forestry Congress, for classifying public lands under two heads: Lands for cultivation and lands unfit for cultivation, but growing pine and spruce, which are to be reserved for lumbering purposes. Quebec furthermore amended the laws already existing for protection of forests against fire, adopting a great number of suggestions offered by the Forestry executive committee, among others, appointing a superintendent to watch over and guard against fires. The Province of Nova Scotia passed last winter a law very similar to the preceding, and designated an Arbor Day.

Prof. ROBERT B. WARDER, from the Committee upon Forestry Education, appointed at the Cincinnati Session in April, 1882, made the following report, which was accepted and adopted:

REPORT OF THE COMMITTEE ON FORESTRY EDUCATION.

Many difficulties attend the discussion of this subject, many opinions prevail, and years will be necessary to work out in detail an educational system, in which the claims of Forestry shall be duly recognized. Your committee respectfully submits the following propositions:—

I. One or more special schools of Forestry may eventually be organized, modelled in most respects after those of Germany, but (like other American technical schools) demanding a less amount of general information, and linguistic training for admission. For the present, however, the business openings offered for trained foresters, are not such as to encourage a suitable number of students in such a course, even with the modifications proposed. For this reason, among others, we believe that it is not best to urge the immediate establishment of such a school.

II. We may expect the interests of practical Forestry to be promoted incidentally by those engaged in agriculture, rather than by those who are exclusively foresters; hence we recommend that courses of instruction in Forestry, as full and practical as circumstances admit, should be offered in the various schools for the promotion of agriculture.

III. Practical lectures before farmers' institutes, promise to be effective in communicating a large amount of practical information among those who will appreciate and apply it. It may be very desirable for State organizations to employ lecturers, and cooperate with the various local societies in this work.

IV. Local Experiment Stations, in which intelligent farmers unite in specified investigations, will have a real educational value,—both awakening a more general interest, and affording object lessons upon practical Forestry.

V. With increasing intelligence, and general information among the American school teachers, we believe they may do very much unofficially, to impart a love of trees, and habits of observation. An Arbor Day, designed for school children, as in Ohio, is a valuable educational means, though quite distinct from the arbor day designed for forest plantation, as in Nebraska and Minnesota.

VI. The agricultural press affords a wide opportunity for pioneer work in Forestry education. Much has been accomplished by the Forestry manuals in Minnesota and Kansas, and by the Iowa Forestry Annuals. It is a cause of regret, that so excellent a periodical as the *American Journal of Forestry* should be given up for want of patronage. We believe that monthly or bi-monthly Forestry leaflets, published as cheaply and scattered as widely as possible, may have a very useful influence. Such a publication may be offered in quantities to the local horticultural and agricultural societies, at the bare cost of paper and printing. We believe that a guarantee fund of $300 would suffice to insure such publications for one year.

Signed on behalf of the Committee:

ROBERT B. WARDER,
ADOLPH LEUÉ.

Mr. MINIER said that he wanted to see the interest in forestry become as contagious as the small-pox. Let American homes be made cheerful and interesting, he said, and we fear not for the future welfare of the people.

Mr. BURSON spoke of the existing ignorance upon the subject of trees, and urged that measures should be taken for educating the people in a knowledge, not of tree culture merely, but of the trees themselves.

ELIZUR WRIGHT referred to the progress which has been made in Europe in this matter, through the schools established there. This was an enterprise, he said, in which the old countries had gone ahead of progressive America.

Mr. MINIER believed in commencing the teaching of forestry to children at an early age.

Dr. HOUGH stated that forestry schools had been established in every country in Europe, upon the continent.

The report of the committee was adopted.

It was ordered that a committee upon Schools of Forestry be appointed, and the following persons were named as this committee, viz: Prof. B. G. Northrop, Prof. R. B. Warder, Mr. G. W. Minier, Mr. D. W. Beadle, Prof. J. L. Budd, and Dr. F. B. Hough.

Mr. G. W. MINIER presented the following recommendation, which was adopted:—

"In view of the widespread and happy results of the observance of Arbor Day in many States, this Congress recommends the appointment of such day in all our States, and in the Provinces of the Dominion of Canada."

Pending the adoption of the preceding, remarks were made by Messrs. Burson, Egleston, and Minier.

Judge WARREN HIGLEY presented a report upon the organization and operations of the Ohio State Forestry Association.

Dr. FRANKLIN B. HOUGH presented a verbal report of the action which had been taken in the State of New York, in reference to Forestry, which may be briefly summarized as follows:—

In 1872, a law was passed naming seven citizens of the State as a State Park Commission. This Commission consisted of Horatio Seymour, Patrick H. Agan, George H. Raynor, Wm. B. Taylor, Richardson, William A. Wheeler, Franklin B. Hough, and Verplanck Colvin. They were instructed to make inquiries with the view of reserving or appropriating the wild lands lying northward of the Mohawk, or so much thereof as might be deemed expedient for a State park. It is believed that the leading motive in this was, to secure the benefits to be expected from woodlands, in the maintenance of the water supply for the State canals, and for hydraulic power, which had been materially injured by clearings.

It was found, upon inquiry, that the State had only about 40,000 acres then in its possession in that region, the rest having been sold at nominal prices to timber operators and a railroad company. As soon as it was understood that the lands were wanted by the State, their owners showed a tendency toward combination, for the enhancement of values, and as the commission did not propose to become accessories to this speculation, they simply recommended a law forbidding further sales of these lands, and their retention when forfeited for the non-payment of taxes. In 1883—eleven years after this first law—the action then recommended was taken. The prediction had been verified, as now more than 600,000 acres belonged to the State, from neglect of taxes by the owners. This is only the beginning of a system of Forestry, since nothing was as yet provided for the management of the lands, except in one county only (St. Lawrence), where an agent

has been appointed to look after the interests of the State in the forests of that county. The law relating to tree planting along the highways has been very recently modified, and the germs of something that may grow into a kind of forest management, may be found in several local laws in various parts of the State, which provide that waste lands upon which taxes are not paid, shall become the property of the counties.

Very recently a call was issued for the holding of a convention for the formation of a State Forestry Association. The proceedings were merely preliminary, but three persons had been named to attend the present Congress and make a report. The speaker (Dr. H.) was the only one present.

Dr. HOUGH further remarked, that in the State of Vermont and New Hampshire, commissions had been appointed by law, and incipient measures were in progress for ascertaining the duty of these States, with reference to the Forestry question. As no representatives appeared from these States, he was not authorized to say what had been done, or what was intended.

The Hon. MARK H. DUNNELL, for many years member of Congress, and mover of the principal Acts that have been passed relating to timber culture and investigations upon Forestry, being introduced, addressed the Congress at some length, upon these subjects.

Mr. D. A. ROBERTSON presented the subject of publication of the proceedings, and suggested the appointment of a committee to memorialize Congress, with the view of procuring an appropriation for that purpose. Discussion arose thereupon, pending which the hour for recess having arrived, the Congress adjourned until 2 o'clock, p.m.

Afternoon Session, August 9th.

The Forestry Congress having been called to order by the President, at the hour appointed, Dr. FRANKLIN B. HOUGH, from the Commission appointed at the Montreal Session, in August, 1882, to report upon the subject of "Legislation in Relation to Forest Fires," made the following

REPORT.

The Executive Committee of this Congress was instructed, at our last meeting, to refer certain subjects for report on the present occasion, and, among these, "Legislation in Relation to Forest Fires," has been assigned to me for consideration.

We find, already, legislation of some kind, in nearly every State and territory of the Union, in Canada and other British colonies, and in every country in Europe. With the view of ascertaining what had been done in this line, I carefully collected our existing legislation upon this subject, and it will be found in my third report, in which this subject is considered with much detail.

The fact that prohibitions are imposed in any law, upon any subject, assumes that something is or may be wrong; and when we find penalties, the presumption is that they can or should prevent this wrong or injury from being done. We find neither prohibitions nor penalties against what is unavoidable; they are enacted only in cases where it is presumed that they will prevent some injury from being done, which might happen without them. Without spending a moment upon the origin of forest fires from natural causes, and which are fortunately of rare occurrence, we may attribute the greater part to human agency, and as originating either from intentional motives, or through carelessness or accident.

We find that fires are intentionally kindled, with the expectation that they will spread to more or less extent, in the following cases:—

1. In clearing land of its timber, as in the beginning of all settlements in wooded

countries, and occasionally, from time to time, in the ordinary operation of cutting off wood lots, and in lumbering.

2. For agricultural improvement, in the burning off of stubble and rubbish, to clear the ground for cultivation.

3. In certain operations in the woodlands, where it is desirable to get rid of the underbrush, by the aid of ground fires, so as to render it easy to get around, as in woods worked for turpentine, etc.

4. For improvement of pasturage in woodlands and waste places, by burning off the dead and dry herbage, and to favour the growth of the succulent grasses.

5. For exposing the ground, as in search for nuts or fruits, in prospecting for minerals and ores, and the like.

6. For clearing the ground of materials that might favour the spreading of ground fires, to the peril of buildings, fences or inclosed fields.

7. From a wanton desire to see a "big fire," but without intention to do injury, or with the expectation that no great harm will ensue ; or,

8. With malicious design, and for the purpose of destroying property, or of concealing a trespass ; or, in the case of hostilities, as a war measure, to injure an enemy.

The spreading and destructive fires, originating from carelessness or accident, may be kindled from any of the above mentioned causes, except the last, the escape being sometimes unavoidable, or beyond the means at hand for control ; and sometimes from want of common prudence and forethought, in leaving a fire, or some burning object, in places where a fire may catch and spread, as in throwing down a burning match or cigar, or in the use of gunwads in hunting, that ignite and retain the fire. They may spring from a neglected campfire, kindled for cooking or warming, or from a coalpit where charcoal is being made, or from fires or sparks dropped in any manner as notably in the case of sparks or coals from a passing engine on a railroad.

The extent of the disaster, however it may be started, will depend upon a variety of causes, chiefly the condition of the soil as to drought, and the force of the winds. A great deal will also depend upon the nature of the soil itself, and upon the kind of timber and other vegetation that grows upon it. Light sandy soils, when overgrown with evergreens of the coniferous species, and with the undergrowth that usually accompanies them are particularly liable to spreading fires ; while a heavy clay soil, or fertile loam, underlaid by limestone and shales, may favour the growth of deciduous trees, and a rank and humid undergrowth, in which a forest fire could scarcely be made to spread, and in which a disaster of this kind is scarcely ever known.

We also find that the season of the year has much to do with forest fires. They are seldom or never known in winter ; but in the early spring months, after the ground has become dry, and before vegetation has made much progress, we find the conditions dangerous. It is the same in a dry summer and autumn, and especially in times of excessive drought, and in high winds. At such times, when this aridity was intensified, the memorable fires of the Miramichi in 1825, and the forest fires in Michigan and Wisconsin in 1871 and 1881, occurred, with destructive energy, and wide spread ruin, consuming millions of dollars worth of property, and destroying great numbers of human lives.

We have started with the theory that prohibitions and penalties imply an avoidable cause. Let us consider, separately, how this will apply in the several classes of causes that have been above enumerated :—

1. In the clearing of land, a little judgment will enable the careful man to avoid a time for the burning of his brush when there is great liability to the spread of fires beyond control. But as some men have not this "little judgment" and this "care," it would be an effectual check upon their carelessness, if we had a law requiring them, before applying fire, to get a premission from some proper town officer, such as the supervisor, the selectmen, the trustees, or such other officers as the State laws recognize as the guardians of the public intrests of the town, and who would presumably be men of prudence and good judgment. They should also be obliged to notify their neighbours of their intention, so that proper watchfulness might be awakened, where the possibility of danger to adjacent woodlands might be apprehended. They might be still further

restricted absolutely from setting fires in certain months known to be dangerous in common or exceptionally dry years.

In this matter of burning brush, it should be more generally known, that it is not a very difficult thing to dispose of it gradually as the clearing progresses, by getting a fire well started, and then throwing the brush upon it. In the case of resinous woods, this may be done at once, and in the deciduous kinds, as soon as they are somewhat dry, but before they have become like tinder.

2. The danger from field fires, in the burning off of stubble and dead grass in fall or spring, as on the prairies of the west, may be greatly lessened by ploughing two belts of land and carefully burning off the rubbish on the strip of land between them. Where this precaution is taken, it is not difficult to keep these fires away from stacks of grain, buildings, and plantations, and it might, in these States, be well to require this to be done by law. Here, as in the case last mentioned, there is great need of prudence and caution, and in case of the least uncertainty, the advice and aid of others should be obtained. In this, also, there should be a prohibited season, wherever there is need.

3. In cases where it is thought necessary to clear the ground of underbrush, the need of caution and counsel is quite evident, and the subject should be placed under the restrictions of law.

4. The custom of burning off woodlands, especially in mountain regions, is one of the worst that we have to contend with in certain portions of the country. It is often practised by those who have a few cattle but no land, and who depend upon finding subsistence for their stock upon the unenclosed lands of others, or upon the public domain. There is nothing more likely to arrest this practice, than an efficient stock law, requiring every owner of stock of whatever kind, to keep them upon his own premises, under the penalties that may result from their trespass and damage upon the lands of another.

Where an owner thus sets running fires on his own lands, to improve the pasturage for his own stock, there should be a legal prohibition as to dangerous seasons of the year, and ample responsibility for the payment of damages that may result from his fires upon the property of others. The penalty of a fine is generally effectual, in the case of a land-owner; for the possession of an estate implies a certain degree of care, industry, and forethought in the owner; and such a person would realize the responsibilities of the situation, if fully known beforehand. But there is a class of men, and unfortunately it is a large one, who, having neither care, industry, nor forethought, and therefore no land, would care nothing for a fine, because they have nothing that the law could reach, if its collection was attemped. For this reason, any law imposing a fine as a punishment, with respect to the setting of fires that escape from their lands to the injury of others, should end with the clause: "or imprisonment for a period of —— days, unless the fine is sooner paid."

5. The clearing off of leaves by fire, for the purpose of exposing the ground, is most likely to be practised by boys in search of nuts, and who do not realize the danger that may result; or by those prospecting for ores and the like, who care as little for the consequences as the common tramp. It may not be a very common or a very important cause of these fires, but it should be forbidden on lands not owned by the person who sets the fire, and should, in this case, be coupled with penalties where it injures another.

6. In light sandy regions, and in cases where the pitch pine and other resinous woods form the principal forest growth, there are seldom many years together in which we do not hear of distressing accounts of woodland fires. They have been particularly disastrous upon Cape Cod, in the interior and eastern portions of Long Island, and in southern New Jersey. In these fires, we often hear of the burning of farm-houses, fences, bridges, mills, and other property, and they generally leave the soil greatly impoverished. In such regions there is a continued liability to the recurrence of these fires, whenever the conditions are a little more favourable to their spread, and nothing but continual care and watchfulness can prevent them.

In such regions, it is undoubtedly a good practice to keep the borders of the woodlands along the railroads, and around buildings, clear of rubbish and litter, by carefully burning off a strip of land in the winter, and when the fire can scarcely be made to

spread, and is easily controlled. Where this is done every year, the amount of combustible material is slight, and the risk is reduced to next to nothing.

It is, therefore, advised that legal provision should be made, requiring railroad companies to keep the rubbish and dead herbage, that might be liable to spread the fires, burned off every year, and forbidding them to allow piles of old ties and other combustible materials from accumulating or being left along their roadway.

7 and 8. From wanton and wilful burning, we have no hope of escape, except in the execution of proper laws against malicious mischief and deliberate crime.

Before considering the measures that might be recommended in our country for preventing by legal enactments the spread of forest fires, let us briefly notice what has been attempted, and what has been accomplished elsewhere. There is a district of country in southern France, some forty or fifty miles in extent, between Nice and Marseilles, and fronting upon the Mediterranean, that has, in former years, suffered often and severely from forest fires. The conditions were peculiarly liable to the occurrence of these fires, as well in soil and climate, as in the vegetation that covered the surface. The soil is rich, resulting from the decomposition of schist, porphyry, and granite. It is exposed to a ardent sun, and watered by abundant rains at the season most proper for giving exceptional vigour to forest vegetation, and, as the result, an abundant accumulation of litter. But it is also liable in certain seasons, to protracted drought; and in such a time, the least spark of fire, in a strong wind, would start a conflagration which nothing could stop, until the tinder upon the ground was burnt off. The forest trees in this region were chiefly chestnut, cork-oak and the maritime pines, and the undergrowth various species of broom, heather, and herbaceous plants that become dry and inflammable in a drought.

The repeated and ever-recurring damages resulting from these fires, led the Government in the autumn of 1868, to send the director-general of forests (M. Faré) to make a careful study of the causes of these disasters, and, if possible, to devise the remedies for their prevention. Having prepared a list of some two hundred names, selecting the principal proprietors and industriels of the district, he first addressed a circular of inquiries, and then convened as many of them as could attend, for the discussion of the subject, and the collection of data upon which conclusions could be formed. The results in the way of oral evidence and written opinions were published in detail. There were also separate publications upon the subject, the more important one being by M. Charles de Ribbe, who deals with great intelligence upon questions relating to the causes of these fires, their history, and the measures that should be taken for preventing them.

It was noticed, as to ownership, and incidentally as to the effect which this had upon surveillance and prevention, that the richest portion, and that chiefly devoted to the cork-oak, belonged to many small proprietors, while the poorer parts, covered with the maritime pine, and largely devoted to resinage, was owned by a few persons, some of them having tracts of several thousand hectares each. It was natural to expect that the former were better cared for, and that the greatest precautions had come to be adopted for preventing the origin of fires. But on the other hand, this parcelling out into small properties, is not favourable for concerted effort; as, in case of danger, every man would be most anxious to save his own, while the wealthy owners of large estates could more easily associate in the adoption of measures for their common welfare, and that a more systematic effort might bring a better result.

But, in the present instance, although there was a great diversity in ownership, and the woodlands were for the most part contiguous, or at least with no large clearings intervening, however diverse the local interest might be, they were menaced with a common danger. The inquiries undertaken in this instance, brought out, as might have been expected, a great variety of opinions as to causes and prevention, as each one reasoned from his own standpoint, and from the little circle of observation around him. They very generally agreed in this, that means should be devised for preventing their neighbours' fires from running over their own possessions, but were more or less widely variant as to the remedies that should apply to the whole.

As to the causes, M. Faré arranges them under two classes:—The one purely intrinsic and belonging to all woodlands, and the other exceptional, and produced by the special circumstances that have been already noticed. It was chiefly to the latter that these

sweeping disasters might be attributed, since two-thirds of the department, having a different soil and forest growth, but otherwise the same rains and droughts, and the same exposure to the sun, suffered no inconvenience from this cause.

The fires are generally started by careless hunters, by smokers, by charcoal burners, and very often from a practice of setting fires for the purpose of clearing off the mosses, herbage, brambles, and rubbish, in which it was generally intended to keep the fire smouldering under a covering of turf, but which in a dry and windy time might easily escape control.

This inquiry resulted in the enactment of a law, limited to twenty years from April 13th, 1870, the date of its passage, the leading features of which were as follows :—

The Prefect, with the advice of the General Council, was to fix the time in each year, within which no fires were to be kindled within the woodlands, or within 200 meters of their borders, for any pretext either of forestry or agriculture. Notices of this order were to be posted fifteen days previous to the forbidding season.

At times not included within this season, fires might be built, provided the space be inclosed by protecting trenches.

Between adjacent properties, a cleared avenue should be maintained, at the joint cost of the owners. The power of arresting offenders was extended, and vigilance, especially in the dangerous season, was increased. The fines were to be not less than twenty nor more than 500 francs ; but these were to be in addition to the damages that might ensue.

At a somewhat later period, frequent and disastrous fires occurring in the region of Landes, in south-western France, in the young pine forests, led to another investigation by direction of Government, by M. Faré, and an extended report was made, but not leading to any special law. In visiting this region in 1881, I learned, upon inquiry, that these fires had ceased to be troublesome, and was told that they had probably been set for a malicious end, a certain family owning extensive tracts of pine, being the heaviest losers. Through some financial failure, great numbers, acting under the advice of members of this family, had lost their little all, and to revenge this grievance, these fires had been set.

But returning to the question before us, as it is presented in the United States and Canada, and reasoning upon the assumption that destructive fires are very generally avoidable with proper caution, I will attempt to draft a bill, that with some modifications might be made applicable in any of the states, territories, or provinces, and which, if sustained by public sentiment, and properly enforced, could not fail to render these disasters less frequent, if they did not hinder their occurrence entirely. I will give it the title of—

"An Act to Prevent The Occurrence of Field and Forest Fires."

Be it enacted, etc.

Section 1. It shall be the duty of the Board of Supervisors (County Commissioners, or other authority in charge of the public business of counties), in districts liable to suffer injury from forest fires, to establish rules restricting the setting of fires in fields or woodlands, and forbidding them entirely, in what experience has shown to be a dangerous season of the year. These rules may be revised annually.

§ 2. In every township, the inhabitants, when assembled at their annual town meetings, may elect as many Fire Wardens as they may determine by a public vote. If there be more than one, the district of each one shall be described by roads or natural boundaries, a record of which shall be made in the office of the town clerk.

§ 3. It shall be the duty of the Fire Warden, in case of a spreading and dangerous fire, to take the chief direction of measures for arresting its progress, and he may order any citizen to assist in this labour, under the penalties hereinafter mentioned.

§ 4. In the absence of the Fire Warden, the supervisor (or other officer in charge of town business) may designate in writing some person to perform the duties of such Fire Warden, and the person so appointed shall have the same authority as if duly elected.

§ 5. In cases of great danger, a Fire Warden, with the approbation of a justice of

the peace, may order back fires to be set, or property to be destroyed, to stop the progress of the fires. Any structures so destroyed shall be paid for as a county charge.

§ 6. The expenses necessarily incurred in stopping the progress of a forest fire, shall be audited and paid by the Board of Supervisors (or other county board, as the case may be), as a county charge. It shall be lawful for the inhabitants at town meetings to fix the rate that may be paid for services in arresting a spreading fire, and to limit the total sum that may be paid; but in no case shall any allowance be made for services to any person through whose act or negligence a fire originated, nor shall payment be made for losses incurred, otherwise than as mentioned in the last preceding section of this Act.

§ 7. No person shall, at any time within the season prohibited under the first section of this Act, set fires in any field or woodland, for the purpose of burning brush, or clearing the land for agricultural purposes, or for improving the pasturage.

§ 8. No person shall, at a season not included in this prohibited period, apply fires in any field or woodland, for the purpose of clearing or improvement, without first obtaining permission from the Fire Warden of his district. He shall also notify any neighbours who may have fields or woodlands adjacent, and liable to injury, at least one day previous to the setting of such fires.

§ 9. No person shall kindle any fire in any woodland, or within two hundred yards of its borders, unless the combustible materials be first cleared away within six feet of the place where it is kindled; nor shall any such fire be left, until it is fully extinguished, or safely covered.

§ 10. In the making of charcoal, there shall be provided at least one barrel full of water to each pit, with pails in readiness for use in the case of a fire escaping and liable to spread. All combustible materials shall be cleared away to a distance of fifty feet from the pits or kilns in which charcoal is made.

§ 11. It shall be the duty of railroad companies, to cause the dead herbage, and other inflammable materials within their right of way to be carefully burned off once a year, at a time when this can be safely done, and with a sufficient force in readiness to prevent injuries therefrom.

§ 12. In districts where it is a common custom to provide against the spreading of field fires by ploughing strips of land, and burning off between them, such strips may be ploughed and burned once in a year, along the boundary of adjacent properties, and along lines of railroad, at the joint expense of the owners. In case that either of said owners, upon request from the other, shall neglect to do his share of the labour, it may be done by the other, and one-half of the cost thereof may be collected, as in an action for debt.

§ 13. And whereas, experience has shown that great benefits result from the maintenance of cleared avenues in a forest, for the control of forest fires, it is hereby enacted, that wherever a line of property between two owners runs through a woodland, and whenever the Fire Warden shall deem the measure necessary, he may direct the owners to clear and maintain such an open space, of not less than fifty feet in width, half of it being on each side of the line, and the expenses to be equally borne by the owners thereof.

§ 14. It is forbidden to throw down a burning match, or any lighted cigar or other burning object, in any field or woodland, without immediately extinguishing the same. It is also forbidden to use tow, or other material liable to hold fire, as a gunwad. It is further forbidden to discharge any firearms within a forest, during the period that is designated as dangerous by the Board of Supervisors (or other county authority).

§ 15. The following penalties are imposed for each violation of the provisions of this Act:

For disobeying the orders of a Fire Warden, from $5 to $50.

For setting running fires in the forbidden season, from $50 to $500.

For setting fires in the season not forbidden, but without permission from the Fire Warden, or notice to neighbours, $5 to $50.

For kindling fires in violation of § 8, or for neglecting the requirement in § 9, from $5 to $50.

For neglecting the requirement in § 10, from $5 to $10 per mile.

And in case of non-payment of fines, the person upon conviction may be imprisoned in the county gaol one day for every $2 of the fine imposed.

§ 16. It is further provided that in addition to the foregoing penalties, every railroad company, and every person, through whose act or negligence a field or forest fire originates, shall be liable to pay the damages which such fire may occasion.

§ 17. And be it further enacted, that the Board of Supervisors (or other county authorities), may cause printed notices, stating the times when running fires are prohibited, and the various penalties mentioned in this Act, to be posted in each school-house, and at such places as election notices are posted, throughout the county, or in such towns as they may deem proper, and the expenses of this may be made a county charge.

§ 18. All penalties incurred under this Act, shall be prosecuted by the Fire Warden of the district before a justice of the peace, and in the name of the people. The moneys recovered are to be paid into the county treasury, to be applied first to the payment of expenses incurred under this Act in the extinguishment of forest fires; and if any remain over, for the support of roads and bridges in the towns where the fines were incurred.

§ 19. This Act shall take effect immediately.

I have thus presented the outlines of a plan of legislation, which I think might be modified to meet the wants of every part of the country. It embraces the following principles:—

1. A local option in the county authorities, who would be best able to judge of local wants and circumstances.

2. A recognized authority in directing operations, as in the case of city fires, where the chief of a fire department, or his representatives, may compel assistance in case of fires.

3. A county charge for necessary expenses. This is justified and allowed in the case of property destroyed by a mob, upon the principle that the county owes protection to its citizens, and that having provided an agency in its civil officers, for the prevention of crimes, and the protection of property,—which may be expanded to meet an emergency at any time,—it is bound to exercise this power for prevention and protection, or pay the losses that may happen from failing to do so.

4. Personal responsibility in the use of fire, and penalties for carelessness, whether damages ensue or not.

5. Responsibility for damages resulting from fires, as a matter of common justice, and upon the general principle, that if any person injures the property of another, he shall pay him for it.

6. A pecuniary fine for carelessness and wrong doing, which may, within certain limits be proportioned to the offence, . . or a personal punishment in default of payment.

In studying this subject, we cannot fail to notice, how much of these calamities is avoidable, with due caution; how much might be saved, by a little timely thought and habitual care; and how much might be gained, by instilling into the minds of the young, in our families and our schools, those habits of caution and prudence, and regard for the rights of others, that would in future prevent so many of these losses that we now deplore.

The following report was then read by the recording secretary, the writer being absent.

THE MANAGEMENT OF BURNED FORESTS.

By Bernhard E. Fernow, Slatington, Penna.

It is evident that in the management of a burned forest, *i.e.*, the efforts to repair the damage done by fire to the standing growth as well as to the soil, the prospective value of the forest, must depend not only on the requirments of the species, of which the forest is composed, and the system of management, to which the forest has been subject, but also on the intensity of the fire and the degree of injury, which has been suffered by the growth.

We have to study the influence of the fire on the soil and on the standing timber, before we can decide upon the treatment.

When we contemplate the method of the prairie settler or the Kassack of the Russian steppes, burning over his grazing lands with a view of encouraging the sprouting of new grass, and of enriching the soil for a more luxuriant verdure, we might be tempted to consider the burning over of a forest tract, if only kept in bounds so as not to injure the timber, as beneficial after all to the growth of trees. But here we are drawing a mistaken analogy, for whilst the production of grass and herbs, in fact all agricultural vegetation depends mainly on the mineral richness of the soil, in forestry this factor of the growth takes a very different part. The tree lives mainly from the air ; the bulk of its substance is undoubtedly made up from the decomposition of the carbonic gas of the air and of water.

The influence of the soil on the forest growth is almost entirely based on its physical properties, and of these especially its capacity of absorbing and retaining moisture, the main agent of successful tree growth. The yearly fall of leaves and dead branches or twigs, not only returns to the soil the greatest part of any mineral substances, absorbed by the trees, and thus sufficiently renews, if that were necessary, the richness in inorganic elements, but by the decay of this vegetable mould a soil cover is formed, which eminently possesses the desired quality of receiving the atmospheric precipitations and returning the same to the trees as needed ; besides this vegetable mould or humus being a bad conductor of heat, it counteracts the drying effects of the scorching sun, wherever the crown cover of the thinly foliaged species or of the thinly standing trees does not afford sufficient protection.

Now, this cover is first attacked by the devouring flames, and is converted into ashes to a greater or less depth according to the season, when the fire occurs and the consequent relative humidity of the soil. And by its destruction all the inherent favourable physical qualities are destroyed.

Especially where the natural conditions of the under-lying soil are of a poor description, such as the dry sands of the diluvial plains, the destruction of the humus, accumulated through many years, may seriously affect the capacity of the soil for successful forest culture. And when, to crown the disaster, the protecting cover of the trees themselves has fallen a victim to the ravaging element, thus giving access to parching sun and wind, the ingenuity of a forester will indeed be taxed to the utmost, to restore the necessary conditions of forest growth, nay, it may become almost impossible.

Although the fire may not have attacked the standing timber, yet the injurious effect will be visible years hence, when the trees are cut ; one or several annual rings or layers of wood following the years after the catastrophe will note the consequent decline of growth, or to express it in a financial way, a reduction of the yearly dividend.

The vitality of the trees may be impaired by the action of the scorching flames on the cambium, and even if utilized at once, the injured butt logs, the most valuable ones, will often count a considerable deficit in the lumberman's estimate. In hardwood forests, where the reproduction is expected from sprouts, the reproductive power of the stocks is injured in proportion to the degree of heat developed by the fire. In the pineries, where reproduction is expected from the seed, the young seedlings fall the first victims of the merciless foe.

Where the fire kills the original growth or causes the speedy death of the same, the conditions for forest growth are at once changed, and those alternations of species occur, which are a natural consequence of the change of these conditions. The shade-loving and the shade-bearing species find no favourable inducements ; the light-needing, especially the light-seeded ones, which produce seed plentifully and give it to the distributing winds, take the place, excluding by their rank and vigorous growth the existence of their more pretentious and slow-growing brethren.

Unfortunately the latter are the more valuable kinds. Yet we must be thankful that the tribe of birches, poplars, cherries, willows, will be satisfied with the unsatisfactory conditions presented to them by the burned forests ; because their decaying foliage, what cover they afford to the soil, recuperates in time the powers of the same to bear a better crop, and recalls to useful production the lost area.

I may be allowed here to quote Prof. C. C. Sargent's happy description of this process.

"If a forest is destroyed by fire, which kills the trees and undergrowth of shrubs and herbs of the same species, except in the case of some of our least valuable trees, they rarely spring up again. Let us take the case of a white pine forest. If a forest of white pine is destoyed by fire, this tree does not spring up again. The land if only a part of the trees had been cut, would have continued to produce pines indefinitely, is not covered again with any growth of trees for a considerable period. The fireweed makes its appearance. The light seed of this plant is often blown for a long distance, and falling upon the bare ground germinates quickly, and finally covers the burned surface with vegetation. Birds drop the seeds of raspberries and blackberries, which find sufficient nourishment (?) and light for germination. These, as they grow, cover the ground and afford protection to the stones of the little mountain cherry, dropped by birds also, or the light seeds of the gray birch or some of the willows or poplars, which are constantly blowing about, and which germinate anywhere upon unshaded ground, however barren.

"These are generally the first trees, which succeed a white pine forest destroyed by fire; but years often elapse before the ground is covered even with such trees. Nature works slowly, and the wounds made by fire on the earth's covering of trees are only healed under most favourable conditions, through the gradual growth and decay of many generations of plants. The cherries, and the birch and poplars are short lived; and unless burned up, when the same process of recovering commences again, are succeeded by more valuable broad-leaved trees. Squirrels and other animals deposit acorns and nuts in the ground, and the wind brings the seeds of maples, ashes, and the valuable birches. Such seeds find protection among the poplars and willows which had sprung up on the burned land, and as these die, the more valuable trees get a chance to grow and gradually occupy the ground. This new forest of hardwood trees, if protected from fire, will long occupy the ground, and the original pine forest will not appear again until the land long enriched by an annual deposit of leaves has been again stripped of its tree covering and mellowed by years of cultivation. Such land, nearly all over New England, if freed from the plough and the scythe, and guarded from fire and pasturage, grows up again with pine. The different processes, however, by which white pine land, on which the forest has been destroyed by fire, has been again brought into the condition to produce spontaneously another crop of pine, have occupied a long period of time—so long, indeed that it must extend through generations of human life. The forest fire then which destroyed the pine trees growing upon the land, destroyed also, the capacity of the land to produce again, during a period which may be set down at from fifty to one hundred years a similar crop of trees." What now can human ingenuity do to meet these disastrous effects and to recall to profitable use a forest so destroyed, so withdrawn from the production of valuable timber; what is the best management of a burned forest?

Before answering these questions let me recall to you the old adage that an ounce of prevention is better than a pound of cure, and never more so than in this case; where, what it took decades and centuries to produce, may be destroyed in a day through criminal carelessness and inexcusable neglect. What may, and ought to be done by legislation to prevent these dangers, will be discussed by another member of this Congress. Let me only call attention to some advisable means, by which the forester may secure his property, or at least lessen the danger and risk of fire, such as are adopted in other countries.

Whatever may be done in regard to a vigilant firewatch, to careful handling of fires outside and inside of the woodland, the following methods are successfully applied to restrict the spread of eventual fires. In the plain and especially in pineries a forest district is divided into blocks of any desired area, by openings of from one to two rods width. In a well regulated forest management, these blocks serve more than one purpose. Not only do they enable the confinement of running fires in the limits of the block, the openings or fireguards presenting convenient lines of defence, and points d'appui for counterfires, etc., but they also form the basis of an orderly division of a large area, they enable easier areantation by numbering the blocks, they give chance for a closer estimation of the standing timber, they reduce, if opened up in time, the danger of storm-falls, (as the outside trees accustom themselves to the swaying wind and take firmer hold with their roots) and

they facilitate the access to any one point of the forest. In fact it is advisable to arrange these openings so that they may eventually serve as roads. The size of the blocks may depend not only upon the size of the area so to be divided, but upon the thoroughness of the management and especially upon the degree of danger from fires; for the latter reason resinous woods should be cut up into the smallest blocks. In Prussia the blocks comprise generally 100 to 200 acres. The form may, in the plain, be most conveniently an oblong, facilitating the removal of the timber. In the mountains it is generally adapted to the configuration of the soil.

If in this country the conditions of development do not yet call for such orderly management, the time will not be far when, at least in the Eastern States and near wood-using centres, similar attention to detail will be requisite, and the economy of such order will be appreciated.

Where the risk of fire is occasioned by the proximity of railroads, and as long as efficient spark arresters are not invented, or their use not enforced, recourse may be had to the formation of a safety belt along the endangered line. Such a belt consists of a space say sixty to seventy feet wide, along both sides of the railroad, cleared of all timber which, where opportunity offers, may be put to agricultural use. In Prussia very often the track-walkers use the ground for their potato patches, etc. Or if the soil cannot be spared from timber-culture, the growth of a thin foliage, deciduous species like the birch, may be allowed on such a belt, taking care, however, to clear away any casual undergrowth and little rubbish, which, by its inflammability, would breed danger. The ploughing up of a few furrows or a ditch between the belt and timber is a cheap additional precaution.

The practice of burning the rubbish after clearing can be recommended only where no other precaution against the spread of fire will do, or where, as sometimes in pine-woods, the additional danger of destructive insects may be increased by offering a breeding place in the dry litter. Otherwise, as has been said before, *any firing must be considered injurious* to the capacity of the soil, especially on sandy soils with only a thin humus cover may it preclude all possibility of reforestation.

In regard to the management of a burned forest it must not be forgotten that the consideration of this question involves a financial as well as a purely forestral problem. In this country, especially where the desire of realizing all the value for the present without regard to the future is prevalent, the distance and the fastidiousness of the market, the lack of demand for inferior grades and for firewood, may preclude all efforts to exercise any systematic forest management.

Considerations for the financier would be the following :—

The possibility of utilizing the remaining timber at any profit, or at least at the cost of working it.

The value of the loss in accretion by the impaired vitality of the timber.

The loss of soil rent for the time from reforestation to growth to the size of the destroyed forest.

A change of system, for instance, from timber forests to coppice, or the reverse : or from forest to agriculture.

Choice of a more valuable or quicker-growing species instead of a slow grower or a less desirable timber.

Setting aside the financial question, which is of a local character, the treatment depends on the species constituting the forest, and on the system of management adopted. In the coppice when the stems have been not only blackened but partly burned, the only right plan is to clear at once at the proper season. Otherwise decay will set in and the vitality of the stocks will be greatly impaired. Besides, with the impaired vitality of the stocks, the yearly accretion would fall below an average rate of growth, and it would therefore make the continuation of the same growth unprofitable. The same rule may be best applied to young plantations of deciduous trees up to fifteen or twenty years; the new sprouts will, if properly thinned in most cases and with most species, soon replace the cover. It is, however, in the further treatment of these, to be considered that the rate of growth of the coppice—*i.e.*, where the growth is originated from stocks, is different from that of seedlings; and that though the sprouts of most species will show a thriftier

growth in the first year, their height accretion relaxes earlier, and they attain their greatest accretion and their maturity sooner than seedlings. The rotation of such forests therefore must be shortened.

As regards the retaining of such trees or groups of trees as were not injured by the fire, this is a temptation to which we must yield only with caution, as their shade might prove injurious to the surrounding young shoots and impeding their growth.

In larger growths, intended for timber forests, if the injury does not extend to a total destruction or nearly so of the trees, it must be kept in mind that a fire induces earlier maturity; and where a healing from the effects of the fire cannot be expected, the utilization with a view to natural seeding or else clearing, followed by immediate reforestation, should be adopted.

Where the destruction is a total one, no wiser plan than immediate replanting can be recommended. This is especially the only measure with resinous trees, which are almost certain to lose their ground entirely, if after a fire left to themselves in the struggle for existence.

It is not to be forgotten that the dead trees remaining offer the very best opportunity for an increased development of injurious insects. In forests of deciduous trees, where the heat of fires generally is not as intense as in pinewoods, it may be a cheap plan to await a new growth from the stocks, and by carefully nursing the more valuable species, cutting back the less valuable ones, eventually filling up bare spots by planting or seeding shade-enduring species, to recover in time the lost ground for the valuable species.

In this, as in every other problem of forestry, it is impossible to prescribe definite rules that will cover all requirements of particular cases. A thorough elementary knowledge of the conditions of forest growth alone will enable the forester to decide what methods to adopt for the restoration of the lost growth, and to repair the damage inflicted by fires upon the soil and the forest.

Dr. Franklin B. Hough then read the following paper on

ASSOCIATION OF INTERESTS IN FOREST CULTURE.

In the management of landed estates generally, there is perhaps more than in any other kind of investment, the need of direct personal supervision, and that attention to detail which an owner can best bestow. Still, in agricultural affairs, it is sometimes necessary for several owners, having lands adjacent, and needing a common improvement, to seek an organization under the protection of a law, where individual enterprise could not secure the result required, even though it becomes necessary for an unwilling minority to unite with them in sharing the expenses and the benefits.

We find an example of this, in the drainage of swamp lands, the reclaiming of tracts submerged or liable to overflow, and especially in regions that can only be cultivated under irrigation. In these cases, and others that could be cited, there is often a large expense to be incurred, before any benefit is realized. It is sometimes necessary to employ skilled engineers; to acquire right of way across lands that are not benefited, or that may be injured by the work in prospect; and sometimes to obtain the consent of a public authority before the work is begun. For most of these cases provision has been made in the several States, under general laws; and special legislation, in the absence of such laws, has seldom been denied, when the enterprise was reasonable and proper, and the owners of the property were able and willing to incur the expenses.

We cannot but congratulate ourselves, at one advantage in our favour, as compared with most countries upon the continent in Europe: we have no rights of common usage to conciliate. What a man owns is his; and his neighbour has no right to question him in its enjoyment, so long as he affects the rights of no one else, and so long as a public interest is not injured by his occupation. This is of course qualified by the conditions imposed upon all citizens, of yielding the right of eminent domain as it becomes necessary for public use, and of assisting in the maintenance of a common government. But there are other instances in which a common interest requires a common effort, beyond

that which is so naturally and so often manifested; by consultation, voluntary associations for the discussion of special subjects which concern all their members, and other measures tending to promote the general welfare.

In the matter of forest management, we find at times a convenience, amounting sometimes to a necessity, for the association of the interests of adjacent owners, in the profitable management of the property, which at a future time cannot fail to require the protection and regulation of law.

In the planting of groves and of wind-breaks upon farms, there is of course no occasion for public notice, any more than there would be in respect to a common grain-field; but in the matter of adjacent woodlands belonging to many owners—perhaps of large aggregate extent, but difficult of access—sometimes inaccessible without crossing the lands of others, there are points to be considered, that we may have to notice.

We find an instance at hand that will illustrate the subject. About fifty years ago, in Rockland county, New York, there was found a wild broken tract of forest among the highlands, extending into two adjoining towns, belonging to a considerable number of owners, and collectively known as the "Big Woods." It was found that the common interests of these owners, required a union of effort in which a majority might control for the common welfare, and an Act was procured March, 13, 1835, entitled "An Act to Enclose a Tract of Woodland in the County of Rockland."

It was a special Act, and after describing the tract by metes and bounds in detail, it named three of the owners as trustees, until others were elected at an annual meeting to be held by all the owners on an appointed day. These trustees were to cause the whole of the tract to be enclosed, each proprietor being allowed to build a certain portion, according to the share of his interest; or if this was neglected, it was done at his expense. In places where the boundary was along lands not thus enclosed, their owners were of course required to build their share as on common partition lines. A record of proceedings was to be kept, and a report made at the annual election of trustees. No person whatever, whether an owner or not, was allowed to turn any of his domestic animals into this common enclosure, unless upon his own part—which was to be separately fenced at his sole expense—under penalties that might be recovered by the trustees in an action of debt, and for the common benefit. In short these trustees were vested with corporate powers, in so far as concerned the maintenance of the protection of the combined estate. In this instance, it does not appear that any of the parties included, dissented from the arrangement. If there had been, it should afford no reason why the law should not have been passed, at the desire of a controlling majority. There would be no difficulty in arranging a general statute, in any of our States, that would meet all the contingencies likely to arise in cases of this kind; and if such a law provided that each owner should have in person or by proxy, a voice in the elections in proportion to his interest, and if the elections and accounting were annual, there appears to be no reason to suppose that injustice could be done.

In Prussia, a law was passed in 1875, after several years of discussion, which secured very effectually not only protection but management of the common interests of adjacent forest lands of different owners, after a proceeding which I regard as better calculated for guarding the rights of all parties concerned, than anything we have in use in this country, and for this reason I will present it as concisely as possible.

This law provided that where woodlands adjoining could not be worked conveniently, except by a common association, a majority might apply for measures having this object in view; might agree upon articles specifying the object, plan and organization, and submit the same to a district tribunal, of the district where located, with all the information necessary for its full understanding.

A time and place being appointed for a hearing, and all parties having an interest being notified, any one of them may appear and state his reasons for or against the proposed union. Those not attending are presumed to accept the decisions of the members present. If approved, a formal code of regulations is prepared and signed, in which the rights of every member are carefully stipulated, including rights of servitude, and the indemnities to be allowed for their extinction; and when these formalities are concluded, the company is declared fully organized, to continue until dissolved by a similar appointment

and proceeding. As such a tract of woodland might be of very unequal value, as well in respect to soil surface and location, as the condition of the timber that might be growing upon it, the values as well transient as permanent, are carefully appraised, and each owner is credited with what is found due.

There are obvious economies to be realized in the management of large tracts of forest land, quite as great as those from associated capital invested in large commercial or manufacturing purposes. I am well convinced that the problems concerned in this subject will at a future day become a matter of careful study in this country,—when the time shall approach, be it near or more distant, that the present great sources of our timber supply shall have been spent.

Should it be found practicable for capital to monopolize and control our lumber supplies, as it does our railroad system, and in various departments, our manufacturers, our financial institutions and our commerce; we need not doubt but that every advantage in the way of scientific principles and economical methods will be sought, and that the most will be made from the opportunities under control.

The time may not be near, but it is none the less true, that these advantages are worth seeking by every owner of a forest estate; and it is capable of proof that in many sections of the country, and especially in the broken and rocky portions of the Atlantic states that are unfit for agricultural purposes, as well as upon fields exhausted by improvident tillage, there is no form of investment that promises a better return. There is certainly no form of cultivation, that, after the beginning, requires less labour, and none which with proper protection is more sure of a profitable return.

These opportunities are offered in increased degree upon the prairies, with the additions due to a better soil, greater convenience in working, and often with a nearer market for the products, besides all the incidental advantages resulting to agriculture, which their presence would bring.

The Hon. H. G. Joly, of Quebec, read a paper on

THE STUDY OF FORESTRY AS AN IMPORTANT CONTRIBUTOR TO PRACTICAL EDUCATION.

There is a danger, in treating this subject—that of exaggeration—which will damage the best cause.

The fact that we have met here from such widely distant sections of North America —that many of us, leaving our homes and occupations, have travelled hundreds and hundreds of miles to attend this Forestry Congress—is a strong guarantee that every effort made to raise in public estimation the study and practise of Forestry, will meet with your hearty support. But I wish to appeal to your reason rather than to your sympathy, and to satisfy the judgment of the thoughtful men, who are ready and willing to join every earnest effort, if they can once see that its results will be beneficial to mankind.

What is meant by practical education? Training the child, his body, his mind, and his heart for the work of life. It is a general preparation for it. When you begin the education of the child you do not know what his future occupation in life will be. A good education is like a solid foundation built on the rock, ready to receive and support with safety any kind of superstructure that may be erected upon it.

Education is training.—There is mental gymnastic to train the mind, as well as corporal gymnastic to train the body. A man is not often called upon in after life to repeat the performances learnt as a boy at the gymnasium. He may even forget them, for want of practice; but he will preserve through life some of the strength and activity thereby acquired.

The aim of practical education or training ought to be as much as possible to choose

for the training of children such exercises as will be directly applicable and useful in after life ; and I think the study of forestry fulfils these conditions to a great degree.

Timber is in request, more or less, all over the world. The Esquimaux is about the only man who dispenses with it, not from choice, but because he cannot get it. His winter residence is built with blocks of ice, and he braves the angry waves of the North Seas in a leather canoe, ribbed with the bones of whales. Everywhere else you will find wood, sometimes only the palm tree, or even the bamboo, but everywhere in the wildest as in the most civilized countries, you will find wood in daily use.

Where the natural growth of timber is abundant the people will waste it, if they are not brought up with a due consideration of its value. As a Canadian, I can speak with some experience on that point. In such countries people ought to be taught the value of timber; which trees to cut, which to preserve, how to thin their forests with judgment, so as to increase their value, while deriving a good revenue from them.

On the other side, where the timber is scarce, or where there is none, like in the western prairies, people must be taught how to grow it. They must learn what kinds of trees are best adapted to their soil, their climate, and their wants, and how to grow them.

It is wonderful how little the country people in general know about forest trees. Let them begin to learn when they are young. The best mode of instructing a people is to begin by instructing the children. This is the surest way of reaching the people at large.

You will say : " You are speaking of a general system of education ; remember that what you propose will only apply to the country, and not to the cities." By far the great majority of the human race live in the country, and those who are condemned to live in the cities generally look forward, as a happy deliverance and reward for their labours, to the time when they will leave town and live in the country. Take the most devoted townsman and ask him if the forest trees are not the finest ornament of his streets. But let that distinction stand as between country people and city people, if you like. I will now attempt to show that the proposition enunciated in the title of this paper applies to both cases, and that the study of the elements of forestry can be made an important contributor to practical education.

How can you teach a child a better lesson of foresight, observation, patience, care for the smallest details, and perseverance, than in teaching him to plant a tree ? He will soon learn that he can only transplant his tree with hopes of success, in certain seasons ; that, if he does not take it up with care, carry it with care, replant it with care, it will not grow. He will soon find out that, by weeding and cultivating the ground, carefully staking his tree, pruning it judiciously, it will prosper.

Speak of the training of young trees ? Has not that very example of the careful training of a young and tender tree, been taken in all ages, in all countries, as the best example for the education of childhood ?

There are not many schools, even in the cities, where children could not be taught to plant, every year, and attend to at least one tree each. If there is no room on the school grounds, there is room along the streets, the roads, the squares, the uncultivated hills, stony patches, waste ground in the neighbourhood of cities, where trees would always be welcomed. The fact is that in several schools the practice has been already introduced in observation of Arbor Day. It is good work for the body and the mind, and I do not fear to say for the heart, too.

What a lesson you could teach a child when he asks : " How long will it take before that tree I am now planting is big enough to be cut down ? " if you answer : " It may take twenty, thirty, forty years or more ; that is a terrible long time to wait, is it not ? You may die before your tree is big, or go so far away that you will never see it again. But your work will not be lost, my child. If you do not profit by it others will, and you will have done more than many a grown up man has done ; you will have left something useful behind you."

A communication was received from Gen. Hermann Haupt, Manager for the Northern Pacific Railroad Company, inviting the Association to an excursion upon their road. The thanks of the Congress were voted to Gen. Haupt for this courtesy, and Mr. J. Fletcher Williams was requested to ascertain the details of arrangement.

Prof. Wm. R. Lazenby, from the committee appointed the day previous, to report upon Tree Planting, made the following report:

REPORT OF COMMITTEE UPON TREE PLANTING.

Forest Trees exist mainly for use, and no knowledge pertaining to the subject of Forestry is more essential than to know how to raise them. Trees may be planted for at least three distinct and special purposes:

(1.) For Timber.

(2.) For Shelter (an object too often overlooked), or,

(3.) For Ornament.

Your Committee would emphasize the fact, that the variety of trees grown for any of these special purposes, the manner of treating the seed and raising seedlings, the method of transplanting and after cultivation, will depend very greatly upon the conditions of soil and climate. Hence the success or failure of tree planting in one section, will be no criterion for success or failure in another. So variable are the attendant circumstances, that nothing except a very general report upon the raising and management of trees will be given.

PROPAGATION BY SEEDS.

No specific time can be given for securing all kinds of tree seeds. As a rule, they should be gathered soon after they are ripe, placed upon the ground and covered to a greater or less depth with soil; the depth depending largely upon the amount of moisture. All seeds which have a porous covering, like the elm, ash, maple, etc., should be sown in a carefully prepared seedbed, immediately after they are gathered. Seeds which have a firm hard covering, like the locust, retain their vitality for a long time, and may be kept in a cool, dry, equable temperature. Such seeds should be thoroughly soaked before being sown. In many sections of the country, seeds like the walnut, acorn, hickory-nut, etc., can be successfully grown by planting them where the trees are to permanently stand, rendering transplanting unnecessary.

PREPARATION OF SEEDBEDS.

For nearly all hardy deciduous trees, any open ground is suitable, provided the soil be deep, mellow and rich. For evergreens, and a few deciduous trees like the elm, the seedbed must be shaded. In propagating forest trees, it is well to grow several varieties at the same time. Some insects, atmospheric trouble, or ill-understood condition of soil, may cause a failure of one or two varieties, where others live and thrive. If all should do well, when you come to transplant, those that are the most valuable may alone be used.

TRANSPLANTING OF SEEDLING TREES.

As a rule, this operation should be performed after the first season's growth. For some cases, if the season has been unfavourable, the variety a slow-growing sort, and the seedlings are not crowded, it may be better to leave them in the soil till another year.

Trees may be transplanted in the fall or spring; these are points that must be determined by the exercise of judgment. In Forestry, as elsewhere, nothing should be absolutely trusted but your own senses.

HINTS FOR PLANTING AND CULTIVATION.

(1.) Plant thickly in rows, with full purpose to thin and prune as circumstances shall dictate.

(2.) Never plant a tree that has any dead or diseased roots.

(3.) Upon a heavy clay soil, never plant seedlings any deeper than they were in the seedbed. On a deep porous or drift soil, they should be planted several inches deeper.

(4.) Good cultivation is just as essential in a young forestry plantation, as it is in a cornfield.

PRUNING FOREST TREES.

A straight stem is always desirable, and to secure this some pruning is often necessary. Trees that are planted for ornament or for shelter should usually be allowed to branch low. Those grown for timber, should be trimmed up, *i. e.*, all the lower branches should be removed. Care should be taken, however, not to carry pruning so far as to check growth. All suckers should be annually removed from the base of trees.

CHOICE OF VARIETIES.

The varieties most valuable for any given section, will depend upon location, and the demand in the nearest market. Locust, Catalpa, Chestnut, Soft Maple, Box-Elder, Cottonwood, Willow, etc., are varieties which will give the most speedy returns.

White Pine, Black Walnut, Butternut, Ash, Oak, etc., while not yielding so speedy returns, will prove in many sections the most profitable in the end.

Remarks upon the report last presented, were made by Messrs. Burson, Minier, G. W. Wright and Northrop.

Mr. MINIER, presented some observations from his experience in the preservation and planting of seeds. He remarked as a general rule, a seed should be placed in the soil to a depth equal to three times its length.

Mr. NORTHROP strongly deprecated the planting of large trees.

Mr. GEO. H. WRIGHT thought that soft maple seeds should be planted the same day that they were gathered.

Mr. BEADLE inquired concerning the planting of black walnuts, and particularly as to the necessity of their being frozen in order to their germination. In the discussion that followed, Messrs. Burson, Beadle, Minier, G. W. Wright and Loring participated; the latter thinking that continuous moisture alone was sufficient.

Mr. J. G. KNAPP then read the following paper on the

EFFECTS OF CLIMATE UPON THE FOREST TREES OF FLORIDA.

BY THE HON. J. G. KNAPP, SIMONA, FLORIDA.

In the discussion of any product of Florida, the peculiar climatic conditions of the state must be constantly borne in mind.

In most regions latitudinal, isothermal and isohyetosal lines give clues to natural growths; and also to what exotics may reasonably be expected to succeed therein. The temperature and rainfall of regions to be compared as homogeneous, must be as nearly identical as possible. It is not enough, that the mean temperature of all the months in the year be equal; because, such an equality may be reached by very high degrees at one season of the year, and very low ones at another season. The same mean temperature for the year, may be thus obtained as well as if all the seasons had been more equable. So too, the isohyetosals for the year, may be the same in two places, and yet in one region the rainfall may be distributed very evenly throughout all the months, and in the other, all the rains may fall in a very few months. Under both these conditions, there will be the same annual temperature and rainfall; but vegetations will not be the same. The one may have killing frosts, and the other be nearly frostless. The one may have destructive rains and floods at one season of the year, and be parched and rainless at another; the other region may have the same amount of rainfall, but spread over the entire year. The mean is the same in both, but the extremes differ. Some of these differences, which characterize Florida, will crop out as this paper proceeds.

The soil of Florida does not essentially vary from the maritime portions of the other Southern States; therefore differences of forest growths must be traced to some differing conditions of the climate.

In an excellent paper, read at Montreal last year, "On the Distribution of the more Important Forest Trees in the Gulf Region," Dr. Mohr noticed a deviation of forest tree growth from the latitudinal lines, east and west of the Mississippi river. He instanced the long leaved pine (*Pinus australis*), as having its northern limit at 32° in Texas, while in Alabama it is found two and a-half degrees further north; and he might have added, that in North Carolina, its northern limit is four degrees further. The over cup oak (*Quercus macrocarpus*), is common in the bottoms as far south as 29° in Texas, yet it is even doubtful if it grows in Mississippi or Alabama. He very properly attributes these differences to the changed climatic conditions of the region west of the Mississippi, and mainly to the chilling influences of the north-western winds sweeping with unmitigated force over the vast expanse of treeless plains west of the forest region; and to the diminished precipitation of atmospheric moisture. Here is a rule which must not be lost sight of in considering any aspect of Florida—an equable distribution of rainfall.

Homogeneousness of climatic conditions causes homogeneousness of vegetation. So heterogeneousness of climate causes heterogeneousness of growths. It is not enough that there be the same isotherms and the same isohyetosals in the regions compared, but temperature and rainfall must correspond in months and seasons. San Antonia and Brownsville, in Texas, correspond in latitude and isotherms with San Augustin and the Ten Thousand Islands, in Florida, but the temperature and rainfalls vary essentially. In Texas the summers are hot and dry; in Florida warm and wet. The Texan winters have severe northers, which, even at Brownsville, would kill the orange tree. In Florida the frosts do not kill them as far north as San Augustin. The rains fall most in winter in Texas, and in Florida they occur in all the months, but most in summer. The dry season of Texas, often a drought in summer, is met in Florida, at the same season, by an average of four showers in a week and a rainfall of three or four feet. In this is found the main cause of the difference of forest growths in the two States.

Below the 33rd degree of latitude, the atmosphere may contain the same absolute degree of humidity, or insensible water held in suspension, over Texas, Mississippi, Alabama, Georgia or Louisana and Florida; yet there may be a great difference in the amount of precipitation in the different localities, owing to a difference in temperatures. The winters of Florida are warmer than in the other States, and the rain and dew are less because the warm atmosphere can retain the moisture. On the other hand the summers are warmer in those States than in Florida, and the latter has wetter summers than the former, which make them suffer from summer droughts. This variation of temperature and rainfall, is one cause of the variation of forest growths. Add to this cause the variation of timber growths already mentioned, which places Texas north of the belt of the long leaved pines, and it is not difficult to suppose most of Florida south of the same belt, and the heterogeneousness of the Florida forest as compared with those of Alabama and Georgia may be accounted for notwithstanding latitudes.

DIVISIONS OF FLORIDA.

In Florida the isotherms and belts of rainfall have such a parallelism east and west, that the most convenient method of considering its forests is by the lines of latitude. The State extends into seven degrees of latitude, and I shall consider it under seven divisions or belts. 1 Northern, 2 North Central, 3 Central, 4 South Central, 5 Southern, 6 Semi-tropical and 7 Tropical.

NORTH FLORIDA.

This belt lying between 30° and 31°, embraces all the northern counties, and extends from the Perdido [Partido?] river to the Atlantic. As far east as the Suwanee river, it is mostly in what Dr. Mohr designates "the great maritime pine belt of the eastern Gulf States;" the timber trees of which he has so ably described, as to leave

little need of further notice. On the older formations of Gadsdon, Leon, Columbia and Jefferson counties, besides the pines on the most silicious portions, are found the more southern forms of hardwood trees and some of truly Florida growth. Mingled with these are seen a few of more northern growth. These last contain the blue ash (*Fraxinus quadrangulata*), red maple (*acer rubrum*), basswood (*Tilia Americana*), mulberry (*morus rubrus*), sassafras (*S. offinale*), sour gums (*Nyssa multiflora* and *unaflora*), sweet gum (*Liquidambar styraciflua*), the magnolia *grandiflora*, *acuminata*, and *glauca*. Among the oaks are the live oak (*Quercus virens*), willow oak (*Q. phellos*), swamp white oak (*Q. lyrata*), swamp oak (*Q. Michauxii*), water oak (*Q. aquatica*), turkey oak (*Q. Catsbaei*) and blue jack (*near tinctoria*) ; the pignut (*Carya porcina*), and water hickory or bastard pecan, (*C. aquatica.*) Dr. Mohr describes many other trees of great value which are found in this belt. The lands on which the hardwoods grow, are denominated "hummucks," or "hammocks," as distinguished from pinelands, and are esteemed the richest soils of the State. The richness is in part due to the character of the soil, but more to the fact that the forest fires seldom run on them to consume the fallen leaves and grass. But this richness has had the effect to destroy these same valuable forests, in order to make fields for cotton and corn.

Near the Atlantic coast and east of the Suwanee river the land is more level, and much of it is at times submerged, giving rise to the expression "flat woods." On this land the long-leaved pine (*P. australis*), loblolly (*P. tæda*), and swamp or bastard pine (*P. cubensis*) are found. But owing to the fact that these lands are not sufficiently drained to allow the long tap roots of the yellow or long leaved pine to penetrate the subsoil, these trees are small and low, as compared with those of the dryer lands. The swamp pines are also less than those described by Dr. Mohr, further west. Much of the timber, such as it was, near the railroad lines, has been already stripped off, and the land is left a prey to the devastating fires that during the dry seasons annually sweep over it, and destroy any young trees that might otherwise grow.

This belt contains many small swamps, called "Bayheads," filled with small bays, swamp ash (*Fraxinus platycarpus*), and small cypress trees, few of which are of any value as timber. The cabbage palmetto (*sabal palmetto*) is common in those flat swamps, but are generally small and short, from some defect in the soil or climate. On places best drained the pines are largest, and the live oaks and water oaks appear. The last on the lower St. John's and St. Mary, become large trees, of little value as timber and short lived as ornamental trees.

The causes spoken of by Dr. Mohr as diverging the timber belts from the parallels of latitude, operate in this portion of Florida, and cause the eastern portion to show a range of timber trees of warmer character than in the western portion ; so much that that portion may be considered south of the great maritime pine belt.

All of north Florida possesses a very decidedly warmer temperature than even the adjoining counties in Georgia, fitting them to excel in early market gardening. East of the Suwanee the orange is largely cultivated. The wet lands of this belt are not unhealthful, because there is little alluvium in the soil, and the fresh water in the swamps and marshes does not become stagnant. All can be completely drained, and when so done, the cultivation of crops adapted to the soil and climatic condition will become profitable.

Before leaving this belt, it should be stated that in Gadsden county, near the town of Chattahoochee, and confined to a small locality, grows the *Torreza taxifolia*, or stinking cedar, the most indestructible wood known ; also the Florida yew (*Taxus Floridiana*) grows near the same place. The first is a small tree, but deserves the attention of the arboriculturists in the south. Like the *Sequoia*, it has come to us from æons of the past.

THE NORTH CENTRAL BELT

lies between the 29th and 30th parallels, at the base of the peninsula ; and is affected by the winds from both gulf and ocean. A great climatic change takes place here. In the eastern half of the belt the sweet orange trees are seldom severely injured by frosts, though frosts are seen every winter. The cold atmospheric waves prevent the growing

of the lemon, citron, and lime. The oranges in this belt do not contain the same amount of sugar as those grown further south, and the grape fruits and shaddocks are not considered edible. The forest growths, however, wear a decidedly warm aspect. The short-leaved and loblolly pines are seldom met with. The white oaks, magnolias, elms, and gums diminish in size and number; the black walnut (*Juglans nigra*), and some other trees disappear from the forests, and other and more southern trees have taken their places in the forest growth of the belt. The climate is becoming more decidedly Floridian. The cold waves are less frequent and injurious in winter. Sufficient rains fall during the colder months for such agricultural products as can be grown. The months of May and June are the dry portion of the year, though they can scarcely be classed as droughty. The summer rains are more frequent than in the northern belt, and the flat woods more often covered with water. These rains have been known to destroy the yellow pines and turkey oaks, in the water lands. Some of the richest hummocks in the State are found in this belt; but not unfrequently, as in the higher portions of the northern belt, these have been sacrificed to corn and cotton. Some fine tracts of pine lands are found in this belt, but they are being sacrificed to fire and cotton.

THE CENTRAL BELT

lies between the 28th and 29th parallels. Being near the centre of the peninsula, and under the influence of the Gulf and Atlantic winds, a further climatic change has taken place, and the Floridian character is more fully established in this belt. The parallel of 28°, and the isotherm of 72° nearly coincide, only separating on account of the greater altitude and distance from the ocean and gulf in the middle of the peninsula. Cold waves do not reach this belt with destructive force every year; and it may be truly said no one can be prepared to speak of the climate and productions of Florida, who has not made himself thoroughly acquainted with this region in all its part.

On both coasts are found the mangroves, butterwoods, ironwoods, and other trees of decidedly tropical origin. The sweet orange, both in tree and fruit here approach their highest perfection. In this central belt lie the counties of Hernando, Sumter, and Orange; the southern portion of Volusia, and the northern portions of Brevard, Polk, and Hillsboro. The backbone of Florida is still found in the counties Hernando, Sumter, Orange, Polk, and Hillsboro. It is supposed that the highest point in the state is in this belt. Some very rich hummocks lie in it; and there is much first-class high pine land, on which the orange trees thrive well; and, as they are never killed by the cold waves, they promise to be durable and prolific. Oranges and other fruits are more profitable than cotton raising, which is yearly increasing in area; and it is to be hoped that the destruction of the forests for the purpose of cotton growing will not continue. Nearly all the wet lands of this belt may be drained sufficiently to grow sugar cane and rice, and make excellent pastures and meadows. Such improvements may put an end to the firing of the woods and consequent destruction of the forests from that cause.

THE SOUTH CENTRAL BELT

lies between the 27th and 28th parallels. Wherever the land is sufficiently dry in this belt, is the region *par excellence* of the semi-tropical fruits. In it lie the counties of Hillsboro, Polk, Brevard, and Manatee. The backbone of Florida extends across the counties of Hillsboro and Polk. Though there is a large area of flat land on which more or less water lies during the rainy season, all may be drained, and made valuable land for agricultural purposes. Much of this land is too wet during the rainy seasons for a healthful growth of the long-leaved pine; and the fires in the dry seasons have destroyed many trees that might otherwise have grown. The cold is never sufficient in this belt to kill the leaves of the sweet orange, grape fruit, and shaddock trees; and the more tender lemon, lime, and citron are seldom cut by the cold waves. The growth of the citron family is continuous, and they all thrive on soils adapted to their growth. All these fruits can remain on the trees until fully ripe, and they have matured their full supply of grape sugar. Hence the best seedling fruits of the state are found in this belt; and it is confidently believed that a large proportion

of the dry land, from which the wild forests shall have been removed, will be again covered with fruit trees, and thus all the climatic advantages of forests be secured.

The wet lands are more subject to winter frosts than the dry ridges, and therefore should not be selected as sites for winter gardens, or for the growth of the more tender fruit trees. The high grounds of the southern terminus of the backbone of the peninsula tend to bend the thermal lines of winter further south in the centre, than on either shore of this belt.

The climate of this belt is decidedly Floridian in character, and cannot be compared to anything bordering upon the Mediterranean. From the vernal to the autumnal equinox, the winds, seldom more than the most gentle breezes from gulf or ocean, vary vary from the west by the south to the east; not unfrequently from all these directions on the same day. The two months before the summer solstice are the dryest, and the three months following that date are the wettest portion of the year. It would therefore be advisable for gardeners, nurserymen, and orchardists to secure the means of watering their crops in that dry period; while the wet season will admonish them to avoid those lands on which water can accumulate on or near the surface, as to all their crops, except sugar and rice; or to provide the means of draining them at that season.

"Bayheads," abounding in rich muck are frequent; and valuable marls and rich phosphates are abundantly scattered over it. By the use of these the dry grounds impoverished by the fires that have devastated these lands for years, may be restored sufficiently to produce crops of grass and fodder plants for the support of stock, upon which farmers here, as elsewhere, must finally depend for the means to keep up the fertility of their lands, and give nourishment to their fruit trees.

Notwithstanding the large amount of wet lands in this belt, there is a tract containing more than 2,500 square miles, where mosquetoes are no more troublesome than in the farming lands of the older northern states, and biting gnats are unknown. The fact is mentioned, not accounted for.

The forest growth of this belt has undergone a further change. The white oaks have disappeared from the woods; the basswood, elm, magnolias, ashes, sassafras, the short-leaved pines and many others are seen for the last time. Two pines not mentioned by Mohr are found. On the keys and mainland are found the mangroves, the sea grape (*Coscoloba uvifera*); gumbo-limbo (*Bursera gummifera*); several varieties of eugenias or ironwoods, white buttonwood (*Conocarpus erecta*); black buttonwood (*Laguncularia racemosa*); sea bean (*Dolichos puniens*); the sweet and sour saps, and several others of the custard apples (*Anonas*); the prickly ash (*Xanthoxylan pterota*); the hog plum (*Ximenia Americana*); the whitewood (*Sapindus saponaria*); the wild fig (*Ficus aurea*), whose juice forms a kind of India-rubber; the Spanish dagger (*Yucca aloifolia*) frequent the coast, but may be transplanted to the dry lands, and constitute a hedge impervious to man and beast. Single trees will form a body straight as an arrow, twenty feet high, crowned with a spike of a thousand white liliaceous flowers, and its wood assumes the double form of an endogens and exogens, like Dracæna, whose antique form is found in the fossils, clathraria and sternbergia. These are a few of the many trees, shrubs and plants of a truly tropical character, found on both coasts and far into the interior. With this almost tropical climate, and vegetations approaching the tropical, no portion of the state is naturally as free from malarial diseases as this; and its general salubrity and advantages must guarantee a dense population to this belt.

THE SOUTHERN BELT

lies between the 26th and 27th parallels, and is embraced in the counties of Manatee, Monroe, and Dade. Its north line passes just north of Charlotte harbour, through the centre of Lake Okeechobee, and a little north of Jupiter Inlet. Its only harbours are on the west side. The few settlements, generally by cattlemen, are confined to the banks of the Miakka, Peace, and Caloosahatchee rivers, to the western keys and the rocky ridge along the eastern shore. The known forests are confined to about the same limits. The peninsula in the southern central belt has been gradually flattening, and the rainy season covers much of this belt with water, without sufficient drains to discharge it into the

ocean. Wet prairies are the result, on which only water plants can thrive, though at some seasons these are dry, and for many years they have suffered like the balance of the state by the insane practice of the incendiary's torch; and all the young trees have been killed as fast as they may have attempted to grow. This, together with the water covering the ground in the wettest and hottest season of the year, has most effectually prevented much of this region from making only a small forest growth.

In this belt the influence of a yearly six feet rainfall, and a tropical heat during summer, have caused a complete absence of all truly northern varieties of trees. The live oak, the southern pines, and a hickory near the Pecan, with a very hard shell, are about the only trees of more northern origin found in this region. The cypress is still seen in the swamps; but, as in the belt next north, it is not the large valuable timber tree of Alabama and Mississippi. The cause of diminished growth is not explained, unless the climate is uncongenial; and it is only found here because trees better adapted to the climatic conditions have not found their way hither.

Frosts are seldom felt in this belt, and all plants that can endure a minimum temperature of 40° will succeed on all lands suitable to their growth. On both shores are found cocoanut palms, and other trees of decidedly tropical character, and we may safely conclude that many other valuable trees may be introduced successfully from abroad. This belt, almost without exception, is sufficiently elevated to admit of perfect drainage. It is now healthful. What effect drainage may have in that respect remains to be determined. I incline to the opinion that it will not be injurious.

THE SEMI-TROPICAL BELT

embraces all the balance of the peninsula, with the east and west keys. Its harbours on the west are Calvareo Bay and the Ten Thousand Islands, entirely unexplored and unmapped, and Bay Biscayne on the east.

The trees are almost exclusively tropical, including the royal, thinax, and cocoanut palms, the cinnamon tree (*Canella alba*), the quassias (*Simaruba glauca* and *S. amara*), satinwood (*Chrysophyllum oliveforme*), torchwood (*Amyrio sylvatica*), that will blaze like a candle when fresh cut from the green tree, lignumvitæ (*Guiacum sanctum*), hornwood (*Condalia ferrea*), the hardest and heaviest of all Florida woods. Mahogany (*Sweetenia mahogani*), crabwood (*Schæfferia frutescens*), manchineel (*Hippomane mancinella*), poisonous to cut or work even when dried, the joewood (*Jaquinia armillaris*), the most curiously grained and ornamental of all timber, the Bastic (*Dipholis salcifolia*), the mastic (*Sideroxylon mastichodendron*), the lancewood (*Nectandra willdenoviana*), the wild tamarind (*Lysiloma latisiliqua*), the tallowberry (*Byrsomena lucida*), and many others of great commercial value and commendable qualities. From these trees we have plain indications that other valuable trees may be here produced by cultivation.

Except the shores and keys, this belt is unexplored. Most of the Indians left in Florida are hidden in its unknown recesses, where whites have never penetrated. The accepted opinion is that it is uninhabitable by Europeans, or even Africans. No reason is assigned for the opinion. These Indians reach it by land, but are never guides. Neither cattlemen, surveyors, nor naturalists have penetrated into the interior—into a region larger than the States of Connecticut and Rhode Island. What forests may be hidden in its everglades, or what new and old varieties may be found, we know not. Whether it consists of tangled jungles like India and central America, from whose labyrinths men can only extricate themselves by the use of a compass; or, if it be deep morasses of tall water grasses, and tropical reeds, no one can do more than guess. We only know that most of it may be drained, and converted into extensive sugar grounds and rice fields, with grain-bearing bamboo plantations; while its drains shall form water ways to the markets of the world, and return to its people such things as they may need. It is healthful now, as far as known, and the copious rains that fall on it, with the sea breezes that always fan across it, will in all probability prevent any unfavourable results from its drainage and cultivation; seeing that all its water-ways should be lined with balsam bearing trees.

consists of the Southern Keys. These are narrow islands washed on every side by the warm waters of the gulf stream. No winds can reach them that do not pass over those warm waters. They are of coraline rocks, and elevated but a few feet above the level of the ocean. Winds reach them unbroken, and storms dash the salt spray across some of them, and waves roll over others; so much that the firm rooting mangroves cannot obtain a durable foothold, and make a shelter for other plants and hold the sand and wind. On the higher keys are palms and the trees and fruits of the West Indian Islands. The water in the ground is salt, and the inhabitants must always depend upon the clouds for their water to drink. All trees except the palms must be short. The population must find employment in gardening, wrecking, and fishing, and live in fields rather than villages and cities; and being on the very verge of the trade winds, these keys must be of great value on account of their climate as residences, and for their productions, though from their narrowness and rocky soil they may never be covered with forests of large trees.

NUMBER OF TREES IN THE UNITED STATES.

There are said to be four hundred and twenty varieties of trees in the United States, and of these full one-half are found growing on Florida soil. More than fifty varities are confined exclusively to this State, more ornamental woods than in all the other States. The climatic conditions we have thus rapidly sketched, the heteroclitical character of Florida, as compared to the balance of the continents of America, Europe, Africa, and a very considerable portion of Asia, becomes apparent, and the trees peculiar to Florida in a great measure demonstrate this characteristic.

Those who may desire to introduce other varieties of trees, whether for the timber, fruit, or ornament, will, by an understanding of these climatic conditions, have a clue to the locations from which the desired trees are to be derived; as also the kinds that will be likely to succeed in this climate. Selections are not to be made from the extremely dry regions of Mexico or California, from the semi-parched coast of the Mediterranean, or the Cape of Good Hope, in Africa, or from the parched peninsula of Persia in Asia, where irrigation is absolutely required for production. Rains are as abundant, and in the hottest seasons of the year in central America, and in Brazil, along the Congo, Niger and Senegal in Africa; in the islands of Ceylon, Java and Sumatra, as they are in semi-tropical Florida; but most of them have a dryer winter. In those places are many trees of great value, which may find a home in Florida, such are the cocoa *(Theobamba cocoa)* from whose nuts chocolate is manufactured; the cow tree, *(Galactadon utile)* which, when tapped, as we do the maple, yields a thick glutinous milk, without acidity, that is drank and eaten as if it were milk from the cow, and is equally nourishing; the Brazil nut, *(Berthelletia excelsa)* whose nuts are so well known, may be grown near the southern shore of the peninsula. It delights in wet marshy lands. The baobab *(Adansonia digitale)* one of which is the oldest tree known upon the globe, and produces the monkey's bread, which is both food and a remedy in putrid fevers; the bread fruit *(Atrocarpus incisa)* with many of the higher orders of spice-bearing trees may prove equal to any cold that may occur in our two southern belts, if they may find a foothold in our coraline rocks, and the salt spray not be uncongenial to their growth. Experiments should be made with many of these trees to determine their adaptability to Florida. There are other trees, like the date and other pinnated and thorny palms, upon which sufficient experiments have been tried to show that they can be grown as far north as Brooksville, latitude 28° 30′. The cocoa-nut palm will thrive near the coast as high as 27° 30′. Although these palms may require twice as many years as the sweet orange before they will bear fruit, yet, when they shall have reached that stage, they will not be less valuable, and with the other valuable trees, will give all the beneficial results, as would the preservation of the natural forests, in retaining to Florida its healthfulness, and afford the people even better shades, and the soil better protection. Among the many valuable trees native and exotic, that may be profitably extended to the warmest regions of the State, the pecan *(Carya oliveformis)* and the mulberry should not be forgotten. The former

will follow the bitter pecan *(Carya porcina)* to Charlotte Harbour; and the *morus multicaulis* and *morus rubra* will flourish all over the State. The latter is a rapid growing tree of valuable timber, and the fruit of both may be made of mercantile value. The olive, as far as tried, thrives well in all parts of the peninsula.

A REGION FROM WHICH TO CHOOSE.

In casting about for a region nearest assimilated in climatic conditions to our Florida, none seems to approach so nearly in its summer rains, equability of temperature and semi-tropical heat, as does the region found near the foot of the Himalaya ranges in upper British India. Here are found some of the largest and most valuable of timber trees, also trees whose fruits are more valuable than the timber itself. Here is the magnificent teak *(Tectona grandis)* whose timber is preferred by the cabinet-maker to mahogany, and by the ship builder to the live oak. The mango and mangosteen are trees nearly as large as the teak, and their timber is nearly as valuable, while their fruits hold a high rank. The tamarind, and the orange with its congeners are natives of this region. These make large and valuable timber trees, and their fruits are too well known to need description. The orange is known to succeed in nearly all of Florida, and the tamarind is found as far north as the twenty-eighth parallel. Some others have already been introduced, and succeed in the southern belts. Others will do the same. Some will thrive on the drained morasses and everglades; and others will cover the dry lands, from which the pines shall have been removed, with more valuable timber and fruit trees and shades, and fill the atmosphere with equally balsamic odours. The tall, straight bamboos, whose seeds equal rye for food of man and domestic animals, can take the place of the tall worthless saw grass and aquatic plants of the morasses, and give their annual yield of seeds and reeds for ages without cultivation. These gigantic straws are brought to our ports by the ship load, and are familiar to every fisherman and boy. Florida might and should supply the United States. The peninsulas of Siam and Cochin China, even China and Japan must be searched for treasures with which to fill our Florida.

ONLY ONE FLORIDA.

The whole earth has but one Florida, and the United States own that. There is only the Florida peninsula in all this world, washed on the west, the south and the east by that greatest of all rivers, "the great river in the ocean," the warmest water of that ocean; but one region in America, if in all the earth, over which devestating cyclones and tornadoes do not pass; but one semi-tropical spot over which siroccoes do not blow and parch; but one region daily fanned by ocean breezes, and whose atmosphere is the breath of flowers and balsamic odours—that region is our Florida.

The general Government may therefore well afford to give a few dollars to the exploration, to the study of the capabilities of Florida; and to place on its soil such trees and plants of value as are adapted to its climatic condition. Florida has in its climate, and may have in its productions, such treasures as none of its sisters can possess—treasures that should be most carefully fostered. Good statesmanship requires the most careful yet liberal legislation on the part of Congress and the State to protect and improve this best inheritance bequeathed by the FATHER to man, till Florida, from an unknown and much slandered region, least of states in estimated value, shall be ranked among the first of states, not only in her rich productions, but in being the home of a healthful and happy people.

Professor DANIELS, of Saint Paul, read a paper on

HOW TO ENLIST THE SCHOOLS IN AID OF FORESTRY.

He spoke of the prevailing ignorance upon the subject of forestry. In creating an interest in the matter, he would first ask the co-operation of the school-teachers, but this also implied an interest on the part of school boards and the State. The first step would

be to summon all the teachers to enlist themselves so far as to know trees by sight, so as to be able to call them by their proper names; for the teachers as a rule were not better informed in these matters than the general public. The essayist went back to the olden time, when country life was more prominent than city life, and when the children, living as they did in the midst of forests, were acquainted not only with the varieties and uses of wood, but of all plant and animal life. The conditions were now changed, and our cities were swarming with people who knew nothing at all about these things. How was such knowledge to be imparted? It must be done through the public schools. Every teacher should be able to teach at least the names of the trees passed by the pupils on their way to school, in the public parks and about their homes. To these should be added the fruit trees. The essayist believed it would be proper for the Legislature to require boards of education to require of the teachers sufficient knowledge to teach these things. In time, when the pupils become more advanced, they should be taught concerning the germination of seeds and the setting of trees. The essayist also suggested the plan of having the pupils cultivate little patches of trees from the seed. If it was urged that the schools were already overcrowded with studies, he would propose that some of the ornamental studies be thrown out and forestry substituted.

It was announced that the excursion upon the Northern Pacific Railroad would start from the Union Depot at 8.30 A.M. on the day following, and that the tickets would be issued to Mandan, Dakota, and return.

A donation of cut flowers from Messrs. Underwood and Emery, of Lake City, to each member of the Congress was then announced, and upon motion of Mr. JOLY, a vote of thanks was returned.

The President having an engagement that would prevent further attendance, made brief remarks upon retiring, and the Congress adjourned until 7.30 P.M.

Evening Session, August 9.

The hour for meeting having arrived Mr. H. G. JOLY, First Vice-President assumed the chair.

Professor ADOLPH LEUÉ, of Cincinnati, Ohio, read a paper entitled

FORESTRAL EXHIBITIONS IN CONNECTION WITH FORESTRY CONVENTIONS.

Professor Leue commenced by saying that forestry conventions in this country have a double purpose—mutual instruction on the one hand and the arousing of a popular interest in the cause of forestry on the other. Nothing should be left undone that may tend to make a forestry convention both instructive and attractive. Instructive to those who earnestly seek information in matters pertaining to forestry, and attractive especially to those who have heretofore persistently remained in that peculiar state of apathy towards our forests, which so advantageously distinguishes the people of this country from those of Europe. The question, How can these be reached, was a problem which at all times had engaged the attention of friends of forestry, and which had never been solved satisfactorily. Forestry, in treating of trees as individuals, of trees in their relation to one another, to the soil, to man, in fact, to all nature, was an extremely interesting study, of which only those who had given it special attention had any idea. In order to reach the indifferent, and create an interest in this study among the people, we must take the forest to them, applying as it were, the advice of Malcolm, when he says:

> "Let every soldier hew him down a bough,
> And bear't before him."

Not only boughs, but anything of the forest, that may be instructive, beautiful or even odd, should be brought. Such a collection which the friends of the forest might easily bring together, will, if properly arranged for exhibition, attract the attention of the people, excite their curiosity and induce them to come and see. Seeing will beget a desire to learn, questions will be asked and discourses listened to, in short an interest will be created and the object is attained. Such an exhibition at each of our annual conventions can not be valued too highly as a means of education. It will stimulate researches, impress upon the mind certain truths, remove doubts, correct errors, become the testing stone of our forestal knowledge.

Professor B. G. Northrop, of Connecticut, addressed the Congress at some length upon

THE NEED OF A DEPARTMENT OF FORESTRY IN COLLEGES.

Professor Northrop stated that he had agitated tree planting in Massachusetts and Connecticut, and that now there was not a homestead in Connecticut that had not been beautified by tree planting during the past fifteen years. What was most needed was to popularize and diffuse the sentiment of trees. Men were more readily reached by sentiment than in any other way. The place to start is at the beginning, and that important fact seemed to have been neglected. There was a school of forestry in Ames, Iowa. There was an arboretum connected with Harvard, but aside from this few steps had been taken to encourage the education of the youth in forestry. In Europe it was one of the rudiments of an early education, and a person destroying a tree or shrub in France or Switzerland would be looked upon as a miscreant just as much as one who would poison the public drinking fountain. What was most needed was to instruct the youth of America in the sentiment of trees and then there would be no need for special legislation to protect the beautifiers of our homes, and we would not be troubled by the starting of forest fires. The value of trees for the reclamation of waste land was not understood, but has been found to be very effective even in Europe. On the shores of the Bay of Biscay terrible storms of sand were continually blowing, and trees were ultimately planted. They protected the habitations on the coast, and where these terrible storms prevailed with such disastrous effects there now stood a beautiful forest over 100 miles long. Thirty years ago Daniel Webster influenced tree planting on Cape Cod, then a barren waste, and to-day there were hundreds of acres under forests. This tree planting had become a matter of vital importance even in China, and recently several trees were planted as an experiment to reclaim waste land near the city of Tine-Tsin, on the property of Wing Ho Tong, president of the Chinese Merchant Steamship Navigation Company. The tree that he was experimenting with was the European larch.

This led to a discussion upon certain points suggested, in which Mr. Thane, Professor Budd and others participated.

The Growth of Various Trees.

Mr. George W. Minier, of Illinois, gave the result of some measurements he had made of forest trees in that State, measuring the circumference at two feet from the ground, as follows :—

Balsam fir, twenty-two years setting, twenty-four inches in circumference ; Norway spruce, thirty years setting, thirty-one inches ; white elm, thirty years, from seed, seventy-two inches ; white ash, eleven years, from seed, twenty inches ; hard maple, twenty-one years setting, thirty-three inches ; tulip, twenty-three years setting, fifty-two inches ; Scotch pine, twenty-one years setting, forty-six inches ; hemlock, eighteen years setting, twenty-two inches ; European larch, twenty-one years setting, thirty-eight inches ; white pine, thirty years setting, sixty-three inches ; Austrian pine, thirty years setting,

forty-three inches; red cedar, thirty years setting, thirty-seven inches; white cedar, thirty-one years setting, thirty-seven inches; soft maple, thirty-one years, from seed, thirty-three inches; black walnut, thirty-two years, from seed, twenty-eight inches; butternut, thirty-two years, dead, thirty-two inches; butternut, thirty-two years, living, twenty-nine inches; white willow, eighteen years from cutting, sixty inches; chestnut, five years from seed, twelve inches; soft maple, thirty-one years setting, sixty inches; red elm, eight years from seed, twenty-four inches.

Mr. Minier stated that the trees were not selected for their size, but the object in the measurement was to take the trees as they averaged in the State.

ARE THE CONCENTRIC RINGS VISIBLE IN THE WOOD A CORRECT INDICATION OF THE AGE OF THE TREES?

Ex-Governor Furnas, of Nebraska, stated that the concentric rings of trees is no criterion of the age of the tree. As a rule Mr. Furnas said the number of rings were in excess of the age of the tree, but he had found one specimen, the age of which was absolutely known, which bore less rings than the age of the tree. He had another specimen which contained two rings for every years' growth.

Prof. Budd, of Iowa, invited attention to a specimen of white poplar, grown on the Iowa Agricultural College farm. It was a close grained timber, does not warp or shrink, and thought it would be a good substitute for the white pine. The specimen showed more than thirty rings, while its actual age was not more than fifteen years. In answer to a question, Prof. Budd said his experience in propagating this poplar from twig cuttings had not been very encouraging. Root cuttings, however, were of quick and strong growth, and twig cuttings put out in the fall generally did well.

Mr. Foster, of Iowa, said he had found in trees he had raised and cut—the catalpa—the rings corresponded with the age of the tree. He noticed, however, that there was a great difference in the width separating the rings, but he was not prepared to say that the rings were unerring indications of the age of the tree. Mr. Foster also stated that he had grown a white pine, not yet thirty years old, which was twenty-seven inches in diameter, which convinced him that that timber could be successfully grown.

Professor Budd said that he had noticed that in dry seasons trees would produce two rings.

Mr. Minier, of Illinois, said he had cut this spring two pine trees he knew to be thirty years of age, in which the rings corresponded with the age, and in his opinion if the gentlemen would look a little further they would find that the timber in which the rings did not agree with the age, they would find it was in cultivated timber. Nature never produced a double flower. Cultivation did that. So, in his opinion, was the ring question, cultivation did the business. As to a substitute for white pine, he thought the reproduction of that wood itself was the cheapest and the best.

Professor C. E. Bessey, of Ames, Iowa, took the position if two rings were produced in one season, there must have been two separate and distinct periods of growth that season, and he asked that each member of the Congress resolve himself into a committee of one to study the subject in readiness for the next meeting.

Professor Wm. Saunders, of London, Ontario, read a paper on the

INSECTS INJURIOUS TO THE WHITE PINE.

This paper is embodied in the report of the Entomological Society of Ontario for the year 1883.

Mr. Elizur Wright, of Boston, Mass., read a paper on

THE HYGIENIC VALUE OF FORESTS.

In comparative computations this is perhaps the least of the values attributed to the woodlands, while possibly, it is the greatest. Health is of the greatest interest to every organized being. The necessary condition of health to all that breathe is, that the atmosphere shall be reasonably pure. It must consist simply of oxygen gas diluted with about four times its volume of nitrogen. Any other gas vitiates it, and, especially if the air should contain as much as one per cent of carbonic acid gas, it becomes intolerably unwholesome. Geology teaches us that previous to the formation of the coal beds the atmosphere was so mixed with this deleterous gas, that such breathing animals as men could not have existed. It was necessary to deoxodize the carbon that existed in that gas, before the higher forms of animal life could exist. And this was done by that vegetation which extracted carbon from the air, and left it in the form of coal.

But no sooner was the air by the paleozoic forests made fit for breathing animals, than these, in the act of breathing, poured more carbonic acid gas into the air, so that the trees or some other powerful deoxodizer must still keep at work purifying the air, or the breathing animals would be stifled; for be it remembered that carbonic acid though it mixes freely with common air, is so much heavier that it is always found in the largest proportion near the surface.

Well, however it may have come about, what exists to-day is, that animals and vegetables are dependent upon each other. The warm-blooded animal is constantly pouring out of his blood, through his lungs, waste carbon, in the shape of carbonic acid gas, and the tree is constantly absorbing that carbon through its leaves and releasing the oxygen. We must not argue from the vastness of the atmosphere that the animals can get along without the trees. Where is any other deoxodizer that works on a sufficiently large scale? Observe that men and domestic animals not only multiply by millions on the face of the earth, but they are disembowling the earth of its coal and burning it by hundreds of millions of tons a year, which means that they are doing much to put the atmosphere into that condition in which only saurian monsters could live. The tall chimneys carry much of the carbonic acid far above our heads, and the kind winds waft it away to the mountain sides, where it feeds the hungry trees. The great Hebrew legislator plainly recognized the hygienic value of trees, where in his Deuteronomy he wrote:

"When thou shalt besiege a city a long time, in making war against it to take it, thou shalt not destroy the trees thereof by forcing an axe against them: for thou mayest eat of them, and thou shalt not cut them down (for the tree of the field is man's life) to employ them in the siege." Deut. xx. 19.

The true doctrine, including the mode of operation, of the interdependence of men and trees, is quite a modern one. Its real discoverer died only six days before the present speaker was born. He was a particular friend of our Benjamin Franklin. Nearly nine years ago, at the unveiling of the statue of Joseph Priestley, at Birmingham, Prof. Huxley used these memorable words:

"He laid the foundation of gas analysis, he discovered the complementary actions of animal and vegetable life upon the constituents of the atmosphere, and, finally, he crowned his work this day one hundred years ago, by the discovery of that pure 'dephlogisticated air' to which the French chemists subsequently gave the name of oxygen."

For human welfare, was there ever a more valuable discovery in the annals of time?

Yet Priestley was persecuted for his humanity and really driven from his own country to ours. His country honours itself with his statue. Let ours honour itself with the glorious forests of the future, whose cause he pleads.

All vegetables absorb more or less carbon from the atmosphere, but plainly, trees the most, for wood consists mostly of that substance. A white pine will grow on a slightly covered rock, when the soil accessible by its roots could not possibly contain enough carbon to make a cubic foot of wood till its grand trunk contains 500 feet or more. That trees do not get their carbon from the soil or the water therein, the negative evidence is partly complete. That they get it from the carbonic acid floating in the atmosphere, I will adduce authority from the highest scientific minds of the age.

Prof. Balfour, of Edinburgh, after citing and considering all the various opinions and theories of naturalists on the subject, says :—

"From all that has been stated, it would appear that an absorption of carbonic acid by the leaves of plants and an elimination of oxygen takes place during daylight, and that this process ceases in a great measure during the night. The exhalation of carbonic acid by healthy leaves is still doubtful, and the appearance of this acid gas may in many of the experiments be traced to an abnormal condition of the leaves. The great function of the leaves thus seems to be deoxydization, by means of which they are instrumental in keeping up the purity of the atmosphere. This function of plants is antagonistic in its results to animal respiration; for while the latter takes oxygen from the atmosphere, and replaces it by carbonic acid, the former removes carbonic acid, fixes carbon, and gives out oxygen. The processes of respiration and combustion are pouring into the atmosphere a large quantity of carbonic acid gas, while the active leaves of plants are constantly removing it, and, under the action of light, substituting oxygen. While plants thus get carbonaceous food, the air is by them kept in a state fitted for animal life."

Prof. Ferdinand Cohn, of Breslau, says :—

"The leaves are cell-villages which perform their daily tasks in the air and in the light. Their principal business is to obtain coal, which is the chief constituent of the vegetable body. Our atmosphere is an enormous coal mine, many miles in thickness, that cannot be exhausted in thousands of thousands of years. The coal, indeed, is not found pure in the air, any more than the metal in the ore, but is in combination with oxygen as a transparent gas, carbonic acid, and a peculiar art is required to separate it.

"In the mining districts smelting houses are erected beside the pits, where the noble metal is extracted from the impure ores. The green cells of the leaves combine the art of the miner with that of the smelter, and have the power of extracting the pure carbon from the atmosphere. In order to perform this work they must be shone upon by the sun, for the sunlight alone can excite in them the marvellous faculty. Having extracted the carbon they combine it with water and with the mineral substances that have been drawn from the soil, and prepare from them the living matters out of which the plant itself builds up its cells, and which, taken up into the body of an animal, are transformed by it into flesh and blood."

Hence, I think we may safely concluded that only decaying or unhealthy vegetables ever give out carbonic acid by day or night, and that forests do nothing to speak of in regard to the atmosphere, but to absorb the impurities which animals and their arts are constantly pouring into it.

It follows from this demonstrated fact that keeping up a fit proportion of forest to arable land, is the prime condition of human health. If the trees go, men must decay. Whoever works for the forests works for the happiness and permanence of our civilization. A tree may be an obstruction, but it is never useless. Now is the time to work if we are to be blessed and not cursed by the people of the twentieth and twenty-first centuries. The nation that neglects its forests is surely destined to ruin.

A paper by Dr. A. Eby, of Sebringville, Ontario, was presented by the recording Secretary, entitled :—

HOW SHOULD WE MANAGE OUR NATURAL FORESTS.

By Dr. Eby, Sebringville, Ontario, Canada.

As our natural forests will doubtless be used as the bases of the future forests, it becomes us to consider well how we should manage them in order to achieve the best results. In other words, how can we change our neglected, natural woods into forests cultivated on scientific principles. Many people imagine that nature left to herself will produce her best results ; but experience teaches us that though she may produce splendid specimens, her best results are only yielded when subjected to cultivation and managed according to scientific principles. Profuse and exuberant as nature may be, no one would think of comparing her products with the fruits of our gardens or our orchards. Who does not know the immense superiority of the cultivated strawberry over the wild fruit ; yet it is well known that this result has been attained by the cultivation of the wild plant. In a state of nature the potato produces tubers little larger than walnuts, but by continued cultivation our splendid varieties have been produced. Who does not know the difference between an apple tree left in a state of nature and one subjected to cultivation. In the same way a far larger amount of wood and much more valuable timber can be produced from a given acreage, in a given time, in a forest subjected to cultivation by a scientific forester, than will be produced in the time from an equal area, in a forest left to itself.

If we examine a natural forest, we find it consists to a large extent of trees that have reached a state of maturity. Giants, hoary with age, occupy a large extent of ground, extending their roots and their branches widely in every direction. Some of them have doubtless stood for centuries, and have long since ceased to grow ; and though still showing signs of life and health, are really slowly decaying and will finally die. Their wood, though still firm and sound, shows a looseness of texture not at all found in growing wood. Other trees, not quite so large or so old, are still slowly growing, though their annual increase may not be perceptible. Others again are hardly able to find a place to spread their leaves to the air and the light. These are still young and vigorous, and in the best years of their growth. But as they are, to a large extent over-shadowed by older and larger trees they make but little annual growth. As sunlight is essential to the growth and development of wood cells, small trees that are over-shadowed by those of greater age, grow very little until they are able to expose their leaves to the sunlight.

There are comparatively very few small trees, or what are popularly called saplings. Though the old trees bear seeds abundantly, large numbers of which annually sprout, very few manage to find their way to the light. The dense shade of the older trees soon kills them off. Only here and there one finds sufficient light to grow upward, to where it can spread its head to the sun. As it is very difficult for young trees to get sufficient light for their development, comparatively very few reach a state of maturity. They mostly die of starvation. Though in the midst of an abundance of plant food, for want of some light and heat to change the chemical composition of that food, and thus enable the plant to use it for the growth and development of its cells, the plant sooner or later dies from want of sufficient nourishment.

As the decay and death of mature trees is very slow, requiring ages for their removal, it requires very few young trees to keep a natural forest intact. As the removals are so slow, but few renewals are required. Very few natural forests contain sufficient young trees to make a dense or close growth if the old trees were all removed. I have seen forests a few years after a full seed year, thickly covered with seedlings which would have rapidly grown up if the overshadowing trees had been removed. But left to a state of nature those seedlings die in a few years, as the amount of light that reaches them is not sufficient to effect the chemical changes in their sap to adapt it to their growth. They die because they cannot get the light necessary to change the food that surrounds them, so as to adapt it for their digestion. An abundance of light is essential to plant growth. As the

overtopping trees that occupy nearly all the upper surface of the forest are mostly full grown, their annual increase in size is very small. At the same time the overshadowed smaller and younger trees are stunted in their growth from want of sufficient light. It will thus be seen that the aggregate growth each year of a natural forest must be much less than would be the case if the trees were all of the same age and still sufficiently young for vigorous growth. At what age our native trees cease to grow and the period of their greatest growth are subjects for future observations. Those points can only be decided after those trees have been extensively subjected to forest culture. The observation of their growth in isolated situations, and even in gardens and parks will be of comparatively little value to the forester. Trees grown in isolated situations have the advantage of a greater amount of light and air than those grown in a close forest. At the same time they are more exposed to droughts and storms than the latter.

The first point for the forester to consider in taking charge of a natural forest is how shall he restore it to a state of vigour, so as to attain a maximum increase of bulk each year. This can in a measure be done by removing all the mature trees and leaving only those that are still young and vigorous. It can be done still better by removing all trees more than three or four inches in diameter, and even those of that size if they have been injured by the falling trees, or if they have been much stunted in their growth by overshadowing trees. Care should, however, be taken before the removal of trees to have the ground thoroughly seeded. If it is possible to await a year when the trees bear a full crop of seeds it should be done; but if such cannot be done, or it is desirable to change the variety of the trees, seed or trees must elsewhere be obtained and planted in the vacant spaces between the saplings that have been left standing. A good many healthy sprouts can be obtained from the stumps if care is taken not to injure them in the cutting and the removal of the old wood. If it is intended to utilize the sprouts from the stumps in the growth of new trees, they should be cut as closely as possible to the ground. I need scarcely say that in a forest to be renewed great care must be taken against fire, which not only destroys the life of the stumps, and thus prevents their sprouting, but it destroys the seeds. Where it is necessary to destroy the brush and other rubbish, it should be removed to some vacant lot, where the fire can do no harm.

If the area to be managed is small it may be as well to make the changes as fast as a profitable market can be found for the wood, unless it is intended to treat it under the copse system, when it must be changed in accordance to the system of rotation to be adopted. If the area to be managed comprises several hundred or more acres, it should be divided into such lots as it may be possible to replant each year with the help and resources at the command of the forester; due regard always being taken of the wants of the wood market. If the future forest is to be allowed to grow up to the natural height of the trees, it will be well to divide the forest to be managed into lots corresponding to the number of years that the trees are expected to grow. One of these lots should be renewed each year. Thus a regular system of rotation will at once be established, giving not only a certain area of wood to be felled each year, but the replanting of the same area. Concurrently with the renewal of the annual lots, the large over-mature trees should be removed from the rest of the natural forest, as fast as it is possible to find a profitable market for the wood.

If the existing trees are of such kinds as are valued for their timber, they should by all means be preserved, by obtaining a new growth from the seed or from sprouts. But if they are of inferior value or quality, it will be advisable to replace them, at least partially, by more valuable varieties. For example, it would be advisable to change a beech forest into one in which oak or some other more valuable wood predominates. Consideration should always be taken of the future wants of the district in which the forest is situated. If it be near a manufacturing centre, such woods as are in especial request by the manufacturers should be grown, if the soil and climate be at all favourable to their growth. This fact cannot always be known from the fact that the particular trees wanted grow in the neighbourhood or in the same latitude in other places. Some trees bear exposure to a moist or a salty atmosphere much better than others. Some, again, will flourish on a southern exposure, while others require the northern declivity of a mountain. If the district to be managed is far from a railway or other means of cheap

transportation, while the inhabitants of the surrounding country follow agricultural pursuits, the chances will be that fuel and building timber will be in demand by the time the trees will grow up. It will, therefore, in such cases, be well to plant trees valuable for fuel, with a lesser amount of such trees as will be valuable for building purposes. As building material will always be in demand, no one will go wrong by planting such trees, as pine, spruce, laurel, oak, elm, etc. ; which are most highly valued for building purposes.

My remarks have hitherto been directed especially to deciduous trees. In pine or spruce forests a somewhat different course should be pursued. No trees less than at least sixteen inches in diameter should be allowed to be removed. Trees smaller in size than that mentioned are still in the best years of their growth, and should be permitted to grow on for future use. At the same time steps should be taken to have the vacant spaces well seeded. Care should also be observed that the ground is properly cleaned for the seed. If it is covered with grass or moss such must be removed before the seed begins to fall. Care should also be taken to have the tops and other refuse removed to some vacant space and burnt to prevent their becoming a source of danger by fire. In districts where fuel is scarce, it may be well to allow poor people to remove the stumps for the sake of the wood. They will thus not become a source of danger from fire when they become rotten. When it is not possible to get the stumps removed, care should be taken to have them cut as close to the ground as possible, so as to be out of the way of future operations.

If the trees are cut before the cones have had time to shed their seed, they should be carefully collected from the prostrate trees and placed on cloths or a tight floor in a dry, warm but airy room so that the cones will open, when the seeds will fall out if the cones be well beaten. The seeds so collected should be carefully sown over the vacant spaces in the forest. In Norway a few of the larger trees are left standing to seed the ground, but as the seeds do not fall very far from the parent stem, the young plants will come up very thickly near them, while the ground will be but sparsely, if at all, covered at some distance from the parent trees. Great care should be taken to have our great pine forests thoroughly reseeded after being cut over. This is a matter of so great importance to the future welfare of our continent that it should by no means be left to the chance of a natural seeding. Where the pine lands are still the property of the government, they should be placed in the charge of an efficient staff of thoroughly qualified foresters, who should make it one of their duties to have the annual cuttings thoroughly reseeded so as to have them reforested as soon as possible. Where the pine forests have become private property, their reforestation becomes a question of greater difficulty. But as those lands are mostly of inferior quality or worthless for agricultural purposes and offer few inducements for settlers, it might be good policy for the state or provincial governments to acquire the title to them for the purpose of reforesting them. As forests they would again in a few generations, become sources of wealth to the people and of revenue to their owners, the government. Those lands if left in private hands will, from the poverty of the soil, in a few generations become a barren desert, totally worthless to their owner and a loss to the national wealth. I do not wish to be understood as saying that all pine lands are worthless for agricultural purposes, but it can be said of most of them. Many pine lands at first show a great richness of soil, but will gradually become worthless for farming purposes. The vegetable mould that was formed by the decay during many centuries of the annual fall of leaves, soon becomes exhausted where the subsoil itself is of a poor quality. Once exhausted, such lands bring the husbandman but a very poor return for the labour he is compelled to devote to them. Planted with pine they would produce a rich harvest and would be a source of wealth to the country, but for other crops they are almost worthless.

It will be observed that I have advised the renewal of our natural forests. In my opinion they have reached their maximum growth, and the best thing to be done with them is to make them the basis of future operations. To continue them in thsir present condition is merely storing up the timber for future use in the same way as we store up grain in a granary. It does not gain in bulk, it merely keeps its own. What it gains in bulk by the growth of the young trees it loses in quality by the decay of the old trees. Our natural forests have reached a stage of maturity and the animal growth merely com-

pensates the continual decay. What is required is the decrease of the annual decay and the increase of the annual growth, so as to obtain a net increase of bulk. Just in proportion as the increase of bulk exceeds the annual decay, will the forest become profitable. The cost of the land and the expense of planting may fairly be represented as an investment of capital. The annual increase of bulk should be regarded as the interest on the investment; and just in proportion to the annual growth will be the profit on the investment of capital. It would not be advisable completely to remove our natural forests at once. Though it might be desirable to renew them as quickly as possible, it would be bad economy to cut them down faster than a profitable market can be found for the wood. At the same time the wood should not be placed so abundrntly on the market as to encourage waste. It is to be feared that such is but too often the case. The owners of our woodlands seem to be but too anxious to get rid of their wood, even if they overstock the market, as is very often the case. While we plant trees in order to create a supply for future generations, we should not forget to economize with the store nature has so abundantly provided for our use and make it last until the growth of our own planting can be utilized. Our people should learn so to economize with their wood that the consumption can be brought within the production, that is as much wood should each year be grown as is required for consumption.

We have still a large amount of forest land on this continent and a great deal of waste land that should be reforested. But it cannot be denied that our forests are disappearing so fast as justly to afford thoughtful men cause for serious apprehension for the future welfare of our countries. In many of the older settlements wood is becoming so valuable that the people are carefully husbanding what is left to them, but little effort is however made in reforesting even waste and otherwise worthless lands. What is wanted is a thorough education of our people on the importance of always having a certain proportion of our lands covered by forests. So long as the Forestry Congress is not well supported by the public sentiment of our people, our forests will continue to disappear and no serious efforts at reforesting will be made until public opinion will compel our governments to take the matter in hand. Far however be it from me to say that our present labours are in vain. On the contrary, they are of the highest importance in educating our people and creating that very public sentiment we are now wanting in order to attain practical results from our labours.

When a forest is to be preserved, steps should be taken to make it accessible at all seasons of the year. In other words, roads should be laid out and graded to all parts of the forest, so that if it becomes necessary to remove any fallen trees or thinnings from the forest, it can be done without injury to the growing trees. A waggon driven over the roots of trees will injure them more or less, and will proportionally retard the growth of the trees injured. The question of forest roads may be a question of small importance in woods containing from ten to fifteen acres; but is a matter of great importance when we have to deal with large tracts. It is also of importance where the forest is divided into lots for successive cutting as in copse culture. In such cases, unless the lots are very small, it would be well to have a road around each lot.

Care should also be taken to have the forest cleared of fallen trees, and decaying logs and stumps, as these are a constant source of danger from fire. The forester should always carefully guard his charge against fire. A fire of a few hours duration may destroy the growth of a life time. The forester should also carefully protect all insect eating birds.

Prof. B. G. Northrop, offered a resolution recommending the appointment of an Arbor Day especially for the schools, in the several States and Canada, which was adopted.

Mr. Stewart Thane, then moved the following resolutions, which being seconded by Prof. Leué, and discussed by various members, were adopted, viz:

"*Resolved*, That it be an instruction to the Executive Committee of the American Forestry Congress, to call a meeting of enrolled members at the opening of next session, *prior to any general meeting*, to receive reports and communications, and to arrange the order of business.'

"*Resolved*, That in the opinion of this Congress, it is advisable that some member of the Executive Committee, or some member or members deputed by them, shall proceed to the next place of meeting ten days prior to such meeting, to see that all necessary preparations be made for the reception of the Congress."

Votes of thanks were then passed—

To the Governor of Minnesota for his kindness in granting the use of the Capitol for the meeting of the Congress, and for personal attention ;

To the Mayor of Saint Paul, and to the members of the Local Committee for courtesies and attention to the affairs of the meeting ;

Mr. J. Fletcher Williams, in an especial manner for his constant and efficient services prior to and during the session ;

To the Burlington Cedar Rapids and Northern R. R. Co.; the Grand Trunk Railway Co. of Canada, the Chicago, Minneapolis and Omaha R. R. Co., the Saint Paul and Milwaukee R. R. Co., the Chicago and Alton R. R. Co., and the Michigan Central R. R. Co , and the Rock Island Railway Co., for the kindness shown to the members of this Congress, and for the concessions granted;

To the gentlemen of the press, who have attended and reported the proceedings.

The American Forestry Congress then adjourned to the call of the Executive Committee.

The Province of Ontario was officially represented by Messrs. D. W. Beadle and William Saunders ; and the Province of Quebec by the Hon. H. G. Joly and Mr. Stewart Thane.

The following paper contains most valuable information upon the subject of

NEW AND NOTEWORTHY TREES, SHRUBS AND CONIFERS.

By W. C. Barry, Rochester, N. Y.

[*A paper read by request before the American Association of Nurserymen, Florists and Seedsmen, at their annual meeting, at Saint Louis, June 20, 1883.*]

During the last few years several beautiful and valuable new trees and shrubs have appeared. It is my purpose in this paper, to refer briefly to some which we have tested and consider most entitled to the consideration of planters.

Taking up the family of Maples first, we have the Japanese species and varieties, which, after having been tried for some time in various soils and localities, have, so far as I can learn, proven nearly hardy. It affords me much pleasure to furnish favourable evidence relative to this important qualification, for when these maples were sent out a few years ago, many persons, myself included, doubted their value for out of door decoration, supposing them to be too tender to resist successfully the severity of our winters. However, being greatly interested in them on account of their extraordinary beauty, we imported fine plants of the choicest varieties direct from Japan, gave them a fair trial, and now have large specimens doing finely upon our lawns at Rochester, where they have stood out unprotected the last three winters. Our experience is that young plants, until they become well established are liable to suffer injury from extreme cold. Hence spring planting is recommended for them, thus affording the plants a chance to become well rooted before the approach of cold weather. Protection with evergreen boughs the first winter is also suggested, and judicious pruning is attended with the most satisfactory results. In the spring, just before the buds start to grow, every tree should be carefully examined, and the dead wood, of which there is always sure to be some, removed. If the specimens do not grow vigorously enough, give them more nourishment, and cut them back severely. These are simple hints regarding their treatment, but nevertheless important; and if the suggestions are carried out, success can be recorded in the future where failure has been experienced in the past. The best varieties for general use are as follows: The normal form or type, *polymorphum*, is a tree of small stature, medium

growth, and regular outline, having rather slender branches, and small handsome foliage of a pleasing green colour during the summer, but turning to a rich crimson in the autumn. This species is, I think, destined to become very popular. The variety *sanguineum*, is a dwarf tree, having rich red foliage, which holds its bright colour till the middle of summer. During the months of June and July a specimen is a very conspicuous and attractive object upon the lawn. *Atropurpureum* is another variety of modern growth, having purple leaves, and when planted with the above produces an effective contrast. *Atropurpureum dissectum*, has slender branches, which show a strong tendency to droop, and its leaves are delicately cut, resembling fern leaves, and of a beautiful purple shade. *Japonicum* is another very distinct species of medium growth, with large, handsome, bright green leaves, the edges of which are scalloped. It grows more vigorously than polymorphum and its varieties, and bears some resemblance to the Red Colchicum Maple. There are several other varieties and forms, but these are the most beautiful and useful.

Now a suggestion with regard to the manner of planting. As these trees are what are termed slow growers, it takes some time for them to become effective. Hence, we advise the planter to arrange them in groups consisting of three or six plants. A very satisfactory effect will thus be quickly realized, and every year the group will become more elegant and attractive. For several years the propagation of these maples has been conducted on a very limited scale, owing to the difficulty of procuring stocks to graft upon, and the price of plants has consequently been quite high. These obstacles having been removed, we may hope soon to obtain these beautiful dwarf trees at a moderate cost.

Two new varieties of the Norway Maple have recently been introduced from Germany, and promise to become important acquisitions. These are Schwedlerii and Reitenbachi. Both have the vigorous, elegant, clean growth, for which the type is so justly esteemed. Schwedlerii has bronzed purple leaves, which appear to the best advantage during the spring time and early summer. As the season advances the leaves change to a duller shade which is less attractive. But in this respect it differs little from purple-leaved trees generally, as they all lose their richest tints during the hot summer days. Reitenbach's maple is of quite recent introduction, and while its foliage lacks the richness and brilliancy of colour, for which Schwedlerii is noted, its purple shade is more enduring and lasts till late in the season. Lorberg's cut-leaved Norway maple is also quite new, but it does not differ enough from the old variety, *dissectum*, to be of much value, at least such is my opinion at present. Dissectum is a rare and handsome variety, and has always been scarce, owing to the difficulty which nurserymen experienced in obtaining saleable specimens, its growth being always more or less crooked. Lorbergii seems to be a better grower, and as it can be propagated more successfully, it may displace dissectum. Among cut-leaved trees both deserve our highest regard, as their leaves are deeply cut, and they form elegant specimens. Woorle's golden-leaved sycamore, a recent novelty from Germany, has superb yellow-tinted leaves, which render the tree remarkably showy in spring and early summer. Planted with purple-leaved trees the effect is charming. The yellow hue is not of the character which indicates lack of health; on the contrary, it has a richness and depth betokening extreme vigour. Still another interesting form of the Norway is the curled-leaf. The leaves are of the usual size, but the lobes curl and turn inward in a curious manner, giving to the tree a unique aspect. This variety must not be confounded with the eagle's claw from which it is very distinct.

Acer Tartaricum ginnala is an ornamental variety of the Tartarian maple, of rather slender, yet vigorous growth, rounded, regular form and having small or medium sized foliage. Its health, freedom from insects, hardiness and handsome appearance combine to make it a desirable addition to the list of small trees.

Acer velutinum is a species brought to notice recently, but its origin I am unable to give. In general appearance it resembles somewhat the sycamore, but the foliage is thicker, of a dark green colour, and the petioles are deep red. The impression I have formed, after examining a small specimen, is that it will prove to be a distinct tree of considerable merit.

We have now studied the maples pretty thoroughly, and will pass to other interesting trees.

Memminger's horse-chestnut is a comparatively new tree, having showy pale yellow

foliage, suffused or sprinkled with white. This shade, though peculiar, is effective and beautiful, and a well developed specimen appears to fine advantage, especially in spring. Later on the delicate tints of its leaves fade under the effects of scorching sun, and then it reverts te the ordinary form of the horse chestnut.

Alnus tiliacea is a noteworthy tree, having the foliage of a linden and the growth of an alder. Indeed few would recognize it as an alder. Its fine pyramidal form and rich, glossy, dark green foliage render it an elegant tree.

The large, double-flowering almond, although it has been known to some extent for many years, deserves mention on account of its rarity. As a flowering tree it has few equals. A specimen about five years old is now in full bloom on our grounds, and I cannot refrain from expressing my surprise that so valuable a tree should be so neglected. The specimen I refer to is a mass of blooms, every branch and branchlet being literally covered with flowers of a delicate pink shade, and perfectly double like small roses. The double red, double pink and double white flowering peaches, are exceedingly showy and ornamental, and wherever seen elicit expressions of the highest admiration. How are we to account for their absence even in fine collections? Is it necessary to call them novelties in order to insure their recognition? At the present time I do not know any subjects more worthy of our attention and I strongly urge their propagation and dissemination.

Cerasus Japonica, rosea pendula, a weeping cherry from Japan, lately introduced, is destined to wide-spread popularity. Grafted standard high, its slender branches droop like those of the Kilmarnock willow, and form a symmetrical head which is sure to please admirers of this class of trees. As the Kilmarnock willow has become pretty generally disseminated, this introduction has enough merit to be ranked with it, and no doubt public appreciation will be shown in its behalf, and a large demand created for it.

Cercidiphyllum Japonicum is a distinct tree introduced lately from northern Japan, where it is said to attain large size. It is pyramidal in form, of vigorous growth, but slender and compact; foliage small, heart-shaped and some what like that of the Judas tree. Specimens have stood out uninjured in our grounds for three years, and we have no doubt as to its hardiness. Its propagation is not easy, hence this promising addition will be rare for sometime to come.

Variegated-leaved Tulip tree. We have in this variety similarity of likeness in all respects to the normal form, except in the leaves which are bordered with yellow, the effect of which is most pleasing. The young subjects which we have seen promise to grow in beauty as they acquire age, and a large well grown specimen will without doubt prove a most interesting object to lovers of rare and curious trees.

Phellodendron amurense or Chinese Cork tree comes from Manchuria, where it is said to attain the height of sixty feet. In general appearance and rapidity of growth it resembles the ailantus. Some authorities claim that it is destined to take the place of the ailantus, being possessed of all the valuable characterists of that tree, without any of its objectionable features.

Quercus concordia or golden oak is a variety of the English, which will undoubtedly prove to be a great favourite with planters as soon as it becomes better known. It is a rapid, vigorous grower, and its leaves are of a rich golden yellow colour, even from the time they appear in spring; and they increase in richness as the season advances, assuming their most charming tints late in the summer and fall. The colour is exceedingly grateful to the eye, and is so enduring that a specimen in perfection makes an impression which it is not easy to forget. Among golden-leaved trees there is certainly not another which can compare with it, particularly in autumn, and, when planted near a purple-leaved tree, the effect is grand.

The Fastigiate Birch is still a rare tree, although it was disseminated some time ago. It has the upright habit of growth, and spiry, compact form peculiar to the Lombardy poplar; hence it is quite unlike any other birch. It will be found useful to give variety to a landscape, and can be employed where the poplar could not, owing to the size which the latter attains.

A real gem among magnolias is Halleana or stellata, which, though it was brought some years ago from Japan, is rarely seen. The Chinese magnolias, usually cultivated, are distinguished for their size and stately appearance, and are great favourites with the

public on account of their remarkable flowers. Halleana is quite different from the other varieties, being of dwarf habit of growth, and forming a symmetrical bush. Its blooms appear very early in spring, before those of any other magnolia; a fact which tends to give additional value to the plant for spring decoration. For the margins of groups or borders it will be found extremely useful, and it is sure to gain numerous admirers wherever it is disseminated.

Van Geert's golden-leaved poplar has showy yellow foliage, which renders it a highly effective tree in groups. For a long time we questioned the value of this variety; but its bright and enduring shade makes it conspicuous, and we think it merits attention.

The purple, myrtle-leaved Elm is a new variety of medium size, having small myrtle-like leaves of a dark purple colour. The foliage is pretty and the colour permanent. It has not been my good fortune yet to see large specimens: but judging from the small plants I think we have in this novelty an addition of high merit. The colour of the leaves is very much darker and more lasting than that of the old variety *campestris purpurea*. There are several other new and very promising kinds of elms, with variegated foliage, but I will defer a consideration of them until they have been better tested.

A very well defined and curious variety of the English elm is that called *monumentalis*. Its habit of growth is erect, compact, and its form conical, resembling as its name implies, a monument. It grows slowly, and can be employed in small grounds advantageously.

Ulmus Wredei aurea is a golden-leaved elm, which bids fair to become very valuable. The leaves have a rich, warm yellow tint, which is permanent, and consequently a fine specimen arrests attention and commands admiration.

SHRUBS.

The common red dogwood is much esteemed by planters for winter decoration, on account of its dark red or crimson coloured bark. The variety to which we now draw attention is called Sibirica, and its bark is of a bright red colour. In the depth of winter the bark is brightest, and a single plant or several together form a most interesting feature in a garden. In the summer its beauty is also apparent, for the foliage is of a pleasing green colour and the white flowers which it produces in spring are followed with purple fruit. This is not by any means a new shrub, nevertheless it is rarely found. Its merits have been withheld from the public long enough, and I trust it will soon receive the recognition to which it is justly entitled.

Shrubs of this character are doubly valuable, being ornamental and effective both in summer and in winter. The crimson and red branches of these two varieties when placed in contrast, produce a very pleasing result.

Cornus sanguinea elegantissima. In this we have a new claimant for public favour. Its origin I cannot give; but when in Europe two years ago, I found it in one of the nurseries, and was much impressed with its beauty and value. Fancy a red dogwood with handsomely variegated leaves, or rather having its leaves broadly edged with silvery white. Cornus mascula variegata has long been held in high regard on account of its distinctly variegated foliage. In some particulars this new variety of sanguinea will surpass it. The variegation is brighter and the shrub more rapid and less formal in its growth, hence it can be made use of in a greater variety of ways. As a new shrub of high promise it will certainly receive a great deal of attention.

Prunus pissardi, or purple-leaved plum, is a novelty sent out from Paris last year. Its leaves are purple, the colour is permanent, and I think this new plant will prove to be an acquisition.

A pure white Weigela of good habit of growth, has long been sought after. During the last few years several so called white varieties have been ushered into notice, but the flowers, nearly always turned out to be blush and frequently rose-coloured. Hortensis nivea the old variety, which bears pure white flowers, and which is comparatively well known to nurserymen and florists, has not been disseminated, being extremely difficult to propagate. Its habit of growth also is quite unsatisfactory. Hence *candida*, which

is a strong upright grower and an abundant producer of pure white flowers, will at once be pronounced a desideratum. It has the additonal merit of being a perpetual bloomer, flowers being upon the plants nearly all summer. Nurserymen will have no difficulty in obtaining a stock, as it can be easily propagated.

Other new weigelas which appear to be very promising, are Lavallei, a variety with reddish purple flowers, the darkest of any. Its habit, however, is loose and spreading. Edward Andre, a latter introduction, bears flowers of a very dark shade, and is a better grower.

P. Duchartre produces flowers of a clear amaranth shade, which contrasts finely with the yellowish foliage of the plant. Hendersoni bears medium-sized flowers of a red colour. Both of them have a good habit and are free bloomers.

Spiræa cratægifolia is not a new variety, but still quite rare. It resembles the well known lance-leaved, in colour, size, and form of the flower, but differs from it in foliage; and it has the valuable characteristic of being more hardy. I consider lanceolata a grand shrub, and in localities where it is hardy it comes out in spring, loaded with pure white blooms, and a large plant resembles a mass of snow, affording a striking contrast with the profusion of green which prevails at that season. But it often happens that much of the flowering wood becomes injured, hence, an equally fine variety, possessing greater hardiness will be an acquisition. I think we shall realize the improved form in *cratægifolia*. While on this subject, I should not fail to refer to another improved variety of lanceolata, which has given much satisfaction. It is called lanceolata robusta, which appears to be more vigorous, hardier, and its flowers are larger.

Spiræa Van Houttei is another form, distinguished for its hardiness.

There is another addition to the family of spiræas which is quite novel. It has received a rather indefinite name, being called species Japonica. It appears to be closely allied to the type callosa, and like that species, does not grow large, but forms a symmetrical bush and yields an abundance of flowers all summer. Its regular shape and small habit of growth will make it useful for borders of groups, and for planting singly on lawns of small extent.

The golden syringa is a most charming golden-leaved shrub. When planted alone or associated with other shrubs in a group, its bright and delicately tinted leaves create a pleasing effect.

We now come to the consideration of one of the most important acquisitions made recently, Xanthoceras sorbifolia, for this is the name of the new aspirant. It comes from Mongolia, or the centire of China, where it was found by the Abbe David, and brought to Paris about 1868 by a Frenchman named Pichou. It is of medium size, forming a shrub or small tree not exceeding ten to twelve feet high. Its leaves resemble somewhat those of the mountain ash and its flowers are five-petaled, white, and reddish copper coloured at base, and disposed in racemes. They appear in April and May at the same time that the leaves are developed. The flowers are succeeded by fruit.

CONIFERS.

Having now discussed the merits of the best new flowering shrubs, we will proceed to examine a few of the best new coniferous trees.

First upon the list and perhaps one of the most important gains of many years is the Rocky Mountain Blue Spruce, (*Abies pungens.*) Its chief merits are great hardiness and beauty. So much disappointment has resulted from planting tender evergreens, that planters generally are commencing to lay great stress upon hardiness, and it is right that they should do so. What advantage is there in growing fine specimens of rare species, only to lose them as they reach perfection. Two years ago when in Paris, I saw in every section of that grand city, ruined specimens of noble and rare evergreens, which it had taken years of patent attention and care to develop. To be sure these extremes do not come every year, but as I stated in a former paper, we cannot place too much importance upon the qualification of hardiness. The blue spruce is the bluest of evergreens, and a well developed specimen is a sight that will charm every lover of beautiful trees. I would like to say something about the beautiful Retinisporas, plumosa aurea and argentea, and

filicoides. These are charming evergreens of moderate growth and medium size, and well adapted to plant in small places; but they are tender with us, and must be protected with a few branches of evergreens, or they will suffer in winter. Those who are willing to devote extra care and attention to them should introduce them to their gardens by all means. But for the general planter in cold regions, we cannot yet recommend them.

Pinus ponderosa, the heavy wooded pine of California, has proved to be a most valuable accession. It is perfectly hardy, of fine form, has long distinct foliage, and is a vigorous grower. Pinus Pallasiana has bluish foilage, and is hardy and beautiful. Pinus Jeffreyi, from California, has also succeeded admirably, being hardy and very ornamental.

Abies parviformis is a dwarf spruce, of slow growth and small foliage. It is an excellent small evergreen; very hardy and will be useful for small grounds. Abies nigra Doumetti, is a handsome form of the black spruce, of dwarf habit and compact growth.

The Silver-variegated Japan Juniper, with foliage of a glaucous green colour, and the golden Japan Juniper, which has golden yellow foliage all the year, are two varieties to be commended.

The Golden Yew, Taxus elegantissima should not be overlooked, nor should we forget the pyramidal Arbor-Vitæ or Geo. Peabody, with its golden foliage.

The Golden Yew and Geo. Peabody are undoubtely the two best golden evergreens. And among the Arbor-Vitæs there is nothing hardier or more handsome than the pyramidal. The new varieties of Arbor Vitæs introduced by Mr. Robert Douglas, are very promising.

I will not occupy your attention longer, but in closing I desire to say that it is a great satisfaction to those engaged in horticultural pursuits to know that there are always new pleasures to look forward to. With each year comes some new tree or plant to engage our attention, and demand our care, and our interest is never permitted to flag, even for a moment. What a gratification it is to aid in the dissemination of a really valuable article. Joy enters the home when the new plant arrives; the new comer is welcomed, receives the best of care from loving hands, and if it proves worthy, affords genuine happiness to the household. But if perchance the great expectations should not be realized, and the high priced novelty should prove worthless, what sorrow and disappointment follow. Let us therefore exercise a care that we distribute only good things, and thus contribute to the welfare and happiness of our fellow beings.

In the summer of 1882 Mr. Charles Gibb, of Abbotsford, Province of Quebec, in company with Professor Budd, of the Agricultural College, of the State of Iowa, visited Russia for the purpose of ascertaining what fruits, trees and shrubs, growing in climates similar to our own, could be procured from that country likely to be of value to us. On his return he prepared his *Hasty Notes on Trees and Shrubs of Northern Europe and Asia*, for the Montreal Horticultural Society, which were published in the Eighth Report of that Society, 1881-2.

At the request of your committee, Mr. Gibb has kindly revised and enlarged his notes and furnished them to us for publication in this report. We take much pleasure in calling very particular attention to Mr. Gibb's paper, as being full of very interesting information of great value to all who reside in a climate of great extremes, as is that of a large part of our Province. Many of the trees and shrubs mentioned by him are worthy of extensive trial in Ontario, as being likely to prove of value for economic purposes, or for ornamentation, or for both. These trees, although botanically identical with those of western Europe, are more hardy. Seeds of these obtained from Russia and grown in Ontario will produce more hardy races than those we have hitherto obtained from England, France and Germany.

ON TREES AND SHRUBS OF NORTHERN EUROPE AND ASIA.

By Charles Gibb, Abbotsford, Quebec.

With notes added in December, 1883.

The experience of the Russian horticulturists is just like our own. They have searched central and western Europe for new species, and have found among the many tried a few hardy and valuable. They have searched for new species on this continent, and in some instances, like ourselves, have received the southern forms of hardy species. Have you the Ash-leaved Maple? I ask Dr. Regel, the Director of the Botanic Gardens at St. Petersburg. "Yes, but it is not hardy here." It is the only street tree in Winnipeg, I replied. "Then I have some Southern form," he said. Yes, such is his experience and ours, and such must continue to be our disappointing experience until we establish direct communication with our like climates in the old world. The Russian botanists had tried to find us years ago. They had endeavoured to get into correspondence with the botanists of the colder parts of Canada through their Consul at New York. They failed in this, but turned their attention to the cold climates eastward to the Pacific.

In the Imperial Botanic Gardens at St. Petersburg, we find the flora of the cold inter-continental climates of eastern Russia, Siberia, northern Turkestan, Soongaria, Mongolia, Mantchuria, and Amur, our own like climates in the old world.

Europe may well be proud of her botanic gardens. The large outlay of the European Governments seems to have been money well invested. Botany in its relation to agriculture, horticulture and forestry is a science deemed too valuable to be suffered to remain untaught. Russia is in no way behind in this matter. At St. Petersburg what cannot be grown out of doors must be grown within, thence they have there the largest number of species under glass in the world. Not only in the larger cities, Moscow, Warsaw and Kiev, but in the smaller towns like Kazan, Voronesh, Orel and Penza (the last not visited by us), we find Botanic Gardens such as we might feel proud to own.

A generation or two ago, when Loudon and Lindley were at work in England, the Royal Horticultural Society imported from all parts of the world the plants likely to be useful or ornamental in England. They sent agents to China. Robert Fortune, however, spent much of his time at Canton, almost in the tropics. He was not in search of plants suited to the climate of Quebec, and yet some of our best hardy shrubs were brought to light at that time. This was probably the age of greatest horticultural interchange the mild temperate regions have ever seen, and upon it is largely based their present advanced horticulture; and yet this work has been of only minor use to us.

In the tropics, and in the sub-tropical climates, the British colonies have taken the lead in this matter of botanic gardens; wherever there is a colony of any size there almost always is a botanic garden. Ceylon, India, (several), Singapore, Hong Kong, Queensland, Victoria, South Australia, New Zealand, Tasmania, Mauritius, Cape of Good Hope, and many others which I am not sure enough to note have their botanic gardens. Also in the West Indies, Jamaica, Trinidad and Demarara. The East and West Indies have interchanged for over 100 years! Read the reports of the Jamaica and other Botanic Gardens in the library of the Montreal Horticultural Society, and you will see that it is this botanic interchange which has built up the present enormous export trade of the tropics.

Now there are two points to which I wish to draw special attention.

I. We in the cold North have hardly begun to exchange with our like climates in the old world.

II. In Canada we have no Botanic Gardens.

As to exchange with our like climates, that will begin next fall. As to botanic gardens we must speak less hopefully. Our horticultural societies have done good work. Our universities do not neglect the science of botany. We have some fair

collections of trees, some horticultural gardens; but our Government has never seen the need of expenditure upon botanic gardens, as have the Governments of the European powers, and the Governments of other British colonies. *That this great Dominion of Canada, which stretches from the Atlantic to the Pacific, should be without a botanic garden, or a series of such gardens, is a fact without parallel in British Colonial history.*

NOTE.—It was at a meeting in Winnipeg, in August last, at which Messrs. Joly, Saunders and Beadle urged the formation of the Manitoba Horticultural Society, that I was speaking of the good work which had been done by the Botanic Gardens and testing grounds of the other British colonies. Mr. J. R. G. Moffatt then brought to notice the interesting fact that it was not the British colonies who began this work, but the early Dutch, Portugese and Spanish colonies, in their earliest days, 200 and even 300 years ago. Mr. Moffatt had visited the Botanic Gardens of Wellington, Aukland, Christchurch, Dunedin and Nelson, in New Zealand; of Adelaide, Melborne, Sydney and Brisbane, in Australia; of Hobart Town and Launceston, in Tasmania; of Durban, Port Elizabeth and Cape Town, in the Cape colonies; of Colombo and Point de Galle, in Ceylon; of Penang and Singapore. Yes, Mr. Moffatt had visited these, or most of these, and others (not British) as those in Java, Sumatra and the Philippines. He had studied their products and their work. He urged the establishment of testing grounds, because he *knew* the value of them, and it is because I have personally examined the testing grounds in Jamaica, plantations upon high levels and low levels, on the dry scorching seashore, and on the misty mountain tops 6,300 feet above it, and because I have noticed how dependent the prosperity of this island has been upon this experimental work, that I said above, "that it is this botanic interchange which has built up the present enormous export trade of the tropics."

Should this great government work be left mainly to private individuals? Surely not.

On the European Forestry plantations I must say a few words. The planted districts in France we did not pass through, but we obtained some idea of their method of work by visiting the Forest School at Nancy. One may get some idea of that work by reading their reports now in the Montreal Horticultural Society's library. In Germany we were continually passing extensive plantations of Scotch Pine (*Pinus silvestris*), bordered with Norway Spruce (*Abies excelsa*). The Germans are most economical in the use of wood, so that pine so extensively planted must ere long become an article of export. But where are the hardwoods needed for a thousand different purposes. Strange this exclusive planting of one species. So well are the forest plantations of Wurtemburg cared for, that the term "high culture" could with justice be applied to them. Evergreens are easily and cheaply propagated in the climate of Germany, and hence the method of planting adopted is that of close crowded planting, which of course, necessitates continued thinning.

In Russia the Government controls, in fact "works," a large proportion of the forests of the Empire. Of natural and planted forest the Government held in 1878 what is equal to 351,780,000 acres, exclusive of Siberia, besides about 51,590,000 acres of scrub at the far north. In 1878 they received from these forests an income of 10,648,000 roubles, and expended on new plantations, and working expenses, 6,400,000, leaving a profit for the year of 4,248,000 roubles, or about $2,124,000. The extent of the plantations in Russia I cannot state. I know, however, that in three of the Steppe Governments in Southern Russia, 22,880 acres have been planted within the last eight years. There are 762 forest stations under the charge of a like number of foresters; and as we journeyed over the prairie regions of Russia, we were continually coming across some forestry station with its surrounding plantations. Like the beet sugar factories they are scattered all over the otherwise treeless plains. Unlike the plantations in Germany the Russians have planted not only their native forms of the Silvestris pine and Norway spruce, but largely of Pedunculata oak, ash and basswood, and somewhat of larch, birch and poplar; also in the southern steppe regions, yellow locust, maple, elm, honey locust and others.

The Imperial Forestry Association was in session at Moscow at the time of our visit. Delegates from all parts of European Russia had assembled under the presidency of Dr. Arnold, Director of the Agricultural College, at Petrovskoe Rasumoskoe, near

Moscow. They meet biennially. We drove to the Government forests in coaches holding eight persons each, on side seats, back to back, drawn by four stallions abreast. After luncheon I was called upon (my friend, Mr. Budd, was not present that day) to plant an oak, which is the joint property of the Canadian and United States Governments, and which may be worth several hundreds of dollars some centuries hence.

These foresters are a fine set of men. It was one of this staff who, of his own accord, and at his own expense, accompanied us through the fruit-growing peasant villages of Kazan, sharing our discomforts and sleeping upon a bundle of hay when necessary.

As to the climates of the places I name, I must refer to my report on "Russian Fruits." Had I had more time I would have shown what these climates are, not from meteorological tables, but from the flora in their botanic gardens. I would merely say that the mildness of central Europe one may judge by the trees growing in the well-sheltered Botanic Gardens at Warsaw. Here, in latitude 52½°, we find Sophora Japonica ten or twelve inches in diameter of trunk, growing from an old stump which had grown to a diameter of two and a-half feet; Juglans regia had grown up with two trunks, each twenty-two inches across; Tulip tree, large and low branched, measuring three feet across its stump at the ground; Gingko, of eight inches diameter; Cornus mascula, twenty-five feet in height, and thirty feet across its extended branches. The horse chestnut grows luxuriantly, and attains very large size at Warsaw.

I must say that these trees could not be grown in open exposure near Warsaw, for such is the ameliorating influence of a large city that the shelter it affords is equal to a difference of more than fifty miles in latitude. Proscau in Silesia, on account of its elevation of 720 feet, its open exposure and cold soil, is a rather more severe test of hardiness than the sheltered city gardens of Warsaw. North and east of Warsaw the climate soon becomes severe.

These notes I have written as addenda to a somewhat lengthy article on "Ornamental Trees," written by me last year for the seventh report of the Montreal Horticultural Society, so that what I say is merely a jotting down of things not said then.

NOTE.—This is a sequel to my report on "Russian Fruits," and should be read in connection with my notes on climate and table of temperatures.

I would also urge the study of the reports written by Mr. Budd, Professor of Horticulture in the State Agricultural College, at Ames, Iowa, my fellow-traveller. His notes are of great value to the north, and I will freely quote from them.

ACER—Maple.

A. Campestre.—In my paper on "Ornamental Trees," I spoke of this as a tree or shrub that would prove hardy, if only we obtained our seed from northern stock. Its beauty in Central Park and other places had made me wish we had its northern forms. In the Imperial Botanic Gardens at St. Petersburg, we find a fine specimen, eighteen feet in height, apparently quite hardy. Another in the Botanic Gardens at Orel, thirty feet; this latter, however, not cork-barked. In the grounds of the Agricultural College at Petrovskoe Rasumovskoe, near Moscow, their stock did not prove hardy. It is a native tree north of Kursk, in central Russia, and runs thence north-west into the Baltic provinces. Further south it grows to larger size. In the Botanic Gardens at Warsaw there is a tree twelve inches in diameter of trunk, and at least forty-five feet high, not cork-barked, and in the Vienna Botanic Garden, twenty inches in diameter of trunk, and forty feet or more across its extended branches. This, too, is not cork-barked. A tree capable of standing drought well. I am at a loss to know what name to give this tree. English cork-barked maple will not do for a tree worthless to us if grown from English seed; a tree not always cork-barked. Let us procure seed of this pretty shrub maple—seed of northern growth. We need direct communication with the botanic gardens, and nurserymen and seedsmen of our own like climates in northern Europe.

A. negundo fol. variegatis argentum.—This is a variety of our ash-leaved maple, with white-edged foliage. It is very ornamental, and largely used, top-grafted in central

Europe. Further north, grown as a low shrub with slight protection, otherwise not at all hardy in extreme climates.

NOTE BY D. W. BEADLE.—The foliage of this tree unfortunately is badly burned by the hot summer sun south of the line of the Great Western Railway, so much so that the tree cannot make a healthy growth. In my own grounds it has at last perished from want of sufficient leaf action to ripen the wood.

A. platanoides (Norway Maple).—We did not find this tree grown in as large quantity in Russia as I had expected; nor did we even find specimens of it as large as our own sugar maple. We find it as a street tree, and in gardens in all the Russian towns, but in limited quantity only. I noticed on the Volga, in the dry regions, that the trees growing there, trees looking just like the platanoides of western Europe, stood drought remarkably well.

Var. dissectum.—This pretty thing we found in severe climates, and in Vienna we saw a specimen eight inches in diameter of trunk, with a dense, round head, nearly thirty feet in height, showing that it attains larger size than I had expected.

Var. fol. digitalis we say only at the Pomological School at Proskau, eastern Prussia. A small tree with leaves still more cut than dissecta.

Var. Reitenbachi a curious and a pretty tree. Leaves, dull brown in summer, and in spring, red. I do not remember seeing it north of Warsaw.

Var. Schwerdlerii.—A maple with young shoots bright red. Quite hardy at Riga, says Mr. Wagner. We did not see it further north.

A. Tartaricum (Tartarian Maple).—This tree is a native near Moscow, and may be seen in the botanic gardens and parks in the severest climates we visited. It is an "entire-leaved" maple, grows into a large bush, and is decidedly ornamental. It is a pity that the trees of it for sale in the States are not to be relied upon for hardiness. We must get northern stock.

Var. Ginnala (tegmentosum of some catalogues.)—A very pretty shrub maple from Amur, noted as quite hardy at St. Petersburg, though only fairly hardy at Riga. My Moscow notes do not mention it. Hardy enough for Montreal, I should expect.

ÆSCULUS AND PAVIA—Horse Chestnut.

As we wandered from place to place we found decided variety in foliage of this tree. Mr. Budd used to notice the thickness of leaf of the trees in some districts, as likely to stand the dry air of the Iowa prairies. The best collection we saw was in the Botanic Garden at Munich. Here special attention had been given to making a large collection. Specimen trees at St. Petersburg, Moscow, and Volsk looked as if out of their latitude. One thing, however, we observed, and that is the hardiness of the *Pavias* or smooth-fruited horse chestnuts, and these *Pavias*, we were told in several places, were European, not American.

ALNUS—Alder.

There are some beautiful shrubs among the Alders. *Imperialis* is said to be the least hardy, and yet I would expect it to thrive in a sheltered city garden in Montreal. *Incana laciniata* has a dull, sombre tint, very unusual; leaves deeply cut, and very ornamental. It seemed and was said to be, quite hardy in the nurseries at Riga. *Incana pinnatifida* or *acuminata* in the Botanic Garden, St. Petersburg, is a large bush twenty-five feet in height, with a trunk twelve inches in diameter; foliage dull in colour and deeply cut. From my notes it must be very like Laciniata. *A. glutinosa oxyacanthafolia* is well named, and, like those above, bears no resemblance to an ordinary Alder. It is light and airy, and rather pretty, but sparse of foliage, and should be headed in to make it appear to good advantage.

AMELANCHIER—June-berry.

We found nothing of special value, but I must speak of kinds which have already found their way into the west, probably from Europe. A dwarf variety has been grown

by a German in Greene Co., Iowa, for the past twelve years. Mr. Budd, who visited the plantation, says "that the plants were literally loaded with a dark, nearly black fruit of good size and excellent quality;" even the sprouts, not more than a foot in height, were bearing. The bushes when full grown were two to three feet in height, bore fruit the size of black currants, and all this time had been grown and marketed under the impression that they were huckleberries. This variety was imported from Germany. Another colonist, near Davenport, Iowa, has had four acres of a somewhat similar berry, and has produced fifty to sixty bushels in a season from the bearing portion of his plantation. This has been over twenty years on trial, and its origin in not traceable.

Again, Mr. Budd draws my attention to the *Amelanchier alpina*, received from Texas, and which is a native of the Andes of Mexico, and apparently quite hardy at Ames, Iowa. It grows a foot or more in height, and has been highly thought of in Texas, where it has been grown as a huckleberry.

NOTE.—A variety of *A. Canadensis oblongifolia*, obtained the silver medal of the Massachusetts Horticultural Society. The plants were received from Davenport, Iowa, in 1874, and fruited abundantly in 1878. Mr. B. G. Smith, Treasurer of American Pomological Society, the worthy recipient, says the fruit is mild and delicate in flavour, and about the size of black currants. Possibly this may be the variety spoken of above.

ARIA—White Beam Tree.

This is a medium-sized tree, allied to the mountain ash; somewhat like it in blossom, and in the fact that it bears clusters of fruit.

The largest collection we saw was in the grounds of Mr. Wagner, at Riga, and of these, *Nivea* specially struck me, on account of the snowy whiteness of the under side of the leaf. This tree would be specially beautiful in a windy situation. Of others, *Acerifolia* has a very long leaf very much indented, and, I suppose, lobed. *Corymbiflora*, like *laciniata*, an indented rather than a cut-leaf. *Cretica*, leaf small, but white on under side. *Eliptica*, very broad leaf, white underneath. *Glabrata*, leaf glossy on upper surface, and quite unlike others. *Lantana*, leaf lanceolate, and white beneath. *Latifolia atroviridis*, leaf larger and broader. *A. lutescens*, of M. Simon-Louis, at Metz, is remarkable for the whiteness of the under, and even of upper side of leaf.

ARMENICA—Apricot.

Let us add the Apricot to our list of hardy fruits as soon as possible.

Mr. Maximowitch, the Primus Botanicus of the Botanic Gardens at St. Petersburg, who has spent many years botanizing that vast country eastward to the Amur, says that in Soongaria, in eastern Turkestan, at the eastern end of the Altai range, it is growing in quantity, and that there the boars, and the bears, and the natives, fight it out as to who is to have the fruit. The fruit is small, that is, about one inch in diameter, but sweet, and pretty good.

In the southern parts of the Province of Mantchuria, there is, says Mr. Maximowitch, a variety of apricot different from those in cultivation. They do not thrive well near the coast, but in sheltered situations inland they grow in great quantity. They are really good, and are sold in quantity in the Pekin market. Could we not get the pits of this apricot expressed to us by our Consul at Pekin? Surely this might be done.

AZALEA.

A. mollis has a large salmon-coloured flower, a variety brought by Mr. Maximowitch from high altitudes in Japan. It has proved quite hardy at St. Petersburg. I see that Ellwanger and Barry, of Rochester, N. Y., speak of the great beauty of *A. mollis*, but say it is only half-hardy and needs protection. What difference in hardiness there is in the offspring of plants of different elevations.

BERBERIS—Berberry.

These I have not made notes of. However the seedless Berberry is recommended as an acid little fruit—good for preserves. The Chinese sweet varieties, which are said to be dried like raisins by the Chinamen, I did not see.

BETULA—Birch.

The beauty of the Russian Birches is a matter of general remark by travellers. In general appearance they are not like our own, nor the birches imported from western Europe. The *alba* of Linnæus, or *pubescens* of Ehrhart, has a leaf in shape like our canoe birch, but smaller and velvety. Sometimes it is very aromatic. It is probably the fastest growing, and is suited to moist soils only, and is the best variety for the far North. The trunk is mostly white, and that almost to the ground. These notes were given to me by a forester who had made a special study of the question. On the other hand, the *alba verrucosa* is a weeping or drooping tree, with triangular leaf, a leaf like our common white birch, and when over ten or twelve inches in diameter of trunk the bark becomes rough and covered with black clefts.

This latter, this weeping form, is the one I wish to draw special attention to. It is the birch growing upon the dry soil of the Petrovskoe park near Moscow, that park which is the summer resort of the residents of Moscow. The most attractive feature of this park is its avenues, and groves of weeping birch. Some of these groves seem to have sprung up as though planted irregularly at distances of from six to nine feet apart, each way. Thus the one thing that presents itself is a vista of bright, translucent, white-barked trunks. The effect is almost magical, and could not be produced by plantations of our dull-barked birches. What an attraction to our Mount Royal park, Montreal, such a grove would be. It would become the haunt of our snowshoe clubs by moonlight, in summer the resort of picnic parties and pleasure seekers. How beautiful our Montreal park could be made by the judicious planting of trees of varied form and foliage.

B. Dahurica, we saw at St. Petersburg, an oldish, slow-growing, rough-barked tree. *Costata*, too, usually noted as from the Amur. Much like our canoe birch in bark and leaf, but has a slow-growing, stunted look.

CALYCANTHUS.

Some northern forms, *C. Sibirica*, seems quite hardy at the Botanic Gardens, St. Petersburg. Flowers whitish yellow.

CARAGANA.

The most widely popular of the Russian shrubs is unknown, I may say, in Canada. In western Europe we scarcely notice the Caraganas, except in the botanic gardens. In central Europe they become much more generally planted; even in mild climates like Prague, we find them common in the city gardens. It is a plant capable of enduring great extremes of cold and drought; the best shrub for planting on the confines of the cold desert, and therefore widely popular in the cold, dry North.

On the Finland road, that suburb which is the resort of the townspeople of St. Petersburg during their short, cool summers, the caragana is the common hedge plant. It and the red berried elder are the commonest shrubs. In the tea gardens of the Petrovskoe park near Moscow, where the Russians meet to enjoy their tea around their hissing samovars, the dividing screens are caragana. At Moscow and Kazan, it and the Siberian thorn are the common hedge plants.

This arborescent caragana is known also as the Siberian Pea tree and in France sometimes called acacia de Siberie. It is a shrub usually from eight to fifteen feet in height, although at Saratof I saw it as much as thirty feet. It has a very small dark

leaf, and may be trained to grow in tree form. There are many varieties; some catalogues offer thirteen or fourteen varieties. The most beautiful to my mind is *pygmæ pendula*; top grafted, it forms a delicate, pendulous head, very graceful and ornamental. I fear there is some confusion in the names given to these varieties. I have seen the names gracilis, microphylla and horrida given to what appeared to me to be this. *C. ferox* or *spinosa* is spiny, stiffer in growth, and has more foliage; it, too, may be top grafted. Of other kinds I would mention *C. altagana Dahurica*, a straggling bush with leaf smaller than arborescens. *Frutescens*, a good shrubby little bush from the Altai Mountains and Turkestan. *C. Jubata* is from Mongolia, and from the cold district of that coldest of all countries, eastern Siberia. This, however, is positively ugly.

CORNUS—Dogwood.

One variety of the Cornus I wish to draw special attention to, the *Cornus alba fol. variegatis* or *C. stricta* of some catalogues. It is a low shrub with bright, white-margined leaves, very showy and attractive, and perfectly hardy. A very great favourite in the nurseries at Riga, a great favourite wherever known.

There is also a white-margined variety of the *Cornus mascula*, very pretty indeed; hardy at Warsaw, but not hardy at Voronesh or Riga. The ordinary *Cornus mascula* is not to say hardy at Riga. At Warsaw, in the Botanic Gardens, we find a tree of it eighteen inches in diameter of trunk and twenty-five feet high, and at least thirty feet across its extended branches.

Andrew S. Fuller, in his "Fruit Culturist," recommended the introduction of the Cornus mascula as a fruit-bearing bush. At the nurseries of Simon-Louis at Metz, where they have six kinds, the *C. mascula macrocarpa* is considered the largest in size, and the best in flavour. This was corroborated at other places. It is worthy of trial at Toronto and southwards.

CORYLUS—Hazel.

On this I have nothing definite to say. At Vienna we saw a specimen of the *C. colurna* or Tree-hazel, thirty feet in height. Further south in Turkey it grows to a height of fifty or sixty feet, but is not hardy in cold climates. At Reutlingen Mr. Lucas showed us the fruit of a number of varieties bearing large nuts of different shapes, but I cannot say if likely to prove hardy here. In the extreme climate of Kazan we saw lots of wild hazel, but the fruit is small; no improvement upon our native species.

Nut culture has been tried at Riga, and Mr. Goegginger suggests that we should try the *Giant de halle*.

COTONEASTER.

We saw many hardy varieties. In the garden of the Agricultural Academy at Petrovskoe, *multiflora*, *vulgaris* and *lucida* seemed all right. In the Moscow Botanic Garden we saw one variety bearing red berries, and another blue; both seemed quite hardy, so was lucida. *Acutifolia* grows to a height of six feet, and seemed quite hardy at some points in northern Russia. I saw many hardy forms, but did not take any trouble to look them up.

CRATÆGUS—Thorn.

The Oxyacantha, or Quick, is the common hedge plant of central and western Europe. On our way to Russia we passed thousands of miles of this hedge; along the railways, along the roadsides, often separating suburban properties. We began to lose sight of it on the way to Warsaw. However, it is quite hardy there and is grown a good deal, but we cease to find it as a hedge plant beyond Vilna. At Riga it is not hardy, and from thence northward it is replaced by *Sibirica*. On our return journey we find the Oxyacantha again at Kiev, large trees of it in the Botanic Gardens,

such as one sees upon estates in England. The hardiness of this plant could no doubt be increased by getting seed from its north-eastern limits of growth.

The *Sibirica*, or rather *C. sanguinea* of Siberia, is a good hedge plant. Much like some of our own thorns, but I think of rather faster growth. Good hedges of it at Riga ten feet high. In the College Gardens at Petrovskoe, Mr. Shroeder points it out as perfectly hardy, so too is *Crus-galli*. *Nigra* also is all right. *Monogama* has a pretty cut leaf, and is fairly hardy, not as hardy as the above.

CYTISUS—Laburnum.

Here, again, are some hardy forms, although the same species from Scotland will not endure our cold winters.

In the Botanic Gardens at Munich we found alpinus growing to a height of over thirty-five feet, with a dozen trunks from five to twelve inches in diameter.

In the severe climate of Orel, in central Russia, we find a tree of alpinus which seemed quite hardy. The northern nurseries all grow cytisus, and these hardy varieties are well worth looking up.

ELEAGNUS—Wild Olive.

This is a race of bright, silvery leaved trees and shrubs of great ornamental value.

In the grounds of the Pomological School at Proskau, we find a shrub three feet high with gray, silvery leaves three inches long and an inch or more wide. We saw it again in the Botanic Garden at Moscow, apparently hardy. It was not named. This is very ornamental and should not be lost sight of.

E. angustifolia. In moderate climates this grows to a large size. At Warsaw we find a tree two feet in diameter of trunk and thirty feet high, old, and on its decline. In the cold climate of Orel we saw a tree thirty-five feet in height, but I do not remember it farther north. It has long, narrow leaves, white on under side, bright and pretty. Of its blossom and fruit I cannot speak.

E. longipe, of Japan, we saw at Kew; a shrub six feet high, bearing large quantities of spotted red berries, like oblong cranberries. At Verrieres, in the garden of M. Henri de Vilmorin, we again see this plant bearing heavily; fruit red, a nice acid, fully equal to cranberries, and as free from seed. It seems a very abundant bearer, and well worthy of introduction as a fruit-bearing plant—a plant likely to yield quite as much of a fruit as good and as saleable as cranberry. The only question is its hardiness. It should be tried with us in sheltered corners, where the snow-drifts would be likely to cover it. In many nurseries this is known as *E. edulis.*

FAGUS—Beech.

The European Beech is not as hardy as our native species. It will not thrive at St. Petersburg, whereas our own is found fifty miles north of the city of Quebec. I observed, however, that the cut-leaved beech *(F. syl. incisa)* is hardier than the purple-leaved, and may be tried in rather severe climates. There is a very fine specimen of the cut-leaved in good health on the grounds of Mr. Wagner at Riga.

FRAXINUS—Ash.

The foresters in Russia prefer the American ash to their native species. So do the Forest Schools in western Europe. The *excelsior*, however, grows to greater size; one in the Botanic Gardens at St. Petersburg rises from the ground with six trunks from five to fifteen inches in diameter. The American is said at several different points to be the hardier. This seems strange, for at the Botanic Garden at Kazan we are told that *excelsior* was indigenous in that government. The variegated form of our native ash *(F. Amaucubaefolia)* we find at Moscow and other places. The single leaved ash *(F. exc. mono-*

haylla) has grown to the height of twenty feet in the Moscow Botanic Garden, and seems quite hardy, whereas little trees of mine at Abbotsford suffer. The weeping ash (*F. exc. pendula*) is fairly hardy at Riga. The young shoots are sometimes injured there. *F. juglandifolia subintermedia* may be seen in the Botanic Garden, St. Petersburg; a tree twenty-five feet in height and apparently quite hardy. *F. mantchurica*, a fine tree, quite hardy at St. Petersburg, and grows to a diameter of three feet in its native land.

GENISTA.

NOTE.—Several species and varieties of this small shrub are worthy of trial. *Genista pilosa plena*, flowers abundantly in June; *G. tinctoria* is hardy even at Moscow; the double flowering yellow of Germany we did not see north, but it will no doubt prove hardy with us.

GLYCYRRHIZA.

G. echinata.—A shrub like a bastard indigo, bearing large balls of rough tufted seeds. A very curious shrub, which we saw in the Botanic Gardens at Kazan.

G. glabra is not so striking.

HIPPOPHAE.

The grey silky foliage of these shrubs makes them very attractive. "Are they hardy?" I asked Dr. Regel. "I received them from central Europe and they proved tender; I then procured seed from Siberia, botanically the same, and they are quite hardy." Such was Dr. Regel's reply, the same old story, his experience and mine, as far as I may be said to have any.

The *Hippophae salicifolia*, which we saw at Proskau, was much like a rosemary willow, and lacking in that white lustre which others usually have. *Sibirica* is more like the *argentea* of Proskau, bright and very ornamental.

JUGLANS—Walnut.

NOTE.—When at Saratof on the Volga, Mr. Budd and I saw two large trees of the so-called English Walnut (*J. regia*), and let us remember that the winter temperature of Saratof is but one degree milder than the city of Quebec. We examined the trees carefully, and could not have easily been mistaken, as we had watched this same walnut and noted it wherever growing for several weeks, through central Europe, noting its variations in leaf in different places. The nuts which are for sale at all the little provision stalls along the Volga, are much like those shipped to the London market, but are harder in shell and slightly smaller, but whether these are grown on the lower Volga, the Caucasus, or in Persia, I cannot say.

LIGUSTRUM.

Ligustrum foliosum.—The common English privet has not been found hardy in Iowa. The northern species named is equally beautiful, and stands the dry summers and cold winters at Voronesh, Russia. It is more than probable it will do good service as a border plant with us.

LARIX—Larch and Tamarac.

In the Riga nurseries we first saw *Sibirica* and *Europæa* growing side by side. Sibirica much the faster grower in nursery, foliage slightly longer, more fringy, and clothing the branches better than on Europæa. This larch was from the Ural Mountains. Again at the Petrovskoe Academy there is a very fine avenue of Sibirica, a quarter of a mile or half a mile long. The foliage very light in colour; the outline much less sharply conic than other varieties. An avenue of even-sized trees about thirty feet in height. In the Botanic Gardens at St. Petersburg we see it in old age, a

few old trees about seventy feet high. Alongside of it is *L. Dahurica*, of equal size and age, but different in this way, that at a certain height Dahurica usually forms two or more trunks; it is just as ornamental, but on this account not equal as a timber tree. In the far north, on the border of the tundra, Dahurica is a small stunted tree. Many years ago the Duke of Athol had imported larch seed from the forests to the south of Archangel. This proved inferior in growth and in quality of wood, and led us to suppose that there was no larch in the Russian forest equal to Europæa, which is that of central Europe. The Duke of Athol's seed, too, may have been obtained from stunted specimens on the northern limit of its growth.

The *L. Koempheri* of Japan, Mr. Wagner, of Riga, says is not hardy at Berlin.

LONICERA—Honeysuckle.

The following list is given by Mr. Budd:

NOTE.—"*Lonicera orientalis.*—A hardy fine shrub, with large black fruit.

"*Lonicera cerulea.*—Much like the above, but with large dark-blue berries, covered with a rich bloom.

"*Lonicera ruprectiana.*—This has peculiar thick plicated leaves and is ornamental through the season.

"*Lonicera alpigena.*—This has the largest and finest leaves of the family, and the red berries are as large as Morello cherries.

"*Lonicera hispida.*—A new species from Turkestan. It has very narrow leaves, and bears fine crops of showy white flowers.

"*Lonicera xylosteum mollis.*—An upright form of the Chinese honeysuckle, which is very hardy and ornamental.

"*Lonicera Kamschatka.*—A large berried species, popular in all the parks of northern Europe."

If I may I will add from my own notes which are very brief. The first four above named seem quite hardy as growing in the Imperial Botanic Garden at St. Petersburg. *Coerulea* and *orientalis* are from Siberia. *Ruprechtiana* is growing to a height of ten feet. It is from Amur. I saw a specimen of it twelve feet high somewhere, I think at Moscow. *Sorbifolia* is common at St. Petersburg. *Alberti* is from Turkestan, and has foliage like a purpurea willow. *Xylosteum*, noted by Mr. Budd, and which I noted as hardy at St. Petersburg, is growing in bush form to the height of ten or twelve feet in the Botanic Garden at Warsaw. *Kamschatka* is also growing there to the same size. *Maximowiczi* is from Amur. It is said to be quite hardy at St. Petersburg and well worthy of introduction.

MAGNOLIA.

Mr. Maximowitch tells me that the *hypoleuca*, if the seed be procured from Hakodadi, on the Island of Yezo, might be worth trying in rather severe climates. It becomes a large tree, and, I think, has a large blossom. The *M. kobus* is less beautiful, but probably still hardier.

MORUS—Mulberry.

We made many inquiries about the Russian Mulberry, but could hear nothing of it in the colder climates. At Voronesh, in the Botanic Gardens, we saw a variety in leaf much like it, though there not valued. In Odessa there are large mulberry trees, we are told, and in the Botanic Garden in Vienna, we saw not only large trees of *Alba*, but a specimen of *Tartarica*, fourteen inches in diameter of trunk and twenty-five feet high. The Russian mulberry, however, as known in the States, is on extensive trial in the cold climate of Cottonwood county, Minnesota. It has been visited by horticulturists, and we shall soon have opinions upon its probable value.

Mr. Maximowitch suggests that we should try the Mongolian mulberry, if we can manage to get it.

The following note by Mr. Budd gives the status of the case in a few words:

NOTE. - On account of ease of propagation from cuttings, the so-called Russian mulberry has been introduced very suddenly and extensively. Its home is in southern Russia. We first saw it at Voronesh and Orel, where the above noted forms of the horse chestnut are perfectly hardy. The stories told about its value as a timber tree were laughed at by Russian foresters. It is used in Russia as it will be here, as a small-sized ornamental tree, of some value as a fruit producer. It is worthy of trial, but not of the fuss which is made over it by interested parties.

PANAX.

P. sessiliflorum.—A shrub or small tree from Amur, well worth introducing. There is a specimen in the Botanic Gardens, St. Petersburg, about fifteen feet high, and Mr. Maximowitch tells us that it blossoms well there, but does not mature its fruit. It grows in Mantchuria, but not north of lat. 49°.

PHELLODENDRON.

Mr. Goegginger, of Riga, tells us that in the Botanic Garden at Dorpat, half way between Riga and St. Petersburg, there is a tree of this variety eight to twelve inches in diameter of trunk, and twenty-five feet in height. Again, at Orel, in central Russia, we find a young tree about fifteen feet. Clearly hardier varieties than those now grown in United States. The tree I have at Abbotsford is not quite hardy.

NOTE.—Seed might be obtained from Prof. Dr. Russoff, Director Botanic Garden, Dorpat.

POPULUS—Poplar.

The poplar is our most valuable tree where quick shade is needed. Different species abound in varieties; some of the best we have not.

P. alba.—The silver poplar is a tree of very wide habitat; the varieties indigenous in cold, dry regions we have not tried. In the Botanic Garden at Kazan, there is a row of eleven trees, in all in the garden twenty trees, about eighteen inches in diameter of trunk; trunk straight and tapering, the leaf larger than our varieties, and than acerifolia only where making strong growth. The quality of the wood of the white poplar is well known, but the trouble is the difficulty of getting a straight piece from the western European form. On dry soils the white poplar we have, becomes very small in leaf, and looks unhappy, while the varieties we find on the Volga, maintain a large acerifolia leaf and good growth on very dry soil, and stand severe drought better than any of the Siberian poplars, better than any other tree we find there except the wild Volga pear. Cuttings from Kazan and other points in eastern Russia should be obtained, for these straight-trunked, drought-resisting, white poplars are very important, both as timber and ornamental trees. In the collection at Verrieres, near Paris, planted by the late M. de Vilmorin, two varieties maintain this straight trunk.

Of the *erect* forms of white poplar, that which we find in the nurseries under the name of *Bolleana*, and said to be from Tashkent and Samarcand, seems the same as that at Busy Institute introduced by Prof. Sargent, and described by me last year as a species from Turkestan: a deeply cut-leaved silver poplar, as erect when young as a Lombardy; a decided acquisition. I am told by those who have been at Astrachan, that the common white poplar along the Volga, from Tsaritsin to Astrachan, is upright like the Lombardy.

Such are the variations in poplar seedlings, that in dealing with them we must consider that we are dealing with approximations. The P. alba and the P. alba nivea in the different botanic gardens of central Europe all differ somewhat.

At Kew there is a grand specimen of alba pendula, three feet in diameter of trunk: a lofty tree of fine weeping form. There is an alba pendula in the catalogues of Riga, and I think Metz, but I have not seen it.

P. monilifera.—This is the most largely planted tree in northern and eastern France, the most common country road-side tree in central Europe. Not only along the road-sides, but, especially in France, along all sorts of imaginary lines across the fields we find it in single rows, with side branches trimmed up and cut as they grow for faggots and even for sheep feeding. Loudon queried as to whether it was introduced from Canada or Virginia. At any rate botanists seem to say it came from this continent. This favourite tree, with some variation of form, is our own native cotton-wood; universally planted in the north-western States, valued in Europe, scarcely known and never planted, I may say, in this Province. A most valuable, though an overlooked tree. Its wonderfully rapid growth at Abbotsford has begun to attract notice there.

P. nigra.—At Warsaw some of the roads are lined with grand old trees of what is there known as the *Vistula poplar.* We saw large spreading trees sixty or seventy feet in height, with a leaf much like our cotton-wood, and with bark rough except on limbs less than five or six inches. In the Botanic Gardens at St. Petersburg are two immense trees, one nearly six feet in diameter, now in a state of decay, and said to have been planted by Peter the Great. However, at Riga and other places this tree is not a favourite on account of its tendency to decay or kill back in the tops of the branches, both on dry and moist soil, and as we get into severer climates, trees of this variety are often very unsightly, and thus it is not a favourite as is monilifera.

A very different tree is the Nigra of the Botanic Gardens at Munich. A tall tree of small diameter, not spreading, and with very small leaf. A good healthy tree, unlike others, and worthy of trial. According to the Flora Russica, by Dr. Ledeborn, the Populus nigra is a native of Lithuania, Moscow, Kazan, the Caspian desert, southern Siberia, and the Altai. For some reason the Siberian balsamiferas have been planted instead of it in eastern and middle Russia.

P. Eugenei.—This is a hybrid between fastigiata (or Lombard poplar) and monilifera; so we are told by Messrs. Simon-Louis, at Metz, who have a very large collection of the poplars of central Europe and who seem to have made them a special study.

P. tremula.—Our own aspen is the poorest tree we have, so short lived. The Russian form grows to much larger size, and does not appear to be short lived. In Botanic Garden at Munich there is a high, narrow, small leaved tremula, much like the Munich nigra. A good tree.

ASIATIC POPLARS.

Under this vague heading, for want of a better, I will group a race of poplars hardly known to us; trees better suited to dry, cold climates than those of the monilifera and nigra types, at least one would suppose so from the fact that they are the street and garden trees from Moscow to Kazan, and south to Saratof, and in middle Russia. They do well on dry soils, yet do not maintain anything like the same healthy foliage during extreme drought as the Volga forms of the silver poplar. Neither are they trees of great size, at least not in their native climates. They seem related to our balsamifera or Balm of Gilead, yet have leaves not pubescent but smooth, and whitish on the under side, and in some forms singularly narrow.

P. laurifolia.—This, Mr. Maximowitch tells me, is a medium sized tree, usually thirty or forty feet in height, and one foot in diameter of trunk, as growing on the Altai Mountains. Mr. M. had seldom seen it larger. It is a common street tree in north-eastern Russia. It is a fast grower, has narrow leaves curled very much on their edges, and has angulated branches. A specimen in the Botanic Gardens at St. Petersburg is nearly fifty feet in height, and I understood it to be but twenty-six years planted. It seems to be a faster grower than suavolens.

P. suavolens is a native, says Mr. Maximowitch, of very cold districts in eastern Siberia, also of Kamtschatka and the islands of the coast. It grows to a height of fifty or sixty feet, with a trunk two or three feet in diameter, and is a good street tree. Branches round.

NOTE.—The two above mentioned are botanic species. The following, mostly horticultural varieties named as in the Russian catalogues:—

P. Berolinensis of Dr. Regel and of the Riga nurseries is the *P. Certinensis* of Prof. Sargent, and which has been grown at Busy Institute, Jamaica Plain, Mass., and has thence found its way into some of the U. S. nurserymen's catalogues. I am not a botanist and am at a loss to know whether to class this as a European or Asiatic poplar. It is a very fast grower, and a favourite in the Russian nurseries, but would seem to be a seedling of our own cotton-wood. Leaf just like it but curled on the edges.

Petrovskoe, as received from Chas. H. Wagner, and growing in the college grounds at Ames, Iowa, seems the same.

P. Sibirica is another variety; foliage slightly broader, and Mr. Wagner, of Riga, says it grows to be a good sized tree. This must be the Sibirica pyramidalis of some catalogues, and is, I think, the tree we used so often to see planted in the gardens at the railway stations, and which looked at a distance very like a sweet cherry.

P. Sibirica pyramidalis received by Mr. Budd from Mr. Wagner, of Riga, seems the same as the laurifolia of Mr. Sargent.

P. balsamifera in leaf in nursery is just like the above, but is said to grow into a tree of different form. We saw a specimen of it in the Botanic Garden at Kazan fifty feet in height and two feet diameter.

P. Sibirica suavolens.—A good sized spreading tree, Mr. Goegginger says like a tilia. Said to grow larger than S. pyramidalis.

Of others, *Wobsti*, Mr. Shroeder, at Moscow, says, is a large as well as a good tree, with broad leaf. It is said to be from Turkestan.

NOTE.—This has dark foliage of balsamifera type and brownish red shoots. This seems to be *P. Nolesti* of Busy Institute.

Petrovskoe, Mr. Goegginger says, is a Turkestan variety, growing at Petrovskoe, also a broad-leaved variety. *Nigra horizontalis*, said to be from Tashkent. *Simonii*, an Asiatic variety with red twigs and a close thin leaf the least like the balsameas. *Effratica* or *diversifolia* from Turkestan is a curious variety of irregular foliage; so says Mr. Goegginger of Riga, who has the largest collection of these poplars which we saw. *Tristis* is a variety with dark concave, thick, glossy leaf, which sprang up by chance in the Botanic Garden at St. Petersburg.

These varieties are mostly variations of what Pallas called the Siberian balsamifera. They will not grow to as large size as our own Balsam of Gilead, which here is a lofty tree with a trunk three feet and even four feet in diameter, and which reaches a diameter of six to ten feet on the upper Peace river in the North-West. They are, however, so easy of introduction, so easily scattered, they differ so much in foliage and growth, that they must be looked upon as interesting and valuable introductions.

POTENTILLA.

NOTE.—Pretty little shrubs for the north. *Dahurica* bears white flowers, *fruticosa* yellow.

PRUNUS—Plum.

P. padus aucubaefolia (Variegated-leaved bird cherry). This and other varieties quite hardy in the north.

P. Maakia.—Hardy at St. Petersburg.

P. spinosa.—The dwarf form on the Volga, seldom grows over three feet. I have seen bushes eighteen inches high loaded with bright blue little fruit. Very ornamental.

PYRUS—Apple and Pear.

Some very ornamental trees among the wild forms of the apple and pear.

P. eleagnifolia.—A bright foliaged tree, nearly as white as salicifolia, leaf broader and growth more upright and regular. I do not know that it is a tree of northern habitat, still it is hardy at Proscau. We also saw a good specimen of it eight or ten inches in diameter of trunk at Warsaw.

P. salicifolia.—The most ornamental of the pyrus; of irregular, eccentric growth, somewhat pendulous, and with branches intertwisted in all sorts of ways. The leaf is very narrow, and as white as the regalis willow; a strikingly beautiful tree. It is a native of the Ural Mountains, and therefore should prove hardy.

P. Ussuriensis.—The wild pear of the Ussuri in Mantchuria. I am not sure that I saw it. The tree is said to be quite ornamental, the fruit of fair size, but it does not soften even when cooked.

The wild pear of the Volga and of middle Russia, I must mention as the best tree I know of for a cold climate, for maintaining a dark, glossy leaf during extreme drought.

QUERCUS—Oak.

Tender and unsatisfactory as are some of the English oaks, the *pedunculata* in Russia grows in climates quite as severe as the native oaks of this Province. The foresters tell me that pedunculata is indigenous in the Government of Moscow, also, I am told, in the Government of Kazan. From this latitude southward, wherever the soil is suitable, this oak has been planted in vast quantity by the Government forestry stations. Our red oak is a good, fast grower, but the wood is inferior. Our white oak is the very best of wood, but, I was going to say, it grows; but watch a white oak for a few years, and if you believe your eyes you will declare it does not. This Russian pedunculata combines good growth with a good quality of wood.

I find the *Q. r. fastigiata*, the upright oak, hardy as far north as Riga. *Q. Mongolica*, a variety with a very small indented leaf, is recommended to us for trial in our cold climate.

RHAMNUS—Buckthorn.

R. alpinus.—A variety with an immense leaf, and quite ornamental. At Riga, Mr. Wagner says, hardy but sometimes slightly injured.

R. catharticus.—Hardy at St. Petersburg.

R. Pallasii.—A pretty shrub with very glossy foliage, six feet in height. It seems hardy in the Botanic Garden at Moscow.

RHODODENDRON.

The rhododendrons extend from the Himalayas north, to the Altai, and east to Kamschatka, and are found in some cold regions. *R. dahuricum* is an evergreen variety with purple blossom, quite hardy at St. Petersburg. It does well on limestone soil. *R. parvifolium*, a smaller and more compact shrub with a small blossom; grows well on peat or without it, and is very hardy far to the north.

RIBES—Currant.

R. alpinum.—A fruit and an ornamental shrub. The fruit is of fair size, a rich carmine, quite sweet, but with a very slight bitter, yet nice, and quite productive, it would seem. It is from Siberia. Mr. Shroeder, at the College Gardens at Petrovskoe, seemed to value it highly. In Siberia, not only the currants, but some of the loniceras bear fruit, which is gathered for the table, and yet these same varieties ripened in the climate of St. Petersburg are not eatable.

ROBINIA—Locust.

The pseudo-acacia, or *yellow locust*, next to the monilifera poplar, is the most common tree in northern and eastern France. We find it planted along the railroad cuttings and embankments to bind the earth. We find it a common tree in the streets and parks of Paris. We find it planted to cover waste tracts of land. As we enter Germany we find it a most popular tree in their streets and city gardens.

According to Loudon it was introduced into Europe in 1601 or 1635, and the tree planted at the latter date in the Jardin des Plantes at Paris is still living. A still larger tree, however, is that in the public gardens at Warsaw. This locust has run into endless varieties. The great favourite in central Europe is a top grafted, rounded variety, which, I think, must be the *umbraculifera* or globe acacia. Not quite hardy at Warsaw though grown there. Not likely to prove hardy here.

In Europe this tree does not seem affected by borers, nor does it have the same seedy look when old that it does here. Its wood is most durable and valuable at any age; its growth when young is rampant; it suckers very badly. At Abbotsford we have had no borers, and hence it promises to be the best fence-post and fence-rail tree we have.

ROGERSIA.

This I did not see, but Mr. Maximowitch speaks of it as a pretty shrub, which does well at St. Petersburg. The flower is small, but plentiful.

ROSA—Rose.

I wish to draw special attention to the *Rosa rugosa*, and especially its double form, *flore pleno*, as a shrub perfectly hardy at St. Petersburg and Moscow. In this respect it is pointed out to us as a shrub of unlimited hardiness. It has a pretty double flower, and is a decided acquisition. It is a native of Japan. The *R. villosa pomifera* is so named because it bears a fruit two inches in diameter, and which is good for preserves. It is fairly hardy at Riga. It should be planted where likely to be covered with snow. *R. rubrifolia* is a red foliaged shrub. The flower is not special, but I am glad to know that this plant, which I had admired at Busy Institute, is hardy in the north.

SALIX—Willow.

S. alba var splendens.—In the Botanic Garden at St. Petersburg there is a fine specimen of this bright silvery willow, a tree about fifteen inches in diameter, and thirty-five feet high, without any dead wood about it; a tree of great ornamental beauty in contrast with dark foliaged trees like S. laurifolia. Throughout Russia we find willows more or less of this shade of colour. In France and central Europe many willows have this bright silvery tint. We intended to try the *alba lucophylla* of Messrs. Simon-Louis, at Metz, until we found at St. Petersburg a variety whose hardiness was already tested for us.

S. alba of the Volga.—The first groves of this I saw were on low land on the bank of the Volga, some distance below Nijni Novgorod; lofty trees with straight narrow trunks, growing quite close, and therefore without lower branches. The foliage is quite narrow and feathery, the branches pendulous. Single trees maintain the same straight trunk. At several points on the Volga I asked what variety it was, and was told Salix alba. It is also known as "vertla." How different is the salix alba of western Europe, the great screen, wind-break and snow-break tree of the prairie States. This Volga willow is not suited for these purposes, but is a straight growing timber tree of great height, with feathery foliage.

S. acutifolia.—This is the favourite willow for planting to stay drifting sands. In Mantchuria, in the woods, it is a large tree with a trunk four feet in diameter, used by the natives for canoes. In cold open exposures it is a mere shrub. It is the best weeper among the willows in the Botanic Garden at St. Petersburg.

Of others, *S. Californica*, a small, broad-leaved, very bright silvery little shrub, quite hardy at Proskau, quite hardy, top grafted even, with Mr. Hoser at Warsaw. *S. cuspidata* becomes a large handsome bush. It has a laurel leaf and yellow twigs, quite hardy at St. Petersburg. *S. fragilis* is, I believe, a widely scattered tree in north Europe and Asia. Large canoes are made of it in Amur. Rather ornamental and quite hardy.

SAMBUCUS—Elder.

An ornamental race of plants, most of which are adapted to cold climates.

S. nigra.—We find this as a small or even medium-sized tree in the milder parts of Europe. It has been grown at St. Petersburg, but is tender there. The *S. nigra incisa*, which we saw at Prague and similar climates, is a very dark, yet feathery cut-leaved shrub of great beauty. I think this is the *Nigra laciniata* of the nurseries at Riga, which is fairly hardy there.

S. racemosa.—The red-berried Elder is the favourite shrub in Russia; more widely planted than any other, except the Caragana; more common than the mountain ash, or any other tree bearing ornamental fruit. In the north it bears its clusters of bright red berries in profusion, and decorates the roadsides and gardens, where it is planted. The *S. racemosa serratifolia* is a beautiful cut-leaved variety of it; fairly hardy at Riga, nearly hardy at St. Petersburg. There is also a variety *plumosa*, much like it, and about as hardy at Riga.

SORBUS—Mountain Ash.

As we journeyed from Proskau to Riga, during the first week in August, the Mountain Ash everywhere were full of clusters of bright red berries. This eastern form is not as straight and smooth a grower as the ordinary forms from western Europe, yet this seems to fruit more heavily: but here is the point, it colours its fruit a month earlier.

SPIRÆA.

I will again quote from Mr. Budd:—

NOTE.—We have introduced very few hardy spiræas at the west, and the few fine ones we have tested are not yet common in our nurseries. Yet, with the hope that we will soon have a specialist in this desirable line of nursery work, I will note a few fine species of the spiræa for the central and north part of the State.

Spiræa oppulifolia.—While no better than our native species, it is a special favourite in all parts of Europe. It should be better known with us.

Spiræa Douglasi.—We have a fine spiræa under this name in the eastern nurseries, but the Russian form seems an improvement in plant and in the length and perfection of its purple flower spike.

Spiræa cana.—This has fine graceful foliage much like our Thunbergia. It flowers freely in June and July at the north.

Spiræa nobleana.—This is a fine hardy species with a profusion of scarlet flowers in July at the north.

Spiræa laviegata.—The only spiræa, it is said, which is strictly dioecious. The leaves are very large and the whole expression of the plant peculiar: very hardy.

Spiræa alba.—In the northern steppe gardens this species attracts the attention of all visitors.

Spiræa bella.—Hardy, fine foliage, and a profusion of fine, white flowers.

Spiræa chamædrifolia.—A steppe species, improved probably by crossing. It is popular as an ornamental hedge plant in the north, and even as far south as Austria. It bears pruning, and in June and July it is literally a wall of pure white flowers. It grows readily from cuttings. Of the spiræas, only the specially hardy are noted, as for milder parts of the State we already have a good collection.

To the above list, by Mr. Budd, I would like to add *fruticosa*, a variety noted for its prolonged bloom, which is yellow. It is indigenous in parts of Siberia, Mongolia and Thibet, and would seem suited to dry climates.

These varieties are all so well known by Mr. Maximowitch, that the list specially recommended by him must be given. It is as follows, amurensis, betulifolia, callosa Foxi, cana, carpinifolia, confusa, hypericifolia, lævigata, sorbifolia, and triloba.

SYRINGA—Lilac.

NOTE.—The northern steppes seem the home of the large leaved lilacs of the *Josikæa* race. In the large cities of central Russia, trees fifteen or more feet in height, with fine rounded tops, are everywhere common in public and private places.

TAMARIX—Tamarisk.

This is a beautiful feathery shrub, unlike any other. I was always making enquiries to see if we could not find a really hardy species. The *T. tetranda* is a native of the Altai Mountains, yet needs shelter at St. Petersburg. *Dahurica* is very light in colour, and very feathery. Mr. Goeggінger, at Riga, finds it a little hardier than Gallica or tetandra. *Gallica* seems to differ much in hardiness. In the Botanic Garden at Moscow it is said to be seldom covered. In Norway, Germanica grows wild in lat. 70°, about as far north as the sorbus and the trembling poplar.

We cannot grow the tamarisk as a tree, as in the gardens of the Tuilleries, in Paris, but as a shrub, cut back each fall, grown in some corner where the snow is apt to cover it, there should be no trouble in the culture of this beautiful plant.

NOTE.—In my search for a hardy Tamarisk, Mr. John Robinson, of the Arnold Arboretum at Jamaica Plain, Mass., kindly comes to the rescue. He tells me of a T. Chinensis (?) received thirty years ago from an unknown source, and which has never shown any signs of winter injury at Salem, Mass. He even sends me a photograph of the tree, the top branches reaching the sills of the windows of the third storey, and yet the tree has been cut back many times to keep it in shape. Mr. Robinson also speaks of the readiness with which it grows from cuttings.

TILIA—Linden or Basswood.

The Linden is a very favourite street or park tree in central and northern Europe. It has long been a favourite, and hence we find avenues of grand patriarchal trees which have been the pride of generations. At Verrieres there is an avenue planted by the late M. de Vilmorin, trimmed inside in the form of a high narrow Gothic arch, with transcept, a prolonged Westminster Abbey.

T. Europæa.—The linden of western Europe is hardy in Montreal, but its leaf is so fine and thin that it is sensitive to drought, and even in England its foliage is apt to wilt in dry weather. It is a favourite street tree on the Massachusetts coast, yet should not be planted largely in drier regions.

T. Europæa var parvifolia.—As we proceed eastward this becomes the favourite, and finally, in middle and eastern Russia, the only tilia. The first specimen we noticed was at Reutlingen, in Wurtemburg, a largish tree with leaf no larger than an English shilling. It was growing very slowly, the foliage is always larger. At Salzburg, in Austria, the grand old lindens, centuries old, trees four or five feet in diameter of trunk, were all parvifolias. At St. Petersburg the finest street trees are lindens, and I believe most of them parvifolias. Here the ordinary Europæa is known as the tilia of Holland. At Moscow parvifolia is represented in the Botanic Gardens by a tree with a straight trunk over four feet in diameter. In Kazan we are told that the trade in basswood bark from that region is all from this parvifolia variety. Russian foresters view the enormous consumption of basswood bark much as thinking men do here our export hemlock bark trade, and consider it a destructive industry. Soon some other material will have to be found for peasants' shoes, rope and matting.

Of the other varieties, *nigra*, which we saw in the Munich Botanic Gardens, struck me as being a good tree, with dark, glossy leaf. The *vitifolia*, of the American nurseries, has a good leaf, but I did not see it in Europe. So has *dasystyla*. *Grandifolia* and a host of others have foliage too thin for our dry air. *Begoniaefolia* is not variegated enough to be ornamental, not in dry weather. *Aspenifolia* is a great curiosity, leaves torn and slashed irregularly, folded and indented, with scarcely two leaves alike; quite hardy at Proskau; fairly hardy at Riga. This is sometimes noted as *dissecta*.

Of the *white-leaved* lindens, the *American*, which I have noted as a native tree as far north as the Hennepin Islands in Minnesota, is spoken of at Riga as the hardiest tree, and the largest tree. I believe it is rather erect in growth. The *Hungarian*, known there as pannonica (I suppose the tomentosa of Messrs. Simon-Louis) is not as hardy, not as erect in growth, more bright in colour, more ornamental. Further south, at Vienna, in the Botanic Gardens, we find a variety marked heterophylla, of Ohio and

Mississippi, twelve inches in diameter, semi-upright, more bright and white in foliage than the T. argentea of Hungary alongside. The white leaved European lindens we did not see in the very severe climates. The alba of Hungary has not proved hardy with me at Abbotsford, still less so the alba pendula which winter kills at Riga. So we had better try the northern forms of the American white lindens.

ULMUS—Elm.

In Europe they have overlooked the grandest of all American trees, the white elm, a tree that thrives in climates even more severe than St. Petersburg and Moscow.

The *campestris* is not indigenous at St. Petersburg, as I had said, nor is it hardy there, but *effusa* is. In the southern part of the Government of Moscow, both effusa and montana are found wild, but the northern limit of campestris is yet further south. *Effusa* is a good and a hardy tree, but I never saw one of large size. At Petrovskoe, Moscow, Mr. Shroeder showed us a fine specimen of *effusa pendula*, so my notes say, but I have forgotten it. *Montana*, or the so-colled Scotch elm, is not so hardy there or at St. Petersburg. Some weeping forms of it of the camperdown type, seemed quite hardy at Riga, and were very graceful and ornamental. The pendula should rather be named horizontalis. They have a fine specimen in one of their public gardens, eight inches or more in diameter of trunk. Another is quite pendulous. We are much in need of a tree of this kind a littlehardier than camperdown. *U. montana exoniensis* is very erect in growth, has large curled leaves clinging around the stem—both odd and ornamental. *U. m. Damierii* is much like it, but said by Mr. Wagner to be less hardy. *Adantifolia* is like the urticaefolia of the American nurseries, but even more crinkled, and its recurved serrations are very curious. The *U. suborosa (?)* of Turkestan, is a small-leaved variety, not hardy at Moscow. Under the name of Sibirica are several varieties unlike one another, and quite unlike that described by me last year.

VIBURNUM.

I again quote from Mr. Budd:

Note.—Except the snow-ball and high-bush cranberry, we have no species of this numerous northern family under cultivation in the State. The following should be introduced: *Alnifolium*, *Dahuricum*, *dentatum*, *lantanoides*, *macrophyllum*, *lantana flore pleno*, *lantana marginatum*, *lantana minor*, *prunfolium*, *pygmœum*, and *pyrifolium*.

The lantana appeared quite hardy in the Botanic Gardens at Moscow.

EVERGREENS

Abies and Picea—Spruce and Balsam.

Note.—The favourite evergreen in the Riga nurseries is *A. Sibirica*, known also there as *pichta*. A good grower and a balsam with rich, long foliage. I think the seed was said to have been brought from the Ural mountains. Picea pichta is common in the U. S. nurseries, but as I noted three years ago, is quite variable in different nurseries in its length of leaf and beauty. On the grounds of General Greig, the President of the St. Petersburg Horticultural Society, on the shore of the Gulf of Finland, in full view of Cronstadt, there is a specimen about thirty-five feet in height and much richer in foliage than the Norway. In fact it was about the most ornamental in the whole collection. At Kazan and again in the Petrovskoe Park near Moscow, we saw much larger and older trees, trees without any decay of their lower branches, as is apt to be the case with our native balsam, and yet these trees were growing on dry soil.

Of other varieties, *Engelmanni* of the Rocky mountains, a great favourite and always hardy. As Mr. Budd says, we must go to Russia to get a true estimate of its value in our own country. *Nordmanniana*, a fine specimen, thirty feet in height,, in the Botanic Gardens at Warsaw, but not hardy further north. *Pectinata*, said not to be hardy at Moscow, and yet it would seem as though they had obtained their seed from some southern source, as there are trees of it two feet in diameter at Kazan. *Obovata*, a hardy spruce

from the Urals, with foliage like the Norway, a lofty tree with very short branches, and therefore a tree of unusually small diameter compared with its height. I have seen trees which struck me very much, and supposed them to be Obovata or Shrenkiana. *Orientalis*, no hardy varieties of it in the Russian nurseries, those so far tried not hardy.

JUNIPERUS—Juniper.

J. communis.—The common Juniper grows to a good size in Finland. Sections of the wood at the National Exhibition at Moscow were nearly a foot in diameter. We also saw a specimen in Kazan nearly the same size.

J. sabina or *Savin Juniper* is a native northern plant, we saw it in the Botanic Garden at Moscow. General Greig tells us that it is commonly known as the Cossack Juniper.

PINUS—Pine.

P. sylvestris (Scotch and Russian Pine). It was through the kindness of M. Alphonse de Vilmorin that Mr. Budd and myself had an opportunity of studying the variations of the sylvestris pine at Des Barres. In 1822 the late M. de Vilmorin began that series of experiments which has been of such great service to the forestry of Europe, and here I would call special attention to the article "On the Riga Pine" in the U. S. report on Forestry in 1878-79, by Dr. Franklin B. Hough. Mons. de Vilmorin had been struck with the variableness of the sylvestris pine of France from a timber point of view. He therefore planted thirty-two samples of seed, seven of which were from Russia, the others from different parts of Scotland, France and Germany. Every sample of seed is now represented by its row or rows of trees, each having an individuality of its own. In the sylvestris of western Europe we find great variableness; some have ascending branches, others horizontal; some attain to good size, others not; some have trunks almost straight, others wobble, if I may so speak. Of the seven samples of seed received from Russia, two were from Riga, and the others from Smolensk, Vitebsk, Vilna, Tchernigov, and Volhynia. All these trees had ascending branches remarkably straight, trunks with reddish bark, and though these different groups to the eye of a botanist like M. de Vilmorin each had an individuality of its own, yet they all combine those characteristics which make them first-class timber trees. It may be noted that these samples were all from western Russia, for the last two Governments lie to the north-east and north-west of Kiev, and yet for timber purposes they are fair representatives of the pines of European Russia. At the Moscow exhibition there was a collection of the branches, cones, seeds, etc., of the sylvestris pine, from nine different governments of European Russia. A chat with a professor in charge, gave me the impression of the general uniformity of these pines for timber purposes. I also asked from which government he would rather obtain his seed? He replied, if planting at Moscow my preference would be rather in favour of seed from one of the three divisions of the Archangel district, but from which division I do not know. This Russian pine seems to grow nearly as high as our own white pine, but is a tree of smaller diameter of trunk. Among the pines of western Europe one variety growing abundantly between the Loire and the Rhone was especially crooked and stunted in growth and worthless as a timber tree. These trees were pointed out by M. de Vilmorin as heavy seed producers, and hence the seed has been picked in quantity, and no doubt has come to this country in quantity.

The experiments of M. de Vilmorin show clearly the great advantage of the Russian pine, which he says "not only grows more rapidly and to a larger size," but he adds "the timber is more elastic and valuable when mature."

The plantations of M. de Vilmorin are not confined to sylvestris pine. There are five varieties of P. laricio, a faster grower, but of doubtful hardiness here. Of Mugho, eleven varieties; of pines of different species, seventy-six kinds. There are sixteen varieties of spruce. Altogether about 117 varieties of evergreens, and 296 varieties of deciduous trees.

M. de Vilmorin began his experimeets with the Riga pines with the hope of growing on French soil the masts for the French navy. The masts had to be brought from Russia. The French forests could not produce them. But this noble patriotism widened into a yet nobler universality, so that his experiments, now perfected by the lapse of time, are the grandest accumulation of forestry data that the temperate regions have ever seen.

P. Cembra (Var. *Sibirica*).—This is the most ornamental of the pines in the Russian parks, more massive in its foliage than our native white pine. We find fine specimens at Gen. Greig's, and in all the botanic gardens and parks. We were told by the foresters that in the Koloninsky Park not far from

Moscow, there are trees of immense size, 600, or 700 years planted. It is a common tree in the Urals and in Siberia. Its seed and that of the sunflower are sold in all groceries, and are the peanuts of the Russian peasant population.

TAXUS—Yew.

T. baccata.—The common yew of central Europe is scarcely hardy at Warsaw. In the well sheltered Botanic Gardens, it has been injured so much as to be scarcely ornamental. Neither is it at all hardy at Riga. However, Mr. Wagner tells us that there is a northern form found in the woods near Riga, and which I suppose is more or less hardy there.

At Volsk, in the Botanic Garden, there are two large specimens of yew, nearly thirty feet in height, with a number of branches or trunks ascending from the ground, different from anything we had seen elsewhere.

In conclusion, I would say that I have written these notes when pressed with other work, but felt it was necessary that they may appear at once, that whatever is of value to us, should be imported next autumn; for orders of plants from points north and east of Warsaw must be shipped in the fall.

Seeds can be sent from or to Russia in bags under eight ounces. Scions I have sent safely to Warsaw by mail; and scions sent by mail from Riga arrived in fair condition. Letters to central and eastern Russia (Moscow excepted) should be addressed in Russian.

As an amateur, I cannot continue to give up to this work the time I have given in the past. My part has been an endeavour to show our Governments and our horticultural societies what may, what should be done.

Let us carefully watch the work now being carried on by Mr. Budd, at the State Agricultural College at Ames, Iowa—work of the highest value to the cold climates of Canada; that work which made our trip to Russia a necessity, that is, a necessity to fair progress; a trip which enabled me in part to see with his eyes, and give you in some degree the results of his study and observations.

Let us then follow out this scheme of interchange with our corresponding climates in the old world. The work has some difficulties. However, as we have the northwestern States and the Russians as our allies, the difficulties may be overcome to our great and mutual good.

INSECTS INJURIOUS TO THE WHITE PINE—

Pinus strobus.

By Wm. Saunders, London, Ontario.

More than one hundred species of insects have been enumerated as destructive to the white pine, some attacking the wood, others the bark, twigs or leaves, and while some of them do comparatively little harm, others are very injurious. In the present paper reference will be made mainly to those which do the greatest injury to this our most valuable timber tree, briefly sketching their life history, and habits as far as they are known. The losses occasioned by the destructive work of borers are unfortunately too well known to those engaged in the lumber trade, although the sufferers in most instances know but little of the curious transformations which these insects undergo. These specially destructive species inflict their greatest injuries during the larval period of their existence, in which condition some of them continue their work for several years before reaching maturity. Most of these pests belong to one of two families of beetles, the longicorn, or long-horned beetles (*Cerambycidæ*), or the serricorn, or saw-horn beetles (*Buprestidæ*). The cylindrical bark-beetles are also injurious, but as they operate chiefly near the surface, immediately under the bark, they do not injure the timber to any material extent.

Monohammus Confusor.

Among the most formidable enemies in the family of long-horned beetles are two species belonging to the genus *Monohammus*, and known as *Monohammus confusor* and *M. scutellatus*. *M. confusor* is a large grey beetle, remarkable for the extraordinary length of its antennæ or horns. This insect is shown in fig. 19. The body varies in length from an inch to an inch and a-half, the average size being over an inch. Its general colour is ashen grey, mottled with darker spots and dots; there are also patches of a whitish colour on the head, thorax and abdomen, which are sometimes indistinct or almost wanting, the colours being chiefly due to a covering of very fine, short hairs, which, as they are easily rubbed off, occasion these variations in the appearance of the insect. The antennæ of the males vary in length from two to upwards of three inches; those of the female are much shorter, and seldom exceed the length of the body. During the summer the female lays her eggs in the crevices of the bark of the white pine trees, frequently selecting those which have been scorched by fire or felled by the wind or the lumberman's axe.

Fig. 19.

The larva when hatched soon eats its way into the wood, where it forms channels or galleries through and through the solid interior. When full grown it is a large, soft, white grub, nearly cylindrical in form and destitute of feet. The head is large, of a reddish-brown colour, and is armed with a pair of powerful jaws; the next joint behind the head is flat and horny, and larger than the others, the body tapering a little from this point backwards. The chrysalis state is passed within the burrow, and the beetle appears late in June or during the month of July. As this insect lives a long time in the larval state, the beetle is often developed after the timber has been built into a house, when, suddenly emerging from its concealment, it becomes a source of wonder to the inhabitants of the dwelling. When burrowing into the wood, the larva makes a noise not unlike the boring of an augur, which on a still night may be heard in the woods for a considerable distance, and such noises occurring in a house where the cause has not been suspected has often given rise to superstitious notions and excited in the timid much alarm. This beetle is very generally distributed throughout the Northern United States and Canada, and in the lumbering districts is sometimes excessively abundant. One instance is on record where nearly three hundred of the beetles were seen at one time on a single pine tree. As these insects are partial to cut timber, they often greatly injure logs which are allowed to remain a season over in the mill-yard.

Monohammus Scutellatus.

This beetle derives its specific name from its white scutellum situated at the junction of the wing-covers with the thorax. It varies in length from three-quarters of an inch to an inch, and usually occurs most abundantly in June. In fig. 20 we have a very good representation of this insect. The body is black above and below, and thickly pitted with irregular impressions. On the wing-cases there are a number of scattered whitish spots of various shapes and sizes, which, when examined with a magnifying lens, are found to be formed of dense clumps of short, whitish hairs, which often disappear by being rubbed off. On each side of the thorax is a thick, triangular spine; the antennæ are many-jointed, and in the female are about the same length as the body, while in the male they are nearly twice that length.

Fig. 20.

The larva of this insect is also a thick, white grub, without feet. The body is divided into a number of well-marked segments, the head as in the species last described being furnished with a strong pair of jaws. This larva infests the white pine chiefly after the lumber has been cut or newly fallen, and injures it by boring large, oval-shaped cavities, which extend for long distances through the interior of the log. In some localities these insects are very plentiful, literally swarming on pine trees, They are common in the lumbering regions of Canada and the Northern States.

Criocephalus Agrestis.

Another injurious beetle belonging to the same family, but having much shorter horns, is known under the name of *Criocephalus agrestis*. This beetle is of a blackish-brown colour, with three large irregular indentations on the top of the thorax and two ridges on each of the wing-covers. The antennæ are about half the length of the body. The eggs of this insect are laid on the pine trees, and the larva when hatched bores into the wood, perforating the trunk in all directions, making a flattened cylindrical hole. When full-grown it is about an inch long, is white, footless, with a brown head. The anterior portion of the body is somewhat thicker than the hinder segments. The larva changes to a chrysalis within its burrow, and produces the beetle late in May or early in June.

The Lesser Orthosoma—*Orthosoma brunneum.*

This is a long-horned beetle of a rather flattened form, about an inch and a-quarter long and about one-third of an inch broad—see fig. 21. It is of a deep red colour, darker anteriorly; on each side of the thorax there are three sharp teeth and several slightly elevated lines on the wing-covers. The larva is about an inch and a-quarter long, cylindrical in form, and of a whitish colour. The beetles are very common during the months of June and July, and the larvæ are frequently met with in decaying pine stumps. Since they feed chiefly on decaying wood they do but little harm.

Fig. 21.

There are several other smaller species of longicorn beetles which injure pine trees, but as their habits are very similar to those of the larger species to which reference has been made, it will perhaps be unnecessary to speak further of them now.

The Virginian Buprestis—*Chalcophora virginiensis.*

Among the Buprestidæ, or saw-horn beetles, the Virginian buprestis (*Chalcophora virginiensis*) will first claim attention. This is a large and handsome beetle, which measures from eight-tenths of an inch to an inch or more in length. It is of an oblong form, and brassy or copper-coloured, sometimes almost black. The upper side of the body is roughly punctated, the top of the head deeply indented, on the thorax there are three elevated and polished thick black lines, and on each wing-cover two small, square, impressed spots, a long, elevated, smooth, black line near the outer margin and another near the inner margin, with several thinner, shorter lines between them. The under side of the body has a coppery lustre, and is sparingly covered with short whitish down. It appears towards the end of May, throughout June, and occasionally later. The larva is a flat-headed white grub, with its anterior segments very much enlarged, which bores into the sap-wood of the white pine, and sometimes girdles the tree; its track begins as a narrow shallow groove on the surface of the wood, increasing in breadth as the larva grows, following an irregular course, and terminating in a large hole, at which point the grub changes to a chrysalis.

The Liberated Buprestis—*Chalcophora liberta.*

This is a closely allied species, much resembling the Virginian buprestis in all its stages. The beetle is about three-quarters of an inch long, of a brassy or coppery hue, sometimes glossed with green, in other specimens nearly black. The thorax and wing-covers are deeply furrowed by irregular longitudinal depressions. It differs from *Virginiensis* in the width and character of the raised lines on the wing-covers.

Dicerca Tenebrosa.

Is another member of the family of Buprestians which is an enemy of the white pine. This species in the larval state mines under the bark of the tree, where it occurs as a medium-sized whitish grub, with a flat head, brown jaws, and enlarged anterior segments. The beetle occurs late in the summer, is of an ashy-bronze colour, with the thorax and elytra more or less furrowed, and densely pitted. The under surface is copper coloured. This insect is found in most parts of Canada and the Northern United States.

The Golden Buprestis—*Buprestis striata.*

This species also deserves mention here. It is a very handsome beetle, from six to seven-tenths of an inch long, of a coppery-red colour, with a broad bluish-green stripe on each wing-cover, which varies in brilliancy in different specimens. There are four raised smooth lines on each wing-case, and a wide, shallow groove along the middle of

the thorax. Both thorax and wing-covers are pitted with minute dots. The larva of this species, which is very similar to that of *tenebrosa*, is occasionally found in sound pine logs, but much more frequently in decayings logs and stumps.

Harris' Buprestis—*Chrysobothris Harrisii.*

This lovely little beetle measures about one-third of an inch in length. The female is of a beautiful metallic green all over; the male has the legs and the sides of the thorax of a reddish-bronze, with a purplish tinge towards the tips of the wing-covers. The thorax has a conspicuous furrow down the centre, and is marked with some irregular indentations, which are repeated also on the finely-punctured elytra. The beetle is found on white pine saplings towards the end of May and in June; the larva lives under the bark of young trees and in the smaller limbs of older trees.

Cylindrical Pine Borers.

Eight species of cylindrical bark beetles belonging to the family *Scolytidæ* are known to attack the white pine, of which perhaps the boring Hylurgus (*Hylurgus terebrans*) is one of the most common, and since they are all very similar in their appearance and habits, this may be taken as a representative species. The beetle is about a quarter of an inch long, of a nearly cylindrical form, a chestnut-red colour, and is thinly clothed with yellowish hairs. It is found in abundance in May in pine forests and amongst lumber in mill-yards and elsewhere throughout the greater portion of North America. The larva is a small, yellowish-white, footless grub, with a yellow, horny head, which bores winding passages in many directions in the inner layers of the bark of the tree, and also in the outer surface of the wood.

Xyleborus xylographicus (fig. 22) is another member of this family, which has proved to be a formidable enemy both to the white pine in the north and to the yellow pine in the south.

Fig. 22.

The Pales Weevil—*Hylobius pales.*

Among the weevils, or snout beetles, there are also several species which injure the white pine, one of them is known as the pales weevil (*Hylobius pales*). It is a dark chestnut-coloured or black weevil, from three to four-tenths of an inch long, sprinkled with dots more or less bright, which are found, on magnifying them, to be clusters of very fine, short, yellowish-gray hairs. These insects are quite common in May and June among pine trees, and lumber piles. The female perforates the bark of the tree with her snout and in the excavation deposits an egg, where it shortly hatches into a white or yellowish-white larva, which burrows beneath the bark, consuming its substance and loosening it from the wood. In the autumn the larva bores into the sap-wood, forming a cell nearly a quarter of an inch deep, arched over the top with a roof of sawdust and woody fibre. Within this enclosure the larva changes before spring to a pupa, from which the beetle escapes early in the summer. It is found from Maine and Lake Superior to Florida.

The White Pine Weevil—*Pissodes strobi.*

This is a common weevil met with at all times during the season, but most commonly in May. They affect the upper shoots of the trees, depositing their eggs in the bark of those which are young and growing thriftily. When hatched the young larvæ devour the wood and pith, causing the shoots to wither and die. The leading shoots being destroyed, the trees become irregular in their growth and much disfigured. The larva is white, and about one-third of an inch long. The beetle (see fig. 23) is of an oblong, oval form, rather narrow, about a quarter of an inch long, of a dull dark brown colour, with two dots on the thorax, and a short, irregular, white band behind the middle of the wing-covers. They are also ornamented with a few patches of tawny yellow.

Fig. 23.

The Woolly Bark Louse of the Pine.

This is an insect which, in some localities, is very destructive to the white pine. Large patches are frequently found on the trunk and branches covered with a white, cottony secretion, under the protection of which live myriads of tiny lice. These puncture the bark with their sharp beaks and feed upon the sap, thus exhausting the trees, and sometimes causing their death. Large numbers of these lice are destroyed by lady-birds, who feed on them both in the larval and perfect state. Two species are especially useful in this instance. One is shown in fig. 24, where it is represented in its three stages. This is known as the painted lady-bird (*Harmonia picta*); the other is black, with two red spots, and is called the twice-stabbed lady-bird (*Chilochorus bivulnerus*). The larva is shown in fig. 25.

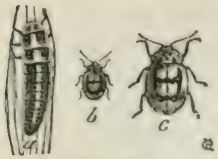

Fig. 24.

Fig. 25.

Pine Leaf Scale Insect—*Chronaspis pinifoliæ.*

Another allied species is the pine-leaf scale insect (*Chionaspis pinifoliæ*, Fitch). The leaves of the pine are sometimes found to be covered with innumerable elongate, snowy-white bodies, which, on examination, are found to be the scales of an insect; these when abundant give to the whole foliage a whitened appearance, and, if the insects are allowed to pursue their course unchecked, the leaves shortly become yellow or brown, and the trees languish and occasionally die. In fig. 26 is shown a tuft of leaves injured

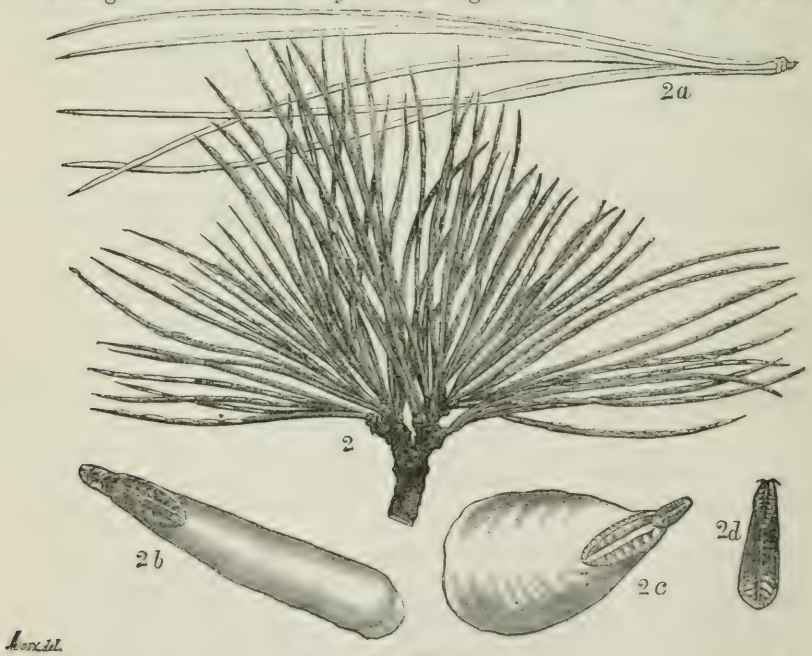

Fig. 26.

by this scale insect. The scale of the female, shown at 2*c*, is about one-tenth of an inch long, that of the male, shown partly grown at 2*d* and mature at 2*b*, is not more than one-thirtieth of an inch. Both male and female scales are much magnified in the figure. This insect has not yet proved troublesome in forests, but has chiefly affected trees in cultivation. It very closely resembles a species found on cultivated pines in Europe, and may possibly prove to be the same. The eggs are produced under the female

scales, from fifteen to thirty under each scale; they are oval in form and of a red colour. The larvæ hatch early in May, and are also red. When first hatched the young females move briskly about until they have selected suitable locations for a permanent abode, when they attach themselves thereto and remain fixed. The males are less active, and often attach themselves to the leaves in the immediate neighbourhood of the parent scales. This insect produces at least two broods in a year, perhaps more, and is found throughout the United States from New York to Florida.

The White Pine Saw-Fly—*Lophyrus Abbotii.*

This species belongs to the family of saw-flies, a class of insects which are said to have greatly injured whole forests of pine in Germany. This American saw-fly is abundant in Indiana, Illinois, and Missouri, and is generally distributed elsewhere through the Northern and Western States and Canada. Fig. 27 represents the insect in its several stages. The larva is from eight-tenths of an inch to an inch in length, of a dingy white colour, with a black head, and several longitudinal rows of black spots along the body, and is found most numerous in the autumn. When full fed they enclose themselves in oval cocoons, which are sometimes spun up among the leaves on the tree, but more frequently among the fallen leaves and other debris on the ground. Within the cocoons the larvæ remain unchanged until the following spring, when the pupa is formed, from which the flies issue in about two weeks The male measures, when its wings are spread, about half an inch the female two-thirds of an inch across. The body of the male is black excepting the under side and tip of the abdomen, which are yellowish. The female is of a honey-yellow colour, with the head and thorax a little darker, the thorax with the abdomen being slightly marked with black. The wings are transparent, with black veins. The larvæ feed in flocks, and seldom leave a twig or branch until they have completely stripped it. When approaching full growth they consume a large quantity of food, and strip a tree of its leaves with wonderful rapidity. When disturbed they have the habit of throwing back the head and ninder part of the body, and if the tree or branch is violently shaken many of them will fall to the ground. A large proportion of these larvæ are destroyed by a parasitic fly.

Fig. 27.

The Pine-boring Pyralid—*Nephopteryx Zimmermani.*

In the months of June and July branches of the white pine often show that they are suffering from the attacks of an insect by the pitch which exudes; the wounds usually occur below the insertion of the smaller branches near the top of the terminal shoots. On cutting into the affected part, the injury is found to be caused by a small larva which, when full grown, is nearly three-quarters of an inch long. The head is shiny-brown, with black mandibles, the body blackish-green, naked, with a few black dots on each segment, from each of which arises a single rather stout hair. The larva devours the inner side of the bark, and making furrows in the wood, causes the exudation which, when excessive and continuous, especially in the case of young trees, sometimes proves fatal. In July the larva spins a thin, whitish, papery cocoon in the mass of exuding pitch, which seems to act as a protection to both larva and chrysalis. The chrysalis is smooth, and of a blackish-brown colour, and produces the moth in from ten to fourteen days. The moth, when its wings are expanded, measures an inch or more across. It is of a blackish-grey shaded with reddish, the hind wings are pale yellowish-white, and the abdomen greenish ringed with dull white. The species is probably single-

brooded. From the fact that the exuding pitch offers so much protection to the insect, it is scarcely likely that any remedy would reach it. The knife seems to be the only resource. A small four-winged parasite attacks the borer in the larval state, the chrysalis being often found filled with the cocoons of this useful friend.

Comstock's Retinia—*Retinia Comstockiana*, Fernald.

This insect as yet has only been observed on the pitch pine (*Pinus rigida*), but as it is probable that it will sooner or later be found to attack the white pine it will be briefly noticed.

The perfect insect is a small moth of a light grey colour, varied with darker shades of rusty brown, which measures, when its wings are spread, nearly three-quarters of an inch across. The eggs are laid on the terminal shoots of the trees, and the larvæ are found in the early part of the summer boring into the twigs and small branches, causing an exudation of resin, and sometimes girdling them. The larvæ, when full-grown, are nearly half an inch long, of a yellowish colour, with a brown head, a patch of the same colour on the next segment, and a few polished brown dots on each ring, and from every one of these there arises a single hair. The larva changes to a chrysalis within the burrow from which eventually the moth escapes. In fig. 28 we have the insect represented in its several stages, also a small branch of an affected tree and a section of one of the bored twigs.

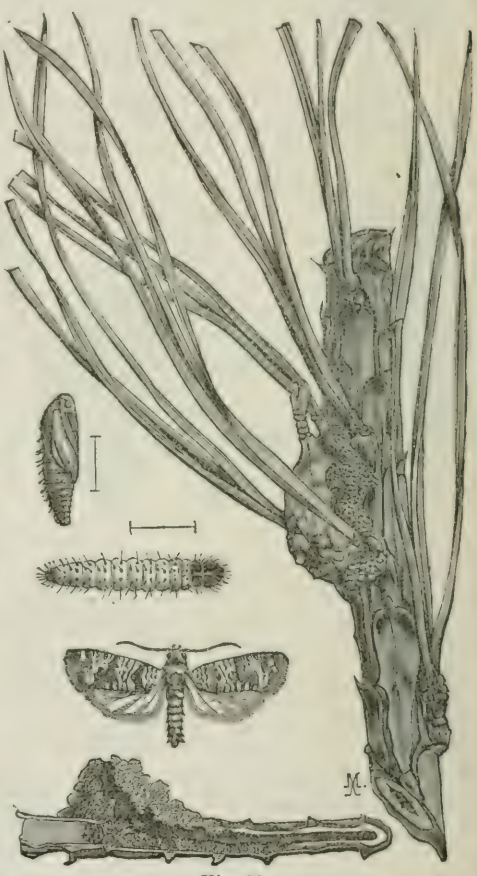

Fig. 28.

The Pine Leaf-miner—*Gelechia pinifoliella* (Comstock).

This insect was first described by Prof. Comstock in his report to the Department of Agriculture, Washington, for the year 1879. It has been found mining the leaves of different species of pine in many parts of the United States, and although as yet unrecorded in Canada, will very probably be found here. The larva is very minute, in the figure it is much magnified; the line below indicates the natural size. It lives within the leaf on the soft tissues, and its presence is soon indicated by the change in colour which takes place in the part affected; it becomes brown, and on examining the leaf, or that portion of it which is discoloured, it is found to be entirely eaten out, and to contain, if in season, the insect, either in the larval or pupal condition. In fig. 29 the work of this tiny insect on the leaves is shown. The moth, chrysalis, and larvæ are all represented, but much magnified.

The larva, when full-grown, is about one-fifth of an inch long, of a pale brown colour, with a black head and a black patch on the upper part of the next segment. It is also sparingly covered with short, fine hairs. The change to a chrysalis takes place within the mined leaf, and in summer the moth escapes in about a fortnight.

The perfect insect, when its wings are spread, measures about three-eighths of an inch across; it is of a brownish-yellow colour, dotted with fuscous scales. The fore-wings are crossed by three white lines, as shown in the figure; the hind-wings are pale grey,

and both pairs are deeply-fringed. There are two or three broods of this insect during the year.

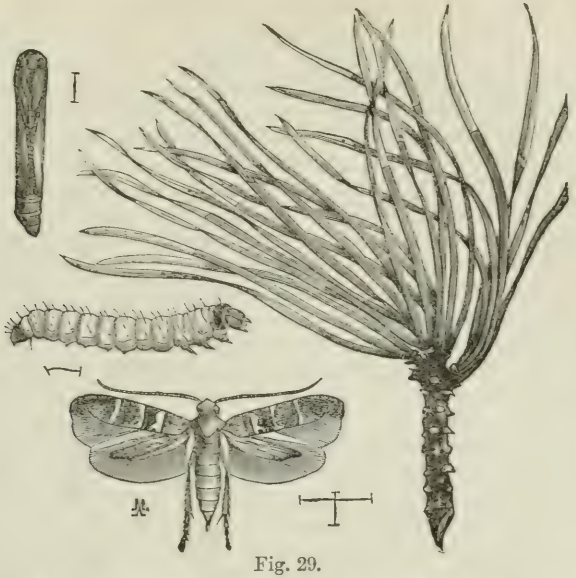

Fig. 29.

In addition to those enumerated, there are a score or two of species of insects which are known to devour the leaves of the pine, in some instances injuring them very much. Unfortunately it does not yet seem to be within the power of man to do much directly towards limiting the destructive work of these enemies to our forests, yet this should not deter us from studying their habits and life history, as a knowledge of these may help us much more than we anticipate. A few trees, such as a belt or group planted for shelter or ornament, may be protected from the leaf-destroyers by syringing them with a mixture of Paris green and water, in the proportion of a teaspoonful of the poison to a pailful of water. Bark lice may be killed by the use of alkaline washes applied with a brush or broom; such alkaline applications are also of use in preventing the borers from obtaining a lodgement in the trees, as these insects will not usually deposit their eggs on trees so protected; but it is scarcely possible that such remedies can ever be applied over extensive areas of forest. It is gratifying to know that in addition to the number devoured by insectivorous birds, almost every injurious species is preyed on by predaceous and parasitic insects, which seek out and destroy the pests with ceaseless diligence. Were it not for these friendly species, the destructive insects would long ere this have rendered the growth of trees an impossibility.

THE CHINCH BUG—*Micropus leucopterus.* Say.

By Wm. Saunders, London, Ont.

This formidable insect pest has recently appeared in force in the adjoining State of New York, where it has within a limited area inflicted a very considerable amount of damage. That an insect so enormously destructive as this one is in the west, has domiciled itself so near us is sufficient to excite some alarm and induce our agriculturists to be on the alert and to use such defensive measures, in case of attack, as the science of economic entomology has suggested.

During the last week in September a package of insects was forwarded to the New York State Entomologist, with the following statement in regard to them, from Mr. M. H. Smith, of Redwood, Jefferson county, N.Y.: "I herewith transmit specimens of (to us)

a new and formidable grass-destroying insect, together with portions of grass destroyed by them, and also some of the soil, for the purpose of examination. If the insect is known to you, and there is any known way to exterminate it, please inform us at once. The evidence of its destructive work was first discovered in June of 1882, by Mr. H. C. King, of Hammond, St. Lawrence county. At haying time, about the middle of July, he noticed about three acres of his timothy grass to be apparently prematurely ripened. In the fall he observed that there was no aftergrowth, and that the stubble was as dead as if it had been boiled. Search was made among the dead roots without any discovery. The following spring the field was entirely barren of timothy, but some clover seeds and thistles occupied the ground where at least one and one-half tons of timothy to the acre, under favourable circumstances, would have been cut. In June of 1883, Mr. King discovered other fields to be affected in the same manner, and instituted a search which has recently resulted in the discovery of myriads of the insect, not in the dead grass, but at the edge of the live grass, where they may be scraped up by handfuls. They have destroyed about fifteen acres for Mr. King, and several acres for each of several other farmers of his vicinity. They are causing extreme alarm, and if you can give any relief from this calamity it will be gratefully appreciated. This is an important grazing locality. In addition to the timothy, June grass and wire grass are also destroyed."

On examination this insect proved to be the notorious chinch-bug, a pest hitherto extremely rare in New York State, and never before recorded as destructive within that State. Prof. Lintner at once visited the district referred to, and thus records his personal observations made during the 5th and 6th of October. He says : "The cold weather of the past few days (ice was formed upon three nights), has doubtless driven most of the bugs to their winter quarters for hibernation, in crevices, beneath boards, rails, etc., in rubbish heaps, and to many other secure retreats, where such insects are accustomed to hide. Yet, upon parting the roots of the timothy, upon the borders of the killed portion, they were found in alarming numbers—in some spots sufficient to cover the ground with their bodies over an area of a couple of inches in diameter, being apparently congregated in such places. In one spot, upon the warm sloping side of a dead furrow, they could be seen, in numbers, running like ants over the ground. Elsewhere, they were concealed among the roots, near to and about the bulbs, upon which they appeared mainly to feed. Their presence in any spot could always be detected by bringing the nose near the ground by their peculiar bed-bug odour. This method of detection proved more convenient, and infallible than looking for them.

"The invasion is more extended than was at first supposed. Nearly all of the farms in the neighbourhood of Mr. King have been attacked, either last year or this, and discoveries of attack not before suspected, are, upon examination, being made daily. A present range of about eight miles is indicated. It is believed to occur throughout most of the town of Hammond, and to extend into Alexandria.

"Without any desire to play the role of an alarmist, I feel it my duty to say that, as the result of my observations, this chinch-bug invasion of northern New York threatens to be the most serious insect attack to which our State has ever been subjected. The following are my reasons for this belief :—

"It has planted itself, maintained a footing and has shown a rapid increase under unfavouring, unpropitious and unnatural conditions, such as these :

"First.—It is regarded as a southern insect (extending further northward, as do most animal forms, in the Mississippi valley), yet it has appeared in the most northern county of the State, and upon (if the report be reliable) the St. Lawrence river.

"Second.—Its attack has been made upon timothy. This seems to be its most unusual food plant, and therefore, we infer, the least suited to it. All previous accounts concur in giving it a preference for spring wheat above all things else ; next in order, oats or corn, and last the grasses. Timothy is only mentioned as occasionally attacked by it.

"Third.—In all previous accounts, great prominence has been given to its being a hot and dry weather insect, dependent upon these conditions, not only for its multiplication, but for its existence. Heavy rains have been claimed to be invariably fatal to it. It could not abound, it is stated, in a wet season. Dr. Fitch had even made recommendation

of sprinkling it with water (an artificial shower), as the best means for its extermination. In the present instance, the bug obstinately persists in multiplying, contrary to all rule. The past year and the present have both been years of excessive rainfall in St. Lawrence county. Spring, summer and autumn have been exceptionally wet. In the spring, I am told that heavy and continued rains flooded meadows now showing the chinch-bug attack. At haying time, when the bugs were young, and, according to all the statements hitherto made, readily killed by wet, the rains were so frequent and severe, that the grass cut could only be secured with difficulty. Upon Mr. King's farm, much of it was drawn in, upon favourable days, by improving the opportunity of extending the labour into hours after nightfall. At the present time grass is lying in fields in stacks, which could not be gathered, owing to continued rain, and fields of oats are still unharvested."

This insect belongs to the order Hemiptera, which includes all true bugs. These are all furnished with a sharp proboscis or beak by which the substance they feed on is pierced and its juices extracted by suction. This piercer when the insect is at rest is bent beneath the body. The chinch-bug belongs to a sub-division of the hemiptera known as the half-wing bugs (Heteroptera), and to this same group the well-known bed pest belongs, and they both give off the same disagreeable odour when touched.

The accompanying figures will aid in making clear the life history of this species.

Fig. 30.

At *a* and *b* (Figure 30) the eggs are shown much magnified, the short lines at the side of all these figures indicate their natural size. These eggs are about one thirty-third of an inch long, of a long oval form with the top squarely cut off. When at first laid they are pale in colour and semi-transparent, but shortly they change to an amber shade and finally in part to red as they approach maturity. The newly hatched larva shown at *c* in the figure is pale yellow, with an orange-coloured patch on the abdomen; very soon the whole body becomes red, except the first two joints of the abdomen which remain yellowish. With the growth of the insect the red colour becomes quite bright and contrasts strongly with the pale band as shown at *e* and in a more marked manner at *f*. As the insect approaches full growth the head and thorax become dusky in colour, and the abdomen of a duller shade of red. At *g* the pupa is represented, in which stage the insect loses none of its activity but gradually becomes duller and darker in colour. At *h* one of the legs of the insect is shown enlarged and at *j* the tip of the same still more highly magnified, while at *i* the jointed proboscis or beak is represented.

In figure 31 we have a view of the perfect insect, also magnified, the short line behind it showing its natural size. It is about one-tenth of an inch long and about one-third of its length broad. In colour it is black, and when examined with a magnifying lens the body is seen to be slightly hairy. The wing covers, which lie flat upon its back, are white with black veins and a black spot on each side about the middle and towards the outer margin. The feet and the outer swollen joints of the antennæ are yellow, the legs and the basal joints of the antennæ black.

Fig. 31.

Its size seems to be quite out of proportion to its destructive powers, and minute though it be it nevertheless inflicts an almost incredible amount of injury in certain years upon the grain and corn crops. Prof. Lintner states that "In 1864, its injuries in the State of Illinois to wheat and corn alone were computed at seventy-three millions of dollars. This was a year of unusual excess, but it is not of rare occurrence that a State should suffer a loss of from twelve to fifteen millions of dollars in a single year. When the

insect abounds, it is so numerous as to cover the ground; it blackens the stalks of the plants upon which it feeds; it fills the air when, at seasons of its mating, it takes wing for flight; it marches to new feeding grounds in solid bodies, upon and over one another; its invading armies sweep over and utterly destroy a wheat or corn field in two or three days; and the nauseous bed-bug odour which they exhale sickens those who are compelled to breathe it.

"As the past history of the insect has shown that parasites and other enemies have entirely failed to arrest its multiplication, we are compelled to believe, from present indications, that it has come to stay, and that it will do so, unless effectual means are taken to prevent it. Its capability of increase is wonderful. Under the most conservative circumstances, a single chinch-bug, depositing its eggs about the 1st of June, would be, in the following August, the progenitor of a quarter of a million."

It is evidently most important that every practicable means should be employed in the endeavour to arrest as far as possible the progress of this mischievous foe, and to destroy it wherever found. Should it continue to increase, since it is already upon our borders, it will in all probability establish itself in force in the adjacent districts in Ontario, if indeed it has not done so already, and it may become to us a more formidable enemy than the wheat midge.

REMEDIES.

Where the insects are found among the roots of timothy, it is recommended to plough them under by turning over a flat (not overlapping) broad furrow as deep as possible, but not less than eight inches. It is said that the insect cannot survive this deep burial. Fire will certainly destroy it, and where the conditions of the grass will admit of burning, this measure should be resorted to; a thin covering of straw would prove a material aid in the burning. Where neither of these remedies can be applied the field should be heavily rolled as early in the spring as possible, for the purpose of preventing the bugs which have hibernated, from gaining easy access to the roots of the grass or grain on which to deposit their eggs. The use of common kerosine or coal oil has also been recommended, made into an emulsion by forcibly agitating it for a considerable time with an equal measure of milk, either sweet or sour, when it will become thick almost like butter, which, diluted with water, should be sprayed over the ground by means of a suitable pump; or the oil may be emulsified by agitating it thoroughly with a larger quantity of soapsuds and applied in the same manner.

PROCEEDINGS

OF THE

AMERICAN FORESTRY CONGRESS

AT ITS MEETING HELD IN BOSTON, SEPTEMBER, 1885.

Vol. IV

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NOTE.—The American Forestry Congress, whether inviting persons to read papers from its platform or publishing those papers afterwards in connection with its proceedings, is not to be understood as endorsing the views expressed or adopting them as its own. The Congress offers its platform, in a liberal spirit, for the purpose of promoting a free and full discussion of all questions of importance connected with the subject of Forestry.

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CONSTITUTION AND BY-LAWS

OF THE

AMERICAN FORESTRY CONGRESS.

ARTICLE I. This Association shall be known as the American Forestry Congress.

ARTICLE II. The objects of this Congress shall be the discussion of subjects relating to tree-planting; the conservation, management, and renewal of forests; the climatic and other influences that affect their welfare; the collection of forest statistics, and the advancement of educational, legislative, or other measures tending to the promotion of these objects. It shall specially endeavor to centralize the work done and diffuse the knowledge gained.

ARTICLE III. Any person may be elected a member of this Congress upon the recommendation of two members and the payment of two dollars. The annual dues shall be two dollars.

ARTICLE IV. The officers of this Congress, to be elected at the annual meeting, are as follows: President, First Vice-President, Second Vice-President, Recording Secretary, Corresponding Secretary, Treasurer, and an Executive Committee, consisting of these officers and five members in addition.

ARTICLE V. The President shall preside at all meetings of the Congress in General Session, and deliver an annual address at the close of his term.

ARTICLE VI. The President, Vice-Presidents, Secretaries, Treasurer, and five other persons to be chosen annually, shall constitute an Executive Committee for the transaction of such business as may be required by this Constitution or by a vote of the Congress.

ARTICLE VII. The Recording Secretary shall keep a record of the proceedings of the Congress, and shall be custodian of all documents, books, and collections ordered to preserved.

ARTICLE VIII. The Corresponding Secretary shall conduct the correspondence of the Congress.

ARTICLE IX. The Treasurer shall have charge of all funds, and pay out the same on the direction of the Executive Committee.

ARTICLE X. The Congress at any regular meeting, or its Executive Committee, in the intervals between its meetings, may appoint such local or special committees as may be deemed proper, and shall define their duties.

ARTICLE XI. The annual meeting of the Congress shall be in the month of August or September, or at such times and places as shall be determined by a vote in General Session.

ARTICLE XII. At each annual meeting there shall be an election of officers for the ensuing year, and they shall remain in office until others are chosen. In cases of vacancies occurring in the intervals between the annual meetings they may be filled by the Executive Committee until others are selected. In case of absence of an officer at a regular meeting his place may be deemed vacant.

ARTICLE XIII. The officers of States, Territories, Provinces, or Local Forestry Associations, or their delegates, or the delegates of any Government, may participate in the proceedings of the Congress as Honorary Members.

ARTICLE XIV. This Constitution may be amended by a two-thirds vote of the members present at any annual meeting.

BY-LAWS.

1. Papers or abstracts of papers to be read must be sent two weeks before any meeting, for classification, to the Corresponding Secretary.

2. The following classification of subjects is adopted for the reading of papers:

Section A. Forest Planting, Forest Management, Forestry Proper, Preservation of Forests.

Section B. Forest Economy, Technology, and Statistics.

Section C. Applied Science and Climatology, General Topics.

3. Contributors who are present shall have the preference in reading their papers.

4. Any member shall be entitled to the privilege of using any books or documents, not of record, at the discretion of the Recording Secretary.

*

We earnestly appeal to all patriotic citizens to join us in the endeavor to arouse public sentiment to the necessity of reform in the utilization of our timber supply and the treatment of our forest lands.

We are actuated by the following considerations:

1. The general and local climatological influence of forest areas, though not yet clearly defined and numerically demonstrated, is beyond doubt established by historical and experimental evidence.

2. The effect of wholesale clearing of forest-clad hills and mountains on the amount and distribution of meteoric precipitations, though not the only cause of waning or irregular water supply, is undoubtedly the principal one, and admits of no doubt.

3. The immediate benefit to agricultural interests derived from properly-distributed forest areas is understood by every intelligent farmer.

4. The natural source of a yearly product of seven hundred million dollars, which the forests at present represent, deserves careful husbanding with a view to its continuity, and calls for due consideration of its interests by legislators as well as by the people at large. Without joining in the cries of alarmists, we have good reasons and sufficient data to assert that the present policy, if continued, must seriously affect this factor of national wealth at no distant time.

5. The excuse of the first settlers in regardlessly removing the forest has no more existence. Wastefulness in the methods of lumbering, as in the reckless destruction by fires—the loss from this cause amounting to more than ten million acres, or value of twenty-five million dollars in one year—with regard to forest products and forest lands, has become criminal, in view of the far-reaching influences which the forests exert.

WHAT WE PROPOSE TO DO.

To effect a reform in this line of economics, in which task we most heartily invite you to co-operate with us, we advocate the following action:

1. To bring the facts which form the basis of the foregoing considerations before the public in an unequivocal manner.

2. To encourage further research and instruction in forestry matters by the establishment of experiment stations, the introduction of lectures or courses on forestry in schools and colleges, the assiduous employment of the press in disseminating correct practical information.

3. To promote and assist the formation of Local Associations for the purpose of furthering the true interests of forestry in every State, teaching and encouraging a systematic use of her forests, and imbuing her citizens with a recognition of their importance.

4. To urge the Legislatures of the different States to enact and enable the enforcement of effective laws for the prevention of fires.

5. To urge the National Government to the enforcement of a sound policy as to its own lands, treating the eighty-five million acres of public forest property as a valuable national treasure, instead of allowing its waste by depredators and fires.

6. To harmonize the interests of the lumberman and the forester,

and devise for the lumbering interest such protection as is *not given at the cost of the forest.*

7. To create popular sentiment against waste, and a love and incentive for Arboriculture by the institution of Arbor-days, by favors to tree-planters in the form of premiums, bounties, or exemption from taxes.

What has been done so far to advance the interest of our cause, in many cases traceable, directly or indirectly, to the influence and work of this Congress, can be shortly recited, as follows:

1. Forestry Associations have been formed in Minnesota, Ohio, Canada, Manitoba, Colorado, New York, while Horticultural and Agricultural Societies have been led to give a prominent place in their discussions to the subject of forestry.

2. Forestry Commissions or Commissioners, either to inquire into the needs of or to manage the forest domain of their States, have been appointed in Vermont, New Hampshire, New York, Pennsylvania, Ohio, Colorado, California.

3. Arbor-days have been instituted in fifteen States of the Union and in the Canadas. Under this incentive in Nebraska, where this observance originated, more than five million trees were planted the past year.

4. The effective fire-legislation now prevailing in Canada was enacted directly upon the specific recommendation of this Congress.

5. The Congress of the United States, largely through the influence of our efforts, has under serious consideration most important legislation with reference to the forests of our national domain.

6. The Forestry Bureau, as a branch of the Agricultural Department at Washington, has collected valuable material in furtherance of the knowledge of our forest condition, in addition to Prof. C. S. Sargent's invaluable work of the census of 1880.

7. Whilst the publications of a "Journal of Forestry," "Forestry Bulletins," "Forestry Manuals," "Forestry Reports," have tried to furnish the needed special information, the press throughout the country, in all its branches, has done good work in creating a widespread interest and a growing readiness for action.

Yet whilst the need of a change of policy is admitted, the means for accomplishing that change are still inadequate. Specific aims and methods yet remain undetermined.

Here is a great problem of national economy worthy the thought and active aid of the best men of the nation!

Here is a duty for every thinking and well-meaning citizen to help preserve and hand over to our children, in full productive power, one of our richest natural resources; nay, the most potent factor of national prosperity!

Here is the opportunity to exercise that duty, in joining those who have begun to open the road to reform!

Change of public sentiment is needed, and such a change can only be effected by the united effort of the best elements.

We need the strongest utterances of the most influential men. We desire the co-operation of every good citizen in the unselfish work which we have undertaken.

You are cordially invited to meet with us.

PROCEEDINGS OF THE FOURTH ANNUAL MEETING

OF THE

AMERICAN FORESTRY CONGRESS.

The fourth annual meeting of the American Forestry Congress was held at Boston, Mass., September 22, 23, and 24, 1885. The meeting was one of great interest, and very encouraging to the members. One of the local papers heralded the approaching assembly in the following words:

It is not long since America was a forest without any congress. For a little more than a hundred years it has had a congress, and now it has too little forest. People are rapidly increasing, and trees are decreasing more rapidly. It is by no means true that there is not room for trees to increase as fast as the people do. The hills and mountains make it sure that there always will be. But they will soon be bare of trees—have nothing to cover them from the burning sun but scrub. If the people do not plant trees, and the right kind of trees, to grow on them, there is a possible desert in the future, with neither men nor trees on it, where population is now most abundant. A few thinking men and women, scattered all over North America, including the United States and Canada, have come to a realizing sense of this serious state of facts, and elected themselves into a Congress to look after the health and prosperity of the trees, which they correctly regard as the indispensable friends of men and animals. This Congress of scientific people from every part of Canada and about every State in this Union will meet at the invitation of the Massachusetts Horticultural Society, and hold sessions in Horticultural Hall September 22, 23, and 24, which will be freely open to the public.

Massachusetts and our own dear over-crowded Boston will give this Congress the warmest possible welcome. It comes here because it is delighted to know that in 1882 the Legislature of this Commonwealth put on its statute-book a wise and well-considered general forestry law, constituting the Board of Agriculture a board of forestry, and authorizing the people of every town to devote land suitable to the purpose to be cared for as a public forest by that board. Under that law it is quite possible for the people of Boston to have, within half an hour's ride in a steam or horse car the use of a public domain of 4,000 acres, covered with every variety of trees and commanding broad views of both salt and fresh water. If the people lend their ears to what this Congress has to say the thing is done.

The sessions of the Congress were held in Horticultural Hall. No place could have been more pleasant or better adapted to the use of the Congress. The Horticultural Society, so long and favorably known among similar societies and to the whole country by its record, had generously placed its hall at the disposal of the Congress, and had also kindly assumed the office of a committee of arrangements for the occasion. Beautiful plants and small evergreen trees in boxes stood along the stairway leading to the assembly room, and seemed themselves to give a very appropriate welcome to the Congress of Forestry men. In the hall itself long tables were spread, which were covered with specimens of forest products, some in their natural state and others manufactured, showing the beauty of many of our woods and their adaptation to decorative purposes.

Although the meeting of the Congress was held in the extreme eastern part of the country, there was a very good attendance, not only of the members resident in the vicinity, but of others from a great distance. California and Nebraska were represented, as well as Canada and the nearer States. Several of the States sent delegations

to the Congress, and the General Government was represented in the person of Commissioner Coleman of the Department of Agriculture.

Earnestness and enthusiasm characterized the meeting throughout its sessions. A looker on must have felt that the members were full of interest in the subject which they had in hand, and which had convened them at this time. The three days of the meeting were fully occupied with the reading of papers and the discussion of them, and some valuable papers which had been prepared for the occasion for lack of time could only be read by their title.

Promptly at the designated time President Higley called the Congress to order and introduced His Honor Mayor O'Brien, who welcomed the Congress to Boston very cordially, and expressed his pleasure in meeting its members. He expressed the hope also that the assembling of the Congress in Boston would have the effect of creating in its citizens an enthusiasm in behalf of forestry which would lead them not only to secure all needful planting of trees along the highways, but the carrying out of the plan for the preservation of the Middlesex Fells, a project which our friend, Mr. Elizur Wright, has so much at heart. The Mayor alluded to the progress which had been made in Boston in the course of the last ten years in securing the ground for several public parks, which, he said, in a few years more would make the city one of the most beautiful in America. His Honor closed by repeating his welcome of the Congress to the city, and expressing the hope that the body might find time to visit some of the public institutions.

President Higley responded to the welcome of His Honor the Mayor, and at the same time acknowledged the obligations of the Congress to the Agricultural and Horticultural Societies of Boston and vicinity for the interest which they had manifested in the work of the Congress by providing Horticultural Hall as its place of meeting, and in various ways providing for its success. The President then made his annual address to the Congress as follows:

ADDRESS OF PRESIDENT HIGLEY.

The subject that brings us together on this occasion from various sections of the United States and Canada has within the past few years grown to be recognized by the leaders of public opinion in America and thinking men and women generally as one of the greatest importance to the public welfare. The discussions of topics relating to forestry and the timber supply, in farmers' clubs, lumbermen's conventions, horticultural and agricultural societies, associations of scientists, and more than all in the meetings of the American Forestry Congress, and in local forestry associations, have awakened a deep and widespread interest in the subject, that in some sections has found expression in important action, and throughout America has laid the foundation, I believe, through the conviction of public opinion, for the sure and onward progress of our cause. Its principles are bound to grow and strengthen until an American system of forestry, adapted to the conditions of the new world, shall be established and shall prevail in all the essentials of successful working, because necessity will compel it sooner or later. Of such vital importance to the people of the United States and Canada is the subject of cultivating and preserving the forests that it must soon command the serious attention of the National and State governments.

Something, to be sure, has been done by way of legislation; a small start has been made through the efforts of a few thoughtful and patriotic men. But before such practical results can be obtained as we desire, the importance of forest preservation and forestry administration must become apparent to the majority of the people. This can be done only through public discussion, wise agitation, educating. Facts of history and personal experience are abundant and convincing as to the effects of deforesting and again of reforesting large areas, upon the climate, the springs and streams, the fertility of soil, the various industries, and the general prosperity.

CHINA.

With such a system of timber culture as Prussia possesses—perhaps the best in the world—China would have escaped those horrible famines which have in the past attacked some of her most densely populated districts and caused the destruction of

millions of people, and imposed untold sufferings upon millions more, as well as the loss of a vast amount of treasure to the state. Only last month came the news from Canton of a great flood, the most serious in thirty years. "More than ten thousand persons lost their lives," says the report, "and a far greater number are left in a starving condition. Entire villages were engulfed, and the rice and silk crops were almost ruined." These destructive floods are largely due to the absence of forests which were long ago cut away from the mountain slopes and the headwaters of streams to give place to the food crop for the support of her dense population. The natural office of the forests in securing moisture and productiveness to the country around was supplied by an extensive system of irrigation and fertilization. Vegetables form the staple of food in China, and this explains how it is that 400,000,000 people can exist in a country only four or five times larger than France. We are told that Chinese horticulture embraces *eighty* different kinds of vegetables, of which *twenty-five*, at least, constitute valuable articles of food for man. The most important of these is rice, for the cultivation of which the Chinese spare no labor or expense. To aid in the cultivation of this cereal they have stripped whole provinces of their original forests, dug immense lakes, and even tunneled lofty mountains. For its sake they collect the waters of both stream and river and direct its course from the mountain's foot over the soil they wish to irrigate. Agriculture to the Chinaman is almost a religion. He repeats to himself the words of the Persian law:

"Be thou just to the plant, to the bull, and to the horse; nor be thou unmindful of the dog. The earth has a right to be sown: neglect it and it will curse thee; fertilize it and it will be grateful to thee. It says to him who tills it from the right to the left, and from the left to the right, may thy fields bring forth of all that is good to eat, and may thy countless villages abound with prosperity."

Ceres, who at Thebes and at Athens brought men together and made the laws, was considered but the reflecting mind of men who till the soil.

CENTRAL NEW YORK.

There is abundant evidence in America of the effects of cutting off the forests. In Central New York streams that thirty or forty years ago kept the ponds well filled for the saw-mill and grist-mill, and furnished a never-failing supply of running water for the farm, are now dry in summer, with the exception of here and there a stagnant pool; the dam is decayed and washed away, the mills gone, and the once picturesque scene is changed to that of desolation. Yet, with the warm rains of spring and the melting snows, the streams overflow their banks, the swift waters carry away fences, bridges, and embankments. Spring opens later. The young cattle were wont to be turned into the wood-sheltered pasture about the first of April; now they are kept shut up until the middle of May. Peach orchards that were sure to be loaded every year with luscious fruit have almost disappeared, and the crop is the exception rather than the rule. The extremes of heat and cold are greater, and droughts in summer and floods in springtime are more frequent and more destructive. Trace the stream from its source and the cause of these things is apparent. The old tamarack swamp that used to supply the boys and girls with aromatic gum, and in which the creek had its source, has all been cut away. The thickly wooded black-ash swamps, through which the stream ran in its course to the lake, have been cleared, and their marshy areas have given place to cultivated fields and pastures. The cutting away the forests from the headwaters and the banks of this stream accounts for the changes I have noted, and this picture, I doubt not, is a very familiar one in the New England and Middle States. It is not difficult for men who know the effects of cutting the timber from small areas around the headwaters of the smaller streams to understand why summer navigation in the Mississippi, the Missouri, and the Ohio has become difficult and at times impossible where it was easy and constant a few years ago; or why the Hudson and the Connecticut are much lower in summer and higher in spring than in former years. The partial deforesting of the Adirondack region has materially affected the flow of of the Hudson, the Mohawk, the Black, and other rivers, and sufficiently demonstrated the fact that were this great watershed of New York stripped of its forest covering, the Empire State would lose her prestige and New York city her rank as the first commercial city of the New World.

THE SCHUYLKILL.

For two years past the engineers of the water-works department of Philadelphia have been making examinations of all possible sources of a suitable water supply for their city, and have lately discovered how seriously the Schuylkill, from which the water supply is now taken, has been affected by the destruction of forests around its

headwaters. Sixty years ago the Schuylkill's summer flow was estimated at 500,000,000 gallons a day. Measurements made from time to time showed a gradual diminution, until in 1874 the minimum flow was only 250,000,000 gallons per day. This is a well authenticated fact, and it is shown that the diminution has been caused by cutting the forests from the headwaters of the supplying streams.

THE FRENCH ALPS.

In 1844 the eminent political economist, M. Blanqui, after visiting the provinces embracing the French Alps, once densely populated and prosperous in agriculture and grazing, presented to the academy a detailed memoir of his journey and observations, and, among other things, said:

"The Alps of Provence present a terrible aspect. In the more equable climate of northern France one can form no conception of those parched mountain gorges where not even a bush can be found to shelter a bird, where, at most, the wanderer sees in summer here and there a withered lavender, where all the springs were dried up, and where a dead silence, hardly broken by the hum of an insect, prevails. But if a storm bursts forth, masses of water suddenly shoot from the mountain heights into the shattered gulfs, waste without irrigating, deluge without refreshing the soil they overflow in their swift descent, and leave it even more scarred than it was from want of moisture. Man at last retires from the fearful desert, and I have the present season found not a living soul in districts where I remember to have enjoyed hospitality thirty years ago."

Such warnings of history are abundant. It is unnecessary to multiply them here. They are familiar to you from their frequent repetition. And yet it is time the people of America learn the sad history of suffering and desolation that have followed the destruction of the forests in the earlier-settled portions of the earth—in China and India, in Persia and Greece, in Switzerland, in portions of France and Italy, on the Istrian coasts of the Adriatic and the extensive shores of the Mediterranean, in Spain and in Palestine, whose rich fields, when her rugged hills and mountain sides were crowned with the sacred cedar, "flowed with milk and honey;" in classic Sicily, once the granary of Rome, and in many of the most beautiful islands of the sea—that they may heed the warning, study the forest conditions, and take the necessary steps to prevent the useless destruction now going on, and thereby escape the fate of those nations and communities that have in the past so recklessly made the unfortunate experiment of stripping the forests from valley and hill and mountain. From the history of these things, and the known data established by long-continued investigation and repeated experiment, we are justified in asserting:

1. That the forest areas exercise a positive climatic influence upon the surrounding country. They modify the extremes of heat and cold, and render the temperature more equable throughout the year.

2. That the deforesting of large areas of hilly and mountainous country affects to a very large extent the quantity of water that comes from springs and flows in rivers. The more apparent is this when the deforesting occurs on the headwaters of important streams. Then the water-power is destroyed or greatly impaired, navigation impeded, commerce interfered with, and droughts and floods are more frequent and more severe.

3. That the interests of agriculture and horticulture are greatly subserved by the proper distribution of forest areas through their climatic and hydrographic influence.

4. That a country, embracing within its borders the headwaters of all the streams and rivers that interlace it, when stripped of its forest covering, becomes a barren waste, incapable of supporting man or beast.

These general facts have been determined beyond question. But it remains for the people of every State and district to decide upon the necessary area and distribution of forest trees for each general locality, and the details incident to their planting, care, and preservation.

PROFITS IN FORESTRY.

The people naturally live and calculate for the present, and are disposed to use the property belonging to themselves so as to derive from it the greatest present good. For the good of neighbors, or the future welfare of the State, they will hardly be induced to forego the advantages to be derived from the cutting of timber and the drainage of swamps, though they knew that such cutting and drainage will eventually result in disaster to the country around; nor would it be fair and equitable for the individual to suffer in his estate for the advantage that might accrue to others, either in this or in future generations. The burden of sacrifice for the public good should be borne by all alike. But the true interests of forestry makes no such demand. On

the contrary, we claim that a wise management of the forest areas connected with the farmers' estates, and the maintenance of a due proportion of them through devoting to forestry purposes the now waste places of the farm, insure to the owner excellent returns for his labor and for the capital invested—a profit that compares favorably with that derived from the ploughed field. This becomes apparent when a fair money value is placed on all the wood and forest product used in many ways on the farm, as well as the timber that is cut for market. The timbered lot is not the dead property that it is often considered to be, and it is worthy the farmer's intelligent care and protection as a source of income.

Until this question is answered affirmatively and demonstrated satisfactorily, Americans will be slow to engage in tree planting for business purposes. Actuated by a sentiment for the beautiful, they will plant trees and adorn the landscape, and even preserve the forest, but not with a view to realize a profit thereby. Until settlements were pushed out into the treeless plains of the West, the necessity for forestry products on the farm had hardly been realized in this country, but then, through the want of them, their full value and countless blessings became apparent to the Kansas and Nebraska emigrant and the dwellers on the prairies of the West. They soon found it profitable to plant and care for trees. Twenty-five years ago cord-wood sold in some of the towns of Kansas and Nebraska for seven, eight, and sometimes ten dollars a cord, where it can now be purchased for from three to four dollars per cord, and that, too, with a population many times greater. "The reason for this," says ex-Governor Morton, "is simply from the fact that the natural groves have been protected from fire, and the artificial groves are turning out an abundance of good wood, such as the necessities of the country demand for fuel." The cultivation of forest trees in the prairie States has proved profitable, according to the testimony of those who have engaged in it. J. W. Davidson, in an article on "Timber Growing in Nebraska," says: "I estimate the cost of preparing an acre, and getting the cuttings of soft maple and ash (they can be had by the thousands along our streams), at $3 per acre. A man can plant 2½ acres per day. That is all the cost for ten years, except interest and taxes on land. I have 1,261 trees per acre. Seven years from planting I will cut one-fourth, or 340 trees, equal to 15 cords of wood; the eighth year 15 cords more; the ninth the same; the tenth year you see my profits. I should cut what is left, 456 trees. Allow four trees to the cord, so as not to overestimate it. I have several trees only ten years old which are 14 inches in diameter and 50 feet high. Four, I think, would make a cord. Allowing six trees to the cord, we have 76 cords, and with 45 cords cut before, 121 cords. At $3 per cord, allowing $1 for cutting, I have $242. As a source of profit, the raising of trees in Nebraska ranks next to the raising of stock."

Many experiments of forest culture have been made in New York and in the New England States with satisfactory results. The financial success of forest culture as a business must depend upon the cost of the land, the adaptability of the trees to the soil and climate, and the marketable value of the wood and timber when grown. While it may be profitable to grow forests in those sections of the country where wood and timber are scarce and high in price, it would be very far from profitable or desirable to plant in sections where lands covered with virgin forests of the most valuable timber can be bought for from $1 to $5 per acre, as they can be in many of the States. But even in these sections it is important that the principles of forestry should be enforced to prevent the destruction, so prevalent, by fire and the lumberman's waste, for at the present rate of cutting in the lumbering districts these virgin forests will in a few years be laid under contribution to supply the great markets of the country.

Forestry has proved remunerative in Europe, where it has been under government patronage and protection for 150 years, and where wood and timber are in good demand at high prices. There is no guesswork about the results there. The book-keeping is thorough and the balance-sheet reliable. Prussia, from her 6,000,000 acres of state forests, receives an annual net income of about $7,000,000. Saxony, from her 400,000 acres of forest lands, receives an annual net income of about $1,250,000. Bavaria, from her 3,000,000 acres, receives annually, after paying all expenses, a net profit of $4,500,000.

ALSATIAN FORESTS.

The report of these forests, made the present year by United States Consul Ballow, of Kehl, to the State Department at Washington, gives some important facts bearing upon the profits realized from systematic, scientific forestry, to which I am indebted for the following facts:

The forests of Alsace-Lorraine cover 35.59 per cent. of the whole territory. The most important of these are in the Vosges mountains, the highest peak of which is 4,300 feet. They were the most important in France before the war of 1870, and are

only excelled by the forests of Baden in Germany. The government and the communities are the principal owners of all these forest lands, amounting to 1,109,660 acres. The government owns of these 336,600 acres—*i. e.*, the government of Alsace-Lorraine; the government and the communities, 42,955; the communities, 496,040; and private parties, 234,665 acres. The government forests are managed by a chief of foresters, with a salary of $2,200, three conservators at $1,800, nine inspectors at $1,600, 63 chief foresters at $1,200, and 275 common foresters and guards at $400 to $500 per annum. Chief foresters and common foresters have free lodging and fuel in addition to their pay.

All forests, no matter to whom they belong, are placed under the supervision of the forest administration, and the latter regulates the cutting. Not even owners of private forests are allowed to cut down their own wood without the consent of the government.

For the cutting and replanting of a forest in the Vosges a period of 120 years is required. During that time the forest is depopulated and renewed.

The average annual gross receipts of the government forests of Alsace-Lorraine, for the last ten years, was $1,786,948, and the average annual expenditure for the same time was $596,684, leaving an annual net income to the government of $1,192,114, or $3.20 per acre.

A large proportion of the forest lands of Europe, and especially in Prussia, has been reclaimed from almost barren wastes, or were lands naturally of little value for agricultural purposes. Their administration furnishes employment to many thousands, yields to the government a large annual income after paying all expenses, even to the support of schools of forestry, experiment stations, etc., while by their climatic and hydrographic influence they render the country more productive and better able to support a dense population.

REFORESTING WASTE LANDS.

In the New England and middle States forests may be grown with little expense and trouble. Fields worn out and abandoned or cleared lands not fit for agriculture and yielding little or no pasture can often be renewed by simply protecting them from browsing cattle and fires. Trees spring up naturally and thickly, and often of good variety. A little expenditure of time and money in sowing or planting the seed of valuable timber trees will insure the growth of a crop that is sure to yield a good return. The wooded area of some of the New England States has increased in the past few years through the mere neglect of the worn out and apparently useless lands, and the lumber product of second-growth white pine is now from 300,000,000 to 400,000,000 feet annually. Frequent examples in New England attest the fact that the rocky hillsides, when protected, soon become covered with a dense second growth of young trees that hide the barrenness of the scene and afford a protecting shelter to the adjoining fields.

But these embryo forests are worthy of more attention than to be simply let alone. Intelligent care in thinning and pruning and utilizing as the growth warrants may add a hundred fold to the value.

A farming country should have not less than 25 per cent. of its area in woodland. In general, outside the prairie States, this proportion can be set aside from lands of little or no real value for agricultural purposes. There is hardly a farm in New England of 100 acres that would not be greatly augmented in value by devoting this proportion to the cultivation and maintenance of woodland, and the same may be safely affirmed of every other portion of the country. And when farmers come to realize this fact they will no longer look upon the wood lot as of little comparative worth, ready to be cleared on the first demand, but will place a just estimate upon its value, and will discern its influence on the rest of the farm in protecting from destructive winds, in holding moisture against the droughts of summer, in modifying the extremes of heat and cold, in rendering the fruit crop surer, and in being, to a certain extent, the conservator of health, while it yields abundantly of its product for the farm.

The words of the late Horace Greeley, in speaking of the available opportunity for timber culture in Westchester county, N. Y., are well worth quoting here. He says:

"Were all the rocky crests and rugged acclivities of our country bounteously wooded once more, and kept so for a generation, our floods would be less injurious, our springs unfailing, and our streams more constant and equable; our blasts would be less bitter, and our gales less destructive to fruit; we should have vastly more birds to delight us with their melody and aid us with our not very successful war with devouring insects; we should grow peaches, cherries, and other delicate fruits, which the violent caprices of our seasons and the remorseless devastations of our visi-

ble and insect enemies have all but annihilated; and we should keep more cows and make more milk on two-thirds of the land now devoted to grass than we actually do from the whole of it. And what is true of Westchester is measurably true of every county in the Union."

FORESTRY ECONOMIES.

Statisticians have furnished us with alarming facts relating to the consumption of forestry products in this country and the consequent rapid decrease of our forest area. These facts have been widely published through official reports and commented upon by the public press. Yet so important are they as the basis for urging upon the people and the National and State governments the necessity for adopting and enforcing measures looking to the prevention of timber waste and the preservation of necessary forest areas that I venture to repeat some of them here.

Prof. Egleston, Chief of the Forestry Bureau at Washington, from the mass of statistics gathered on the subject, estimates the total value of all the annual products of our forests at not less than $800,000,000, outmeasuring the value of our great cereal crop, that of corn; about double our wheat crop; more than that of our crops of hay, rye, oats, barley, buckwheat, potatoes, and tobacco taken together, and ten times that of all our mines of gold and silver. Prof. Sargeant made the estimate for 1880 of more than $700,000,000.

The capital invested in the United States in the lumber business – *i. e.*, in the business of manufacturing lumber in 1880, was, according to the census return, $181,186,122. The total value of our lumber product for that year is given at $233,367,729, while the estimated value of the cord-wood used for domestic purposes was $321,962,373.

The New England States had invested at the same time in the lumbering business $16,641,326, and produced a lumber product valued at $19,271,914; and the value of the cord wood consumed for domestic purposes that year amounts to $16,242,801.

FOREST FIRES.

In addition to the contribution of our forests as above indicated, they suffer an enormous loss from fires and browsing animals. The forest area burned over in the census year of 1880 in the United States, as estimated by Prof. Sargent, was 10,274,089 acres, involving a loss of $25,462,250, beside the incalculable injury done to the soil, which in many instances rendered the burned region incapable of reforesting. "Fire and browsing animals," says Prof. Sargent, "inflict greater permanent injury upon the forests of the country than the axe, recklessly and wastefully as it is generally used against them."

RAILROAD TIES.

The large and rapidly increasing demands made upon our forests in the supply of railroad ties alone are impressively shown by Prof. Egleston in his report on forestry issued last year, to which I am indebted for the facts following: There is now in use in this country about 150,000 miles of railroads, which have required 396,000,000 ties, or the wood supplied by 3,390,000 acres, an area larger than that of the States of Rhode Island and Connecticut. Estimating that ties need to be renewed on an average once in seven years, there must be drawn from the forest annually 56,571,428 ties, requiring the timber growing on 565,714 acres. Allowing 30 years as the time necessary to produce trees of proper dimensions for ties, it will require 16,971,420 acres of wood land to be kept constantly growing as a kind of railroad reserve in order to supply the annual needs of the existing roads. This constitutes an area larger than the States of New Hampshire, Vermont, and Massachusetts combined, or the States of New Jersey, Maryland, and Delaware, with the addition of Connecticut. It is more than 4 per cent. of the total area of wood land in the United States, exclusive of the Territories, and 3 per cent. of the area in the States and Territories together. With the rapid extension of our railroad systems, these figures will be proportionately increased. From these facts it would seem that the subject of forestry should receive the most favorable consideration from railroad corporations.

THE WHITE-PINE SUPPLY.

The general awakening to the interests of forestry among the people of the originally wooded States came largely through the wide-spread publication a few years ago of the alarming facts relating to the destruction and fast disappearing of white-pine forests of the United States and Canadas. When the people were convinced by the reports of the statisticians that the supply of this most valuable and extensively used

timber would last but a few years at the rate of consumption going on, and that they would have to look ere long for other timber to take its place, active inquiry began as to our whole timber supply, the comparative value of the different kinds in the mechanic arts, how long these would last on the present basis of demand, and what the prospects were for the future.

When the forestry bulletins, issued by Prof. C. S. Sargent from the Census Department, announced that in both the upper and lower peninsulas of Michigan there remained of standing white-pine timber, suitable for market, but 35,000,000,000 feet, board measure, and that in the census year of 1880 there had been cut in the State 4,396,211,000 feet, requiring only eight years at this rate to exhaust the supply; that in Wisconsin there were standing 41,000,000,000 feet, with a cut of about three billions (2,097,299,000) feet for that year, leaving a supply that would last but fourteen years; that in Minnesota there were remaining 8,170,000,000 feet, and that 541,000,000 (540,997,000) were cut in the census year, leaving a supply for fifteen years, that at this rate the supply of white-pine lumber would be exhausted in these three States in the brief period of about twelve years, the question of the future supply of this most valuable timber became serious to the business world.

The late James Little, of Montreal, in 1882, said of the supply of white pine in Canada that he had consulted with the best authorities, and was pursuaded that, at the rate of cutting then going on, the whole supply of the provinces of Quebec, Ontario, New Brunswick, and Nova Scotia would be used up in about ten years. According to these estimates, then, the supply of white pine will soon be exhausted, and the mechanic arts will have to look to other fields for their supply of wood and timber. In view of this vast industrial interest the protection and conservation of our forests demands the earnest attention of our people and of the National and State Governments.

FORESTRY EDUCATION.

We have no schools as yet in this country which provide for a systematic training in forestry. The time for this, perhaps, has not ripened. The foundation, however, has been laid through the establishment of a few experiment stations, the general agitation of the question by forestry, agricultural, and horticultural associations and the public press. One of the most effective means employed thus far has been the institution of

ARBOR DAY.

Tree-planting on Arbor day, for economic purposes in the great West, has given to the prairie States many thousand acres of new forests, and inspired the people with a sense of their great value, not only for economic purposes, but for climatic and meteorological purposes as well. The celebration of Arbor day by the public schools in several of the older States by the planting of memorial trees, as originated at Cincinnati in the spring of 1882, and generally known as the "Cincinnati plan," has done much also to awaken a widespread interest in the study of trees; and this annual celebration promises to become as general in the public schools and among the people as the observance of May day in England. "Whatever you would have appear in the Nation's life you must introduce into the public schools." Train the youth into a love for trees, instruct them in the elements of forestry, and the wisdom of this old German proverb will be realized.

AGRICULTURAL COLLEGES.

In 1862 the National Government donated to the several States 9,600,000 acres of the public domain for the support of colleges of agriculture and the mechanic arts. There are forty-two of these schools that have received their *pro rata* of these lands, or the right to them. With a few notable exceptions the subject of forestry is not known in their curriculum. Every agricultural school in the country should give a prominent place to this study. While it is not feasible, nor perhaps advisable, yet to give an extended course in forestry instruction, it seems to me inexcusable not to give such general instruction as to lead the student to appreciate and care for the wood lot as well as the tilled field. The growing of timber is like the growing of a crop, to be cared for intelligently, to be utilized wisely, and to be cut and used when ripe for it. In connection with every one of these colleges there should be a forestry experiment station, conducted with a special view to the needs of the locality in which the school is situated. The advantages of these stations are obvious when we consider the almost absolute want of reliable scientific data in this country on which to found a general system of forestry management.

GOVERNMENT LANDS.

The National Government still owns about 85,000,000 acres of forest lands. These are without effective protection against the depredations of lumbermen. Hundreds of thousands of dollars' worth of timber is stolen annually from the public domain, and the destruction by fire is going on unchecked. Portions of these forests lie on the headwaters of the most important rivers of the continent, and their destruction would cause incalculable loss to the Nation. These forest lands should be promptly withdrawn from sale, efficient measures should be adopted to protect them against loss by theft and fire; such portions as are deemed necessary to the water supply and for climatic purposes should be dedicated forever to forest preserves, and the balance put back upon the market at a fair valuation. In the meantime, such timber should be sold to the lumbermen as the business demand and the interests of forestry might require. This important interest should be placed, by law, in charge of the Forestry Bureau of the Agricultural Department, with ample appropriations for attaining these ends.

I have thus called your attention to some of the features of forestry that I deem most worthy of consideration. Your papers and discussions will embrace a much wider field, and I trust that we shall come to some definite conclusions, and take definite action with reference to some things that should be done the coming year in furtherance of our cause.

In this connection, and finally, I venture to suggest—

1. That action be taken by the Congress with regard to securing appropriate legislation by the National and State Governments.

2. That plans be devised and methods adopted for promoting forestry education in our institutions of learning, for the continued spread and still more efficient celebration of Arbor day, and the organization of local forestry associations.

3. That special consideration be given to the relation of forestry to commerce—*i. e.*, railroads and navigable streams.

4. That steps be taken toward collecting and classifying reliable statistics in America (the United States and Canada) relating to our forests, and making them a part of our annual report, stamped with the authority of this Congress.

CONCLUSION.

"I have written many verses," says Holmes, "but the best poems I have produced are the trees I planted on the hillside which overlooks the broad meadows, scalloped and rounded at their edges by loops of the sinuous Housatonic." May the work done at this session of the American Forestry Congress result in adding many a like poem to the landscape, and in adding a powerful impetus toward the protection, the conservation, and wise utilization of our forest wealth.

At the close of the President's address, the reading of the minutes of the last meeting being next in order, on motion, the reading was dispensed with.

As the call was next made for the report of the Recording Secretary, the absence of Dr. Hough, hitherto always present at the meetings of the Congress, was perceptibly felt. His recent death was announced by Mr. Egleston, and a committee was appointed for the purpose of making proper expression of the sentiments of the body in view of his decease.

Mr. George Noyes, of Boston, was then chosen temporary Secretary in place of Dr. Hough.

The report of the Corresponding Secretary, Mr. B. E. Fernow, was then read as follows:

REPORT OF THE CORRESPONDING SECRETARY.

When a year ago it was your pleasure, against my strong advice, to entrust me again with the office of Secretary to your Association, I undertook once more the task with that diffidence which the magnitude of the work before me, as in comparison with the insufficiency of means and facilities at my disposal, would naturally add to a proper conception of my own shortcomings.

I assured you that my good will would have to stand for what I could not bring to the office, namely, experience in this class of work, a large personal acquaintance with the workers in the field, and plenty of time for correspondence with them, in order to bring about united direction of work, and to keep public sentiment warm to the interests of our cause.

These requisites being more or less absent, as well as the funds necessary for any diffusive propaganda, the slow progress in our work of reform must be understood. We can only expect to work in a small way and very gradually break the ground, until more means are at our disposal for specific work and the diffusion of our publications to a larger extent.

It has been my suggestion that the proceedings of this Congress would find a wider range of usefulness if, instead of being published in one volume, their publication would be distributed through a series of bulletins, in which could at the same time be noted the progress in the development of the forestry movement, and constant intercourse could be kept up between our friends. It was also expected that the cost of such publication would be largely covered by subscription. With this in view, the January bulletin was prepared in a rather more expensive style than at first contemplated. But, while kind commendations of the work were not lacking, sufficient patronage could not be secured to continue these issues on a subscription basis. In consequence, the proceedings and papers read at the Saratoga meeting remain still unpublished; the same is true of those read at Montreal and Cincinnati, to a large extent. It is suggested that these should be carefully sifted and the most valuable papers published, together with the report of the present meeting.

As our work can bear fruit only by a liberal diffusion of our published proceedings the most important problem for solution remains: How shall a more general and generous support be secured? In this we must keep in mind that our Congress is still more or less a benevolent society, which must look for their financial support to the generosity of their members and patrons. It will be different when this Congress represents an association of professional foresters, who in joining together advance their own personal aims and the interests of their profession. At present we are only a reform association, and cannot accomplish anything without expending on the education of the large mass.

The next problem in importance is, "How can we make our work most valuable?" and in this the possibilities are only limited by our facility in solving the first. Allow me, however, to point out a few possibilities of improvement. First of all we must personally produce at our meeting only work of some special value. In view of the still frequently vague writings on the subject of forestry I would repeat the injunction not to rely on mere authoritative statements. Generalities on forest preservation or forest destruction and forestal influences have become trite and their constant reiteration without positive data will dull the interest of listeners and readers, create suspicion and defection. We need definite, well-authenticated local observations, arrived at by well-described scientific methods; we need methodical work in establishing the conditions of growth for different species, their behavior towards the soil and towards each other in different soils, their rate of growth at different periods of life under different conditions. In fact, besides making propaganda, we should by concerted effort establish the principles upon which the forestry we advocate is to be carried on. Therefore, secondly, we ought to find means of engaging those men who by their profession are led to such studies as are germane to forestry problems to give more definite attention to these problems; we ought to count them in our ranks, and whilst their membership in our Congress will lift its work to a higher level their individual efforts will acquire that force and momentum which such an association will impart.

Thirdly. Our work in promoting proper legislation, in inducing the establishment of Arbor days and procuring other means of advancing our cause, must be largely done by committees during the intervals between our meetings. It is therefore of the highest moment that whoever accepts the appointment to such committee work should be imbued with the importance of such a trust, and not undertake it unless he is willing and can with sincerity devote himself to its discharge. Except for the committee on Arbor day and the painstaking work of Mr. Elizur Wright on the Mississippi reservoir committee, we have not done well in this respect.

In conclusion I would point out that the more the question of forestry is appreciated the more will grow a necessity of organizing local interests. In this question the Eastern mountain regions have different conditions, and consequently different aims to pursue from the treeless States of the West. The interests of the Northern States, with a largely denuded and decreasing forest area, differ from those of the vast forest wealth in the South.

We should as members of this Congress individually promote such association of local interest, by which means a systematic forestry may be much sooner secured in the aggregate than by an association which lacks the incentive of a direct benefit to a particular locality. Eventually this Congress will then be made up of the delegates from local associations, meeting to further the interests common to all.

Understanding this to be one of the duties of this Congress, your president and secretary undertook in the beginning of the year to organize the forestry interests in the

State of New York, taking advantage of the efforts that had been made in this direction by other parties without result. An enthusiastic meeting at Utica, called almost on the spur of the moment, inaugurated the New York State Forestry Association, which, but for some misunderstanding in its ranks, might have done better work in promoting the Adirondack forest legislation.

The Forest Commission for the State of New York has at last been established, and, with an appropriation of $15,000, should be able to show soon how a proper State forest administration may be organized, and, with what is left of State timber lands, should soon pay at least its own maintenance.

This year has also witnessed, under most favorable auspices, the formation of a Forestry Association in Colorado. So promptly and so well was its work done that, after a propaganda of a few months, Colorado could boast of the first Forest Commissioner in the States appointed to manage her forest reserves.

The Ohio Association has also succeeded in having a commission appointed for the purpose of advising in the management of her forestry interests.

California, too, has established a Forest Commission to experiment and study the requirements of different timber trees and similar questions of forest culture.

Thus it is shown that the agitation which we have carried on for now three years has found its reward and expression in a practical manner in all parts of the country.

As to the status of our Association, a few remarks will suffice.

From our member-list I find that we have 21 life members. We carry on our Treasurer's book 68 annual members, making a total of 89 members; but if we should apply the test of paid-up dues, this number would shrink considerably. We are not strong in numbers and must make up this deficiency in energy and earnest work. We mourn, therefore, the more the loss of our Recording Secretary and of the active and vigorous support of Dr. Hough. Perhaps no man in the Union deserves more credit for having not only invited timely attention to the needs of American forestry, but for the indefatigable industry and persevering energy with which he gathered valuable information and diffused it throughout the Union. Though not a man of original research, his name will lastingly be known among the pioneers of American forestry.

From the Treasurer's statement you will learn the modest sums which have been spent to pay for the issue of two bulletins of 2,000 copies each, the preparation for two annual meetings, and the incidental expenses of correspondence.

Our last two annual meetings have largely lacked the local support which must needs be enlisted to lend impressiveness to our proceedings. The welcome which we have met in this centre of intellectual life, and especially by the gentlemen of the Massachusetts Horticultural Society, must be the more gratefully acknowledged.

From this meeting we hope and expect fresh life and new impulse by enlisting the energetic and earnest work for which New England men have ever held the highest reputation.

BERNHARD E. FERNOW,
Cor. Secretary.

In the absence of the Treasurer his report was read, as follows:

REPORT OF THE TREASURER.

John S. Hicks, Treasurer, in Account with American Forestry Congress.

SEPTEMBER 15, 1885.

Received by Chas. Mohr, treasurer's balance		$203 47
life memberships		210 00
donation, Jos. S. Fay		10 00
members' dues and fees		83 00
bulletin subscriptions and advertisements		26 30
Expended:		
Stenographer's bill	$65 00	
Printer's bills	289 80	
Stationery	37 19	
Clerk hire	10 00	
Postage and expressage	85 07	
	487 06	
Balance on hand	46 21	
		533 27

Specification of Expenses.

Saratoga meeting, printer's bills	$10 60	
postage	19 10	
		29 70
Boston meeting, printer's bill and electrotypes	36 50	
postage	34 80	
		71 30
Bulletin No. 2, printer	63 32	
postage	8 50	
		71 82
Bulletin No. 3, printer and electrotypes	179 38	
postage	17 35	
		196 73
Letterheads and envelopes	30 42	
Rubber stamps	1 50	
Sundries, stationery	5 27	
		37 19
Sundry postage and express		5 32
Clerk hire		10 00
Stenographer		65 00
		487 06

Showing a balance on hand of $46.21.

After the appointment of sundry committees, the Congress adjourned to 2 o'clock p. m.

AFTERNOON SESSION.

The President called the Congress to order at 2 o'clock, when the Corresponding Secretary read communications from several persons expressing their inability to be present at the meeting of the Congress. The first was from Dr. Oliver Wendell Holmes, who, while expressing his regret that he was unable to attend the Congress, said he hoped the Congress would have influence sufficient to induce the country to retain "leaves enough to hide its nakedness, of which it is already coming to be ashamed." Letters of regret were also read from Prof. H. M. Seeley, of Middlebury College, Vermont; Governor Harrison, of Connecticut: Senator Warner Miller, chairman of the Forestry Committee of the United States Congress; Gen. W. Ward; Hon. Charles Francis Adams; Prof. C. K. Adams, of Cornell University; the Governor of Vermont, and Mr. H. C. Putnam. All expressed sympathy with the objects of the Congress and the hope that the session would be a successful one.

RESOLUTIONS IN REGARD TO DR. HOUGH.

The committee appointed in the morning in view of the death of Dr. Hough reported the following resolutions as expressive of the feelings of the Congress:

Resolved, That this Forestry Congress has heard with profound regret of the recent death of Dr. Franklin B. Hough, its Recording Secretary, and desires to place on its records its sense of obligation to him, not only as one of the founders of the Congress, and one of its most efficient officers from its beginning, but as one by whose indefatigable labors and zealous interest in the cause of forestry that subject was brought to the attention of the Congress of the United States, so as to secure favorable action by that body tending to the preservation of our wood lands, and whose exhaustive inquiries and comprehensive reports furnish a body of information on forestry unsurpassed for value and interest by any publication in the English language. The whole country is indebted to him as one of the chief instruments in arousing the people to a sense of the importance of maintaining a proper extent of forests, and for the interest in the subject which is already manifested.

Resolved, That this minute be placed upon the permanent records of this Congress, and that a copy of the same be transmitted to the family of Mr. Hough.

Remarks were made by several members in regard to the character and services of Dr. Hough, and the resolutions were adopted unanimously.

FACTS IN REGARD TO THE PRESENT STATE OF OUR FORESTS.

A large colored chart was suspended on one side of the platform, which had been prepared in the office of the Forestry Division of the Department of Agriculture at Washington, for the purpose of showing at a glance, by means of different colors, the extent of farmed lands, forests, and waste lands in each State and Territory.

Mr. Egleston, Chief of the Forestry Division, read a brief paper, in part explanatory of the chart, and giving some particular facts of special interest in connection with the subject. He spoke of the great difficulty of obtaining exact and satisfactory knowledge as to the extent of the forests, or the rate at which they are consumed. It is a vast country with which we are concerned, portions of it yet but sparsely settled, and much of it altogether unsurveyed. The Agricultural Report of the Census was a report as to farms, and took no account of the large area lying outside of the appropriated farms of the country. The Census of 1880 was the first to undertake an inquiry into the extent and character of the forests, and the volume prepared under the direction of Professor Sargent would be resorted to often as a treasury of facts on this important subject. Mr. Egleston gave some startling figures in regard to the consumption of the forests which is taking place.

Mr. Little, of Montreal, the well-known lumberman, who is equally well known for his intelligent views and his enthusiastic interest in forestry, while expressing his pleasure in listening to the statements of Mr. Egleston, said that the lumbermen were to blame for most of the forest fires. It was their careless and wasteful methods of lumbering that made forest fires possible. He himself had not lost more than one per cent. by fire in all his lumbering operations. It was the limbs of the trees, left by the lumbermen to wither and dry where the trees fell, instead of being removed, which afforded the ready fuel for any chance spark that might fall from the smoker's pipe or the unextinguished camp fire.

Mr. Merriam, of New York, corroborated the opinions expressed by Mr. Little.

The remainder of the afternoon was occupied in welcoming those who had come to the Congress as accredited delegates from various States and listening to the reports which they had to give in regard to the condition of forestry in the States represented by them. All the New England States were thus represented, together with others as distant as Nebraska and California. Applause broke out when ex-Governor Morton announced that as the result of premiums offered in Nebraska for the greatest number of trees planted on Arbor day 7,000,000 trees were planted in a single day.

The venerable Elizur Wright, active and enthusiastic as though forty, instead of eighty years old, made a very interesting statement in regard to the Middlesex Fells, and hoped the Congress would influence the Legislature to make this forest the property of Boston for the purposes of health and recreation.

EVENING MEETING.

The evening session of the Congress was designed to be of a more popular character than those of the daytime. Governor Robinson was present, and, on being introduced to the Congress by President Higley, addressed the body, as follows:

Mr. President and Gentlemen of the Forestry Congress: Invited some weeks ago to be present here for a few moments to say something of greeting to you, in reading over the journals of this evening I found the most worthy chief magistrate of the city had already extended the welcome of the city of Boston to the Congress, and, knowing her abundant hospitality, I felt it would be almost useless for me to bid you welcome to the larger people. But one is so soon out of the woods in Boston—I do not mean politically—we feel like introducing you to something of the woodlands

outside, and so, speaking for the larger number of people outside the city, I bid you welcome to the State. During last winter a resolve was passed by the Legislature asking me to appoint five gentlemen to attend this Congress. I assure you it was a pleasure to me to do so, and I wished they might be able to be of some use to you in your deliberations. It is, therefore, with heartfelt satisfaction that I see these five gentlemen are present to attend to their duties. [Applause.] Nor would you expect anything different from Massachusetts or her subjects. She has the right to claim the position of being the first State to take into consideration this question. At the beginning of the present century the old State society of agriculture offered prizes for the development of forest growth, and so it has continued. There is a gentleman here who is credited with a magnificent sum for his devotion in planting trees. In 1837 the Government ordered a survey and inquiry into the growth of all the woodlands of the State. You know it resulted in the report of Mr. G. B. Emerson in 1846 to Governor Briggs, a work which deserves study at the present time. Indeed, it is a classic, as it were. As early as 1818 our people thought it to be of interest to look to the shipping interest, and so they provided that the Agricultural Department should provide encouragement for the growth of the oak, and that provision remains on the statute book to-day. Perhaps the agricultural societies do not know this at this time; perhaps because ship-building is not now of such great importance. Then in this State we have offered encouragement by the exemption of taxation, under certain conditions, to the owners of trees. Then penalties have been imposed for the wanton destruction of trees by fire. In 1882 an act was passed authorizing the cities and towns to raise money to make the forest lands public domain, so that the people may have the pleasure of them perpetually. Nor is that all. In 1884 it was my privilege, in addressing the Legislature, to bring the subject before the attention of that body, and it was deemed advisable to get every fact of importance, and the officer now charged with the State census is collecting all the statistics and data on this question, that it may be laid before some future Legislature. That is a most important step. Knowing the gentleman in charge of the census bureau, you know the work will be well done, and that the results will be entitled to confidence. Others far more at home on this subject than I am, and very likely gentlemen who have had more leisure recently to devote to the question, will address you and touch on these topics. But any man with eyes in his head and brains to direct his intellect knows the value of growing forests, even in these thickly-settled States. Time was when we were on the farm that we thought we were doing the highest service by destroying the trees, and year by year farmers have done all they could in reclaiming, as they call it, land that had better be left alone in the forest. [Applause.] Agriculture is not the pastime in Massachusetts that it is in the Western States, and those of us who began life with those days when we rode the horses to the stump know what it is. I say all such land would have been better land if left alone and the fallow kept away. Experience is proving the truth, because it is a fact that the acreage of the forests in the States during the last half century has not diminished. Certain lands have been abandoned for tillage, although the capacity for production of trees may have been seriously diminished. The whole question of water supply only needs to be touched upon. Boston may well say we are most interested in some practical solution of the question. Boston wants the clear water of the country from the woody forest, from the shade of the forest, where the air sweeps from every breeze. [Applause.] And we in the cities want life, energy, muscle, and spirit, and we expect to get it from the pure air. Start some fine morning out of sultry Boston and go to the woods of New Hampshire and Maine and try the effect, and you will come home ready to demonstrate that the air of the forest is good. Transplant that forest as near the city as you can, and let the young child and the old man breathe good air in the morning, at noon, and in the evening, and it will be a luxury. Then, in material concerns, the manufacturer who depends on water power is interested, so we in New England hope that out of this meeting the States will find they have a common interest. There is something that we may do in all places. We may not make a forest, for we may not own land enough for one, but wherever there is a dwelling, and wherever there runs a road or stands a school-house, a church, or a railway station, or a water trough beside the road where the animal stops to drink, there is a place for a shade. Then, if the animals could speak, how they would bless the man who planted the tree beside the water, so that he could enjoy the cool shade while he took his draught. We are glad to welcome you to Massachusetts. The Commonwealth gives you greeting, and hopes for a great success. [Loud applause.]

The Governor was followed by ex-Governor Morton, of Nebraska; Major Ben: Perley Poore, Hon. George B. Loring, and Dr. B. G. Northrop.

A letter from Hon. Warner Miller was read, expressing regret on account of his in-

ability to attend the Congress, and presenting for its consideration a bill which he had prepared and proposed to introduce at the approaching session of the National Congress, providing for the withholding from sale of all public lands which are timber lands and the appointment of a commission to survey these lands so as to determine which may properly be disposed of and which shall become permanent reservations. The letter and bill were referred to a committee, who subsequently reported a recommendation of the general provisions of the bill for adoption by the General Government, and the report of the committee was adopted.

Colonel Merriam, of New York, offered a resolution recommending the planting of memorial trees by the army posts of the country in connection with the commemorative exercises of Decoration day. The resolution was unanimously adopted.

SECOND DAY.

That was a remarkable scene presented to view on the opening of the second day's session of the Congress. The Hon. Marshall P. Wilder, known throughout the country and beyond it for his enthusiastic interest in horticulture, and who had recently celebrated his eighty-seventh birthday, was on the platform. Close at hand were Hon. Elizur Wright, in his eighty-second year, and Hon. Joseph S. Fay, who, not yet in his eighties, had come to invite the Congress to take a practical lesson in forestry by paying a visit to his planted forest of 200 acres and more on the southern shore of the Cape. And there were the white beards of ex-Governor Morton, Hon. Mr. Joly, of Quebec, and others, who were the leaders and enthusiasts in this Forestry Congress. Indeed, it might almost be said that the enthusiasm of the members and their manifest earnestness in the cause of forestry were proportioned to their age. This was like a reversal of the usual order of things, as we expect old men for counsel but young men for action. Is it because, as the lives of the trees are measured by centuries and the influences of forestal agency are developed slowly and cover large spaces, so it requires the observation of the larger part of man's ordinary lifetime to give him a proper apprehension of the importance that attaches to trees, and especially to forests?

Mr. Wilder, on being introduced by President Higley, was received with applause. Allusion having been made to his age in the President's remarks, he said he would never be so old as not to take interest in the object of this organization. He welcomed them to the Massachusetts Horticultural Hall in Boston. This society, he said, was the first of its kind incorporated in the country, and was the parent of many others. It had been the means of introducing ornamental trees, which originally came from the forest, and it was of the highest importance to protect the forests for the many useful purposes the timber served mankind. He said: "Go on; press on in your noble work, and future millions shall remember you with gratitude long after you have passed away." [Applause.] He said he had been a lover of nature from his youth, and hence his interest, and he loved everything in nature—the balmy spring, the glorious summer, the mellow autumn—and he loved dearly to be remembered by those who had for their object, as his hearers had, the health and happiness of the human race.

The first paper read this day was one by Mr. Egleston on "Forestry Legislation in the United States," in which he traced its progress from the earliest settlements of the country to the present time. He considered forestry legislation in the two aspects of laws for the protection of forests, as property, from theft and depredation by fire, and laws for the production or extension of forests by bounties on tree planting. The substance of the laws of each State was given, usually with the date of their enactment.

The Hon. M. Joly, of Quebec, in speaking on the forest economy of Canada, bore emphatic testimony to the practical usefulnesss of this Congress thus early in its history, showing how the Legislature of Canada had adopted the suggestions of the Con-

gress, and had thus placed Canada in advance of the United States in respect to forestry. In 1883 the Province of Quebec carried out the suggestion of this Congress by causing all lands unfit for agriculture to be set apart for the cultivation of timber. The Government would not allow any of its land which is unfit for cultivation to be allotted to the settler. It was a cruelty to allow him to settle on such land.

SMOKE-CONSUMING DEVICES.

A very interesting paper was read by Mr. Lander, superintendent of motive power on the Old Colony railroad, on the subject of "Smoke-consuming Devices for Locomotives." He gave a history of the attempts to arrest the sparks of locomotives as a relief to passengers, and for the purpose of preventing fires liable to be occasioned by them. He described the difficulties to be surmounted by any successful contrivance, and affirmed that these had finally been overcome, and that there were now such effective appliances that there is no good reason why there should be any further annoyance or danger from the sparks of locomotives.

This paper was of such interest and practical importance that it led to an animated discussion, and to the reference of the subject to the Committee on Legislation, who were charged to gather information on the use of spark arresters, and lay it before railroad commissioners in the several States and enjoin them to enforce the use of such appliances on all locomotives running through wooded regions.

STANDING COMMITTEE ON LEGISLATION.

The President was directed to appoint a standing Committee on Legislation, for the purpose of drafting bills touching forest legislation which are most desirable for the present. The committee were authorized to associate with them in each State proper persons who would co-operate with them.

ONTARIO COMMISSIONER'S REPORT.

An important report was received from the Hon. R. W. Phipps, forest commissioner of Ontario, giving facts of much practical interest.

AFTERNOON SESSION.

In the afternoon a paper was read by Hon. John E. Hobbs, of Maine, on the dependence of the lumbering interests upon systematic forestry. The paper abounded with interesting facts in regard to the production of lumber and the sources of future supply. The necessity of planting and cultivating forests was strongly urged.

A paper of much practical interest on the cultivation of the red cedar and the osier willow was read by Mr. Edmund Hersey, of Hingham. Mr. H. exhibited some shoots of the willow grown the present year which were nearly ten feet in length. They were grown on elevated and comparatively dry ground which had not been enriched.

Mr. Fernow read an interesting paper on the practicability of making use of the waste material of the lumberman as a fertilizer for the agriculturist. He said the experiment in Canada had already proved successful.

PLANTING OF EVERGREENS.

Mr. W. C. Strong read a paper on the transplanting of evergreens, giving his experience as to the best time of the year in which to do this work. This he has found to be in August, rather than at an earlier or later period, and he gave some physiological reasons in favor of summer planting.

ARBOR DAYS.

The subject of Arbor days had a hearty reception this afternoon, being brought before the body in a paper by Mr. Egleston, who urged that the observance of Arbor day was properly not for the prairie States alone, where it originated, but that it was needed in all the States, and was one of the most efficient means of promoting the cause of forestry throughout the country.

Mr. Peaslee, of Cincinnati, also sent a paper on the subject of Arbor day, in which he treated of the Ohio plan of connecting its celebration with the public schools and its happy results.

A standing committee on Arbor day was appointed, consisting of Dr. B. G. Northrop, Mr. Egleston, and Mr. J. B. Peaslee.

EVENING SESSION.

At the evening session the committee, to whom was referred the proposed bill of Senator Miller for national legislation to preserve a proper amount of the public timber lands, reported in the form of a resolution, commending the bill and referring it to the committee on legislation.

Rev. Dr. Mayo then enlivened the meeting by reading a paper in a somewhat different vein from the ordinary discussions, entitled the modern "Babes in the Woods."

The Hon. Norman J. Coleman, Commissioner of Agriculture, was then called out, and addressed the Congress for half an hour in a very earnest and spirited manner. He avowed himself fully in sympathy with the objects of the Congress. He desired the aid of the Congress. He wished to do some practical forestry work. But the Department of Agriculture was hampered in its forestry work by lack of means. Congress appropriated only $10,000 for the work needed throughout the whole country, when the single State of New York appropriated $15,000 for her own needs alone. He would have them urge their representatives in Congress to appropriate $50,000, and if ten times that were appropriated it would return a hundred fold. The remarks of the Commissioner were listened to with great attention, and at the close were applauded.

THURSDAY MORNING.

The two previous days, with their three sessions each, left but little of the indoor business of the Congress to be done, except that of a routine character and the choice of officers for the ensuing year.

Officers were chosen as follows:

President, Hon. Warren Higley, of New York.

First Vice-President, Hon. H. G. Joly, of Quebec.

Second Vice-President, Hon. J. Sterling Morton, of Nebraska.

Corresponding Secretary, Mr. B. E. Fernow, of New York.

Recording Secretary, Dr. N. H. Egleston, of Washington.

Treasurer, Mr. J. S. Hicks, of Roslyn, L. I.

Hon. B. G. Northrop, of Connecticut; Hon. William Little, of Montreal; Hon. J. B. Grinnell, of Iowa; Hon. J. G. Knapp, of Florida, and Mr. R. H. Warder, of Ohio, were chosen to be with the other officers of the Congress an Executive Committee.

MIDDLESEX FELLS.

Hon. Elizur Wright again urged the Congress to visit Middlesex Fells and see the capabilities of the tract from a forestal point of view. Here were 4,000 acres, the forests on which and the now ample water supply were threatened with destruction unless the tract could be purchased from the present proprietors and made a public domain. Mr. Wright said this was the only place in the immediate neighborhood

where the woods can be preserved and the water kept pure. There was enough pure water there to supply a million people with four and a half gallons daily.

PUBLISHING FUND.

Under the lead of the President an effort was made to secure a special fund for the purpose of publishing the valuable papers which had been read and others which had been prepared but could not be read for lack of time. In response to the President's invitation quite a number of those present subscribed $20 each to the proposed fund.

NEW ENGLAND LEGISLATIVE COMMITTEE.

A committee of twelve was appointed with special reference to the forest interests of the New England States. They were charged with the duty of memorializing the Governors and Legislatures of the States and to do all that is reasonably possible to secure a conservative forest policy which shall tend to mitigate the evils of forest fires and to encourage land owners to cultivate trees, with a view to maintain the vast resources of the lumber supply of the country. The following were appointed as members of the committee: Gen. Charles Hamlin, Bangor, and Hon. John E. Hobbs, North Berwick, for Maine; Mr. W. I. Ladd, Lancaster, and Mr. George B. Walker, of Concord, for New Hampshire; Mr. T. S. Gold, West Cornwall, and Hon. B. G. Northrop, Clinton, for Connecticut; Mr. W. C. Strong, Newton, and Mr. Francis H. Appleton, Boston, for Massachusetts; Mr. Henry G. Russell, West Greenwich, and Mr. Hathaway, for Rhode Island; Hon. Frederick Billings and Dr. Hiram Cutting, for Vermont.

The remainder of the forenoon was occupied with the reading of some brief papers and with statements in regard to the condition of forestry in various places. Major Phinney spoke of the successful planting of the pitch pine in Barnstable county, which had much enhanced the value of the land.

Mr. S. W. Powell, of Brooklyn, N. Y., read a paper on the requisites of an effective fire legislation, and Mr. E. B. Southwick, the botanist of the New York Central Park, exhibited a very interesting collection of specimens illustrating forestry. It occupied 50 cases, and consisted of nearly 500 specimens, embracing sections of wood, seeds, cones, acorns, wood fibres, fungi, galls, insect borings, cocoons, pith, bark, sawdust, and various other products of the woods.

On motion of Mr. Elizur Wright, the Legislative Committee was instructed to take into consideration the Middlesex Fells.

VOTES OF THANKS.

The usual vote of thanks was given to the reporters of the press, but in this case with more than the usual heartiness, for the reporters had given very full and accurate accounts of the meetings and of the papers read. Their work was spoken of by several members in connection with the passage of the vote of thanks. It was the manifest feeling of the Congress that they were greatly indebted to the Boston press for presenting the views of the Congress on forestal subjects to the public in such an appreciative and effective manner.

The thanks of the Congress were also given most heartily to the officers of the Massachusetts Horticultural Society for the use of their hall and for the courtesy and painstaking care with which they had made arrangements for the comfort and success of the Congress at its present meeting, and especially to Hon. Wm. C. Strong, chairman of the Committee of Arrangements, and to Mr. F. W. Brewer, of Hingham.

After a hearty vote of thanks to Governor Robinson and his Honor Mayor O'Brien the Congress adjourned to meet next year at such place as may be chosen by the Executive Committee.

But though the formal sessions of the Congress were now ended, much that was most enjoyable and of practical interest and utility in a forestry point of view yet remained for the members. In compliance with the invitation of the Mayor most of the members of the Congress and many of the ladies accompanying them took steamer at 2 o'clock in the afternoon for an excursion down the harbor and a visit to Deer Island, the site of the city's prison and reform school. The sail among the islands of the harbor was delightful and the visit to Deer Island was very interesting, giving all a favorable impression of the care and wisdom with which Boston watches over those who have been led to take the first steps in vice and seeks to reclaim them. Two hundred of the boys and girls were assembled in the neat chapel and welcomed the Congress with pleasant songs, accompanied by an organ and a band of instruments. After an inspection of the buildings an excellent collation was served, and the members of the Congress returned to the city about dusk.

EXCURSION TO WOOD'S HOLL.

The Forestry Congress, though a formal adjournment was made on Thursday, really continued its meeting through Friday by engaging in an excursion to Wood's Holl to inspect the forest of 200 acres which Mr. J. S. Fay, of this city, has grown there from seed planted at different times within the past twenty-five or thirty years. Not the least valuable of the sessions of the Congress were those held in the special car devoted to its use while on its way to Wood's Holl and back. The subjects which had been brought forward by the papers read in Horticultural Hall were discussed in a free way, while objects of interest in connection with forestry were constantly presented from the car windows. But the great meeting of the day was that at Wood's Holl. Mr. Fay was at the station on the arrival of the train, with a sufficient number of carriages to contain the members of the Congress, and two hours were spent in driving about the forest and hearing Mr. Fay's explanation of the method of his work. On as bare and wind-swept piece of ground as can be found, perhaps, along our coast and on poor soil, Mr. Fay began, years ago, to scatter over the trodden-down grass the seeds of our common yellow or pitch pine, and here to-day is a dense body of wood, in places almost impenetrable. Many of the trees are fifty or more feet in height. Having gained a foothold of pines, and thus raised a screen against the driving winds from the ocean, Mr. Fay planted behind them the seeds of other trees, evergreen and deciduous, and with unfailing success.

The members of the Congress were delighted to see this proof that forest trees can be so easily raised from seed under such unfavorable circumstances. It was a confirmation of what they had believed and taught, and nothing more convincing and encouraging could be asked for. Mr. Fay said, emphatically, that farming had not paid and would not pay in such a situation, but that raising of forests would.

After inspecting the forest the members of the Congress were invited into the house to partake of an excellent collation.

An invitation had been received from Professor Baird, in charge of the United States fish hatchery near by, to visit that establishment. The invitation was accepted, and the Congress spent an hour in looking over that interesting place and listening to Professor Baird's explanations of the work going on under his direction, after which, with hearty thanks given to Mr. Fay, who accompanied the members to the cars, they returned to the city at 7 o'clock, and then finally separated, and the Congress was closed.

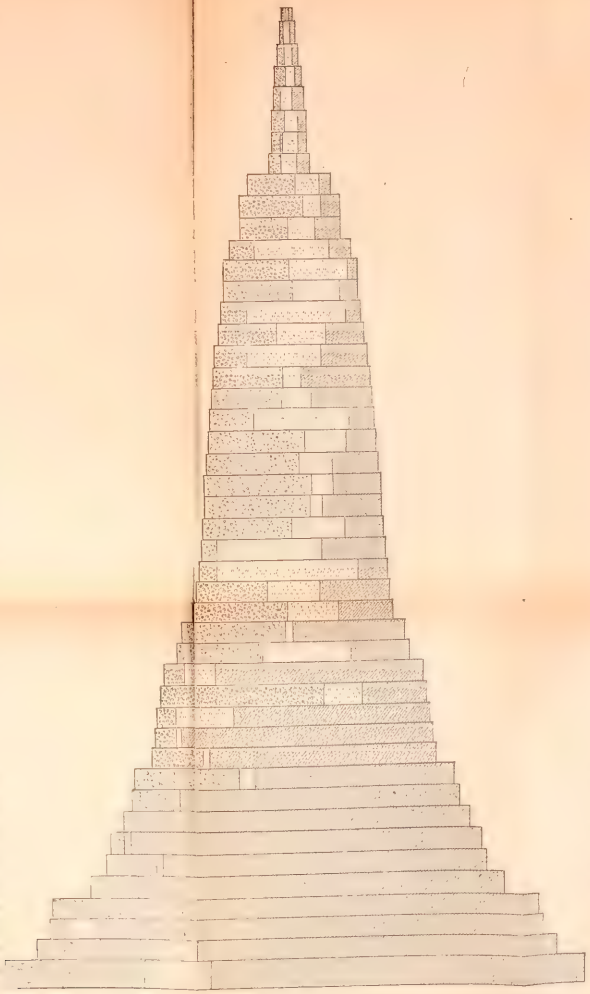
DIAGRAM

SHOWING THE

FORESTS, FARMS, UNIMPROVED AND WASTE LAND IN THE UNITED STATES.

	Forest area	Farm area.
	Acres.	*Acres.*
[illegible]	200,000	300,000
[illegible]	300,000	800,000
[illegible]	650,000	1,700,000
[illegible]	2,330,000	2,100,000
[illegible]	1,000,000	2,200,000
[illegible]	3,000,000	2,350,000
[illegible]	1,900,000	3,300,000
[illegible]	2,000,000	3,400,000
[illegible]	9,000,000	4,000,000
[illegible]	12,000,000	3,500,000
[illegible]	9,000,000	4,500,000
[illegible]	4,500,000	14,000,000
[illegible]	12,800,000	11,000,000
[illegible]	12,000,000	11,000,000
[illegible]	4,500,000	18,200,000
[illegible]	11,000,000	8,500,000
[illegible]	7,000,000	13,500,000
[illegible]	13,000,000	5,000,000
[illegible]	11,000,000	5,300,000
[illegible]	8,000,000	18,000,000
[illegible]	18,000,000	7,000,000
[illegible]	17,500,000	11,500,000
[illegible]	19,200,000	3,700,000
[illegible]	23,000,000	1,500,000
[illegible]	17,000,000	11,000,000
[illegible]	2,300,000	20,000,000
[illegible]	3,500,000	20,000,000
[illegible]	14,000,000	7,500,000
[illegible]	18,000,000	8,500,000
[illegible]	20,000,000	9,000,000
[illegible]	16,000,000	17,000,000
[illegible]	1,500,000	1,000,000
[illegible]	30,000,000	7,000,000
[illegible]	3,500,000	11,000,000
[illegible]	4,000,000	500,000
[illegible]	10,000,000	2,000,000

	Forest area
[illegible]	*Acres.*
[illegible]	[illegible]
[illegible]	1,254,400
[illegible]	3,100,800
[illegible] Jersey	4,771,200
[illegible]achusetts	5,145,600
New Hampshire	5,703,200
Vermont	5,849,400
Maryland	6,310,400
West Virginia	15,772,800
Maine	19,132,800
South Carolina	19,368,800
Indiana	22,982,400
Kentucky	25,600,000
Virginia	25,680,000
Ohio	26,086,400
Tennessee	26,720,000
Pennsylvania	28,700,400
Louisiana	29,068,800
Mississippi	29,057,600
New York	30,476,800
North Carolina	41,041,200
Alabama	42,085,600
Arkansas	33,648,800
Florida	14,713,600
Wisconsin	34,848,000
Iowa	[illegible]
Illinois	35,804,000
Michigan	36,755,200
Oregon	37,747,200
Washington	42,803,200
[illegible]	43,960,480
Nebraska	48,758,400
Minnesota	50,531,240
Kansas	52,288,000
Utah	52,601,600
Idaho	53,043,600
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]



REFERENCE:

Forest, *Farms,* *Unimproved and Waste Land.*

The TOTAL AREAS are exclusive of Lakes and land embraced in Cities.

SOME FACTS AND FIGURES IN RESPECT TO THE FORESTS OF THE COUNTRY AND THEIR CONSUMPTION,

BY N. H. EGLESTON,

Chief of the Division of Forestry, Department of Agriculture, Washington.

The census of 1880 embodies the results of the first attempt by the Government to ascertain the extent and character of the forests of the country as a whole. No previous census had undertaken to do more than to take note of the forests embraced in and forming a part of the *farms*. The volume prepared under the direction of Prof. Sargent is a most valuable compendium of information, and will often be resorted to as a treasury of facts in regard to the forest condition of the country. Of course it is not, and could not be, a complete account of the subject. The field of inquiry is too large and other sources of information are too limited at present to make this possible. Estimates must often be made where exact information cannot be obtained.

In the prosecution of its work the Forestry Division of the Department of Agriculture has been endeavoring from year to year to ascertain such additional facts as would enable it to present a more complete view of the condition of the country in respect to its forests than it had been possible to give before. To insure the utmost accuracy the estimates made by the Division, from the reports of its agents and all other sources of information, have been submitted for verification or correction to the Governors or other officers of the several States and Territories, and the result arrived at is given in the accompanying table:

The States.	Total land area.	Forest area.	Percentage of forest to total area.
	Acres.	*Acres.*	
Alabama	32,985,600	17,500,000	53.1
Arizona	72,268,800	10,000,000	13.8
Arkansas	33,948,800	20,000,000	58.9
California	99,827,200	20,000,000	20.0
Colorado	66,332,800	8,000,000	12.1
Connecticut	3,100,800	650,000	21.0
Dakota	94,528,000	3,000,000	3.0
Delaware	1,254,400	300,000	23.9
Florida	34,713,600	20,000,000	57.6
Georgia	37,747,200	18,000,000	47.7
Idaho	53,945,600	10,000,000	18.5
Illinois	35,840,000	3,500,000	9.8
Indiana	22,982,400	4,500,000	19.6
Iowa	35,504,000	2,300,000	12.7
Kansas	52,288,000	3,500,000	6.7
Kentucky	25,600,000	12,800,000	50.0
Louisiana	29,068,800	13,000,000	44.6
Maine	19,132,800	12,000,000	62.7
Maryland	6,310,400	2,000,000	31.7
Massachusetts	5,145,600	1,000,000	19.6
Michigan	36,755,200	14,000,000	38.1
Minnesota	50,591,200	22,000,000	43.4
Mississippi	29,657,600	13,000,000	44.0
Missouri	43,990,400	16,000,000	36.4
Montana	92,998,400	25,000,000	26.9
Nebraska	48,758,400	1,300,000	3.1
Nevada	70,233,600	2,000,000	2.8
New Hampshire	5,763,200	3,000,000	52.0
New Jersey	4,771,200	2,330,000	48.8
New Mexico	78,374,400	8,000,000	10.2
New York	30,476,800	8,000,000	26.2
North Carolina	31,091,200	18,000,000	57.9
Ohio	26,086,400	4,500,000	17.3
Oregon	60,518,400	20,000,000	33.0
Pennsylvania	28,790,400	7,000,000	24.3
Rhode Island	694,400	200,000	28.8
South Carolina	19,308,800	9,000,000	46.6
Tennessee	26,720,000	11,000,000	41.2
Texas	167,865,600	40,000,000	23.2
Utah	52,601,600	4,000,000	7.6
Vermont	5,846,400	1,900,000	32.5
Virginia	25,680,000	12,000,000	50.6
Washington	42,803,200	20,000,000	44.3
West Virginia	15,772,800	9,000,000	57.0
Wisconsin	34,848,000	17,000,000	48.8
Wyoming	62,448,000	7,800,000	10.9
The United States	1,856,070,400	479,080,000	26.4

In this table, in order to show the comparative extent of forest, only the land area available for use as farm or forest is given. The land occupied by towns and cities and that covered by large bodies of water, such as lakes, is excluded. Our whole available land surface, therefore, Alaska being left out of consideration, is 1,856,070,400 acres. The total forest area is 479,080,000 acres. The total farm area is 301,000,000. Of unimproved and waste lands, including "old fields," there are 1,082,018,980 acres.

In regard to the consumption of our forests, we have some very significant, if not startling, figures. We had in 1884, as reported in Poor's Manual of Railroads, 156,497 miles of track. The average number of ties used for each mile is 2,640, which would make the whole number used 413,152,080. As the roads generally demand the best timber, choosing young, thrifty trees, which will not commonly make more than two ties each, not more than one hundred ties can ordinarily be cut from an acre of timber land, though with proper cultivation the yield should be much larger. To build the existing roads, then, has required the available timber on 4,131,520 acres. The average duration of ties is seven years. To keep the existing roads in repair, therefore, will require 59,021,700 ties, or the product of 590,217 acres. The average length of new road built every year is about 5,000 miles, requiring 13,200,000 ties, or the timber of 132,000 acres. If we allow twenty-five years as the time necessary for trees to attain a size suitable for making ties, then it would require the annual growth of 14,755,425 acres to keep good the existing roads, and 3,300,000 to supply the annual demand for new roads, to say nothing of keeping the latter in repair; so that we need to hold in reserve not less than 18,000,000 acres of woodland for the maintenance of the road-beds of our railroads, aside from the additional demand for the building of cars, bridges, depots, and platforms. In other words, it would require the timber growing on an area larger than the States of New Hampshire, Vermont, Massachusetts, and Rhode Island combined. The census also reports that in 1880 forest fires consumed the trees on 10,274,089 acres, or an area equal to that of Massachusetts and New Jersey. The consumption of our forests for the supply of fuel for factories, locomotives, steamboats, stores, and dwellings requires the product of not less than 6,560,000 acres annually. The estimated cut of lumber last year would lay bare 5,600,000 acres. All other products of the forest, such as hewn timber, posts, telegraph poles, and miscellaneous articles, of which we have no definite reports, it may reasonably be supposed would clear 4,260,000 acres—making in all 27,416,306 acres of woodland. Making an allowance of 10 per cent. for any possible over-estimate, we still have 25,000,000 acres as the annual consumption of our forests, or 68,493 for every passing day. This would clear the State of Rhode Island, if it were entirely wooded, in ten days, or the States of Kentucky or Virginia in a single year.

We may well inquire, and ask the country to inquire with us, most earnestly, What can be done to lessen this drain upon our forests, by the prevention of the needless destruction occasioned by fires—two-fifths of all—and by a more economical use of those products of the forest which are legitimately called for?

ALARMING DESTRUCTION OF AMERICAN FORESTS.

BY WILLIAM LITTLE, OF MONTREAL, CANADA.

I shall make no apology for appearing before you to-night, except to express regret for my inability to properly impress upon your minds the importance of the subject that I shall present for your consideration. I allude to the alarming destruction of the forests of the United States and Canada, especially in those descriptions of timber that have furnished in the past—you may say three-fourths of the commercial timber of America—the White Pine and the Spruce.

That the constant drain made upon the forests of America for supplies of these invaluable woods should at last occasion a scarcity and compel economists to point to a time, in the very near future, when their total exhaustion may with confidence be predicted, unless prompt and intelligent measures be taken for their conservation, will not surprise those who have known the enormous demands made upon them, but it is questionable if many persons are prepared to realize how near at hand that time is.

Thinking men, aware of the facts and desirous of protecting the forests, have tried to forewarn the public of the actual state of things, but have only been ridiculed for their pains. Now, however, this matter has passed beyond the region of conjecture. The United States' supply of these woods has been carefully ascertained through investigations made in connection with the census, and that of Canada is so well known to those conversant with the subject as to give rise to the most serious apprehensions.

Respecting the United States' supply, Prof. Charles S. Sargent, Director of the Arnold Arboretum, Harvard University, and special agent in charge of Forestry Statistics of the United States Census, made the following statements three years ago, in a paper read before the Massachusetts State Board of Agriculture:

"The entire supply (white pine) growing in the United States and ready for the axe does not to-day greatly, if at all, exceed 80,000,000,000 feet, and this estimate includes the small and inferior trees, which a few years ago would not have been considered worth counting. The annual production of this lumber is not far from 10,000,000,000 feet, and the demand is constantly and rapidly increasing.

"The publication of these facts a few months ago has greatly increased, and, in some cases, more than doubled, the value of pine lands, and it does not require any particular powers of foresight to be able to predict that the price must advance to still higher figures. Enough is now known to permit the positive statement that no great unexplored body of this pine remains, and that, with the exception of the narrow redwood belt of the California coast, no North American forest can yield in quantity any substitute for it."

And again, in the same article, as if to emphasize his remarks respecting the disappearance of the white pine, he says:

"Fatal inroads have already been made into the great pine forests of the North Atlantic region. Its wealth has been lavished with an unsparing hand; it has been wantonly and stupidly cut, as if its resources were endless; what has not been sacrificed to the axe has been allowed to perish by fire. The pine of New England and New York has already disappeared. Pennsylvania is nearly stripped of her pine, which only a few years ago appeared inexhaustible. The great northwestern pine States—Michigan, Wisconsin, and Minnesota—can show only a few scattered remnants of the noble forests to which they owe their greatest prosperity, and which not even self-interest has saved from needless destruction."

This is the condition of the United States forests as described by a gentleman who was specially engaged by the Government, on account of his pre-eminent ability and high character, to thoroughly investigate the subject, and which was made two years after all reports had been given in, when any errors in calculations, if such existed, would be fully known. What does it show but that there was then barely eight years' supply of this timber? Since then three years' cut has been removed; so that to-day there is standing in the forests less than five years' stock of this timber, not only that of merchantable quality, but of all kinds, good or bad, large or small, old or young—timber convenient and accessible, as well as that more remote and inaccessible. So serious indeed are the facts that actually before another census report could be made, there would not be a foot of this timber to take into account, if the present reckless cutting should continue!

And now, if we turn to Canada, what do we find is the condition of things there? It would, of course, be easy to give my own views or those of my father, the late Mr.

James Little, of Montreal, who took the deepest interest in the subject of forestry in America; but instead of this we will quote from the valuable report on the Canadian forests submitted to the Government some seven years ago by the Hon. H. G. Joly, our honored vice-president, as member of the Dominion Council of Agriculture—a report which is replete with most valuable information and suggestions.

In this report we find, under the heading "State of our Forests," among other remarks—

"They (the forests) contain," says Mr. Joly, "a great variety of timber, but I will call your attention principally to the pine and spruce, as they form nearly all our export to Europe, and are really the produce of our forests; while the hard-wood we export, especially the fine oak, nearly all comes at present from the lake regions of the United States, as we have very little of our own left.

"For some years past," continues Mr. Joly, "the idea has been gaining ground among men who take an interest in the future of the country that our great pine and spruce forests are getting rapidly exhausted, and that before long a trade which enables us to export annually over twenty million dollars' worth of timber will shrink down to wofully reduced proportions.

"Thinking men have begun to sound the note of alarm, and we owe it to them, but especially to ourselves as a nation, to try and find out how far their previsions are likely to prove true."

Then, after showing what difficulty the inquiry presents, he says:

"Let us now try and make an inventory of the timber resources of the Dominion, beginning in the west. On the Pacific shores of the Dominion, in British Columbia, the bountiful gifts of Providence are still stored up for us, and the forests have scarcely been attacked by the lumberman. How long these treasures will last us and what advantages we shall derive from them depends in a great measure upon ourselves.

"From the Rocky Mountains to the province of Ontario there are scattered here and there certain tracts of well-timbered land, but they are the exception. That timber will be required for the local wants of the people who are now only beginning to settle on our fertile prairies."

It is now known that this prairie country will require thousands of millions of feet in excess of its own stock. The report goes on to say:

"The great forest of Canada, *par excellence*, is spread over that vast territory watered by the Ottawa, the St. Maurice, the Saguenay, and their tributaries, over one hundred thousand square miles in extent. Before drawing your attention more particularly to it I will mention our remaining timber limits, that cannot compare with it, either for size or resources. They are found in the Georgian Bay country; the Muskoka and Nipissing regions; the eastern townships of Quebec and south shore of the St. Lawrence to the gulf; the region on the north shore of the St. Lawrence, from the Saguenay down to the Bersimis, and, perhaps, still lower down, as far as Mingan, and the country watered by the St. John, the Miramichi, the Restigouche, and their tributaries. Those limits, in many places, are scattered and isolated; they have, with few exceptions (such as the Bersimis at the east and some newly-discovered pine tracts at the west, on Lake Superior), been worked for a long time, and cannot be expected to supply much longer any considerable quantity of first-quality pine; but they still contain an immense quantity of spruce, principally in the east, sufficient for a great many years' supply, if carefully worked and protected. The spruce, unlike the pine, reproduces itself with wonderful ease, and a good spruce country, carefully worked, where you leave untouched all the trees under a certain size, say twelve or thirteen inches at the foot, can be worked and worked again, after a very few years' rest, I might say, almost forever.

"As a match to the timber wealth of British Columbia in the west there have been lately discovered at the extreme east of British North America, in the recent explorations through the hitherto unknown interior of Newfoundland, magnificent forests. Let us hope that before long they will take their place among our Canadian forests.

"I will now return to the great Canadian forest—our great pine country—with its wonderful network of streams and its three great arteries, the Ottawa, the St. Maurice, and the Saguenay.

"Does it begin to show signs of exhaustion? Is it possible that in such a short time man has been able to make an impression upon those millions and millions of acres of forest?

"If there is no sign of exhaustion, what is the meaning of the complaints that come over the seas to us, every year louder and louder, about the falling off in quality and size of our pine, hitherto considered as the finest in the world? Are they no more than the ordinary complaints of the purchaser? I leave it to our lumbermen to answer.

"But, before they answer, I will ask them, why are they compelled to go now to such enormous distances for the really superior quality of pine they used to get so much nearer home a few years ago?

"Look at the map of that great region and you will see how little of it is now left untouched. On the Ontario side, all the most accessible tributaries of the Ottawa, the Madawaska, the Bonnechère, Mississippi, Petewawa, and others have been worked for years. The lumbermen are now round the eastern end of Lake Nipissing, with the Matawan for an outlet to the Ottawa, that can only be reached by a land road; they are still much further north on the shores of the Montreal river.

"On the Quebec side they have nearly reached the headwaters of all the great tributaries of the Ottawa, the Rivière Rouge, the Rivière du Lièvre, the Gatineau, with the Jean de Terre and Lake Kakebonga and the Lac des Rapides. They are now working three hundred miles higher up than Ottawa, as the river runs, on Lake Temiscamingue and the Keepawa.

"On the St. Maurice they are as far up as Lake Manouan on the western side of the river; its great tributaries on the eastern side—the Bostonnais and the Rivière Croche—have been deprived of the greatest part of their fine pine; it is now sought at the headwaters of those rivers.

"As for the Saguenay region it still contains a good deal of spruce, but there is only a limited extent of pine still untouched, or nearly so, south of Lake St. John, between the Metabetchouan and the headwaters of the Rivière Croche, near Commissioner's lake and Bouchette's lake. There is a little pine left north of Lake St. John, and a certain quantity on the River Shipsha and in the lower Saguenay on the Ste. Marguerite and Petit St. Jean, etc. As for the large rivers that flow into Lake St. John, the Chamouchoua, Mistassine, and Peribonca, the pine that was on the lower part of those rivers has been nearly all cut, and the remainder of their course, from their distant northern sources, is through an immense burnt-up wilderness, where the vegetable soil has been consumed by fire.

"That huge tract of lumber country, between the Ottawa and the St. Maurice, that separated (or rather appeared to separate) the lumbermen working on those two rivers by what seemed an inexhaustible and endless forest—that huge tract is tapped through and through, and the Ottawa lumberman has met the St. Maurice lumberman on the shores of Lake Manouan. A glance at the map will show what that means.

"Those who think that there will never be an end to our timber may say: 'We can still go north.'

"Not very far north. From Lake Temiscamingue and the Montreal river, on the shores of which the lumberman is plying his axe at this very moment, they cannot go very far north before they strike the height of lands dividing the St. Lawrence watershed from the Hudson's Bay, and the country is generally poor and barren. There is still some fine pine there, in what quantity is not known, along the headwaters of the Ottawa, but it cannot be brought down to market, at least as square timber, until very extensive and costly works have been executed for the improvement of the great Rapide des Quinze.

"Once over the heights that divide the St. Lawrence and Hudson's Bay watersheds one from the other, the streams, without which timber cannot be brought to market, all run to the north to James' Bay and Hudson's Bay. Those regions are generally represented as a huge barren wilderness, with little timber, and that mostly of a stunted growth.

"While every one admits the great value of the timber trade to Canada, no one would complain, in a new and sparsely-peopled country like ours, if the finest pine forests were to disappear and make room for fine farms. But, unfortunately, we cannot comfort ourselves with such hope, for the soil of the pine region is not generally favorable to agriculture, and when the pine disappears the farm does not very often take its place.

"Men are the same all over the world. They never set much value upon the free gifts of Providence, and disregard them in proportion to their abundance. Timber, fish, and game have been destroyed everywhere in the same way. When what appeared to be inexhaustible becomes exhausted, it then begins to be valuable, and we must pay for our experience.

"Our neighbors in the United States have applied to the destruction of their forests their almost superhuman activity and energy, and they are now worse off than

we are for timber. But their eyes are being opened. The President, in his last message, has earnestly drawn the attention of Congress to the subject, and the following quotation from the last annual report of the Secretary of the Interior shows how thoroughly they appreciate the gravity of the situation:

"'The rapidity with which this country is stripped of its forests must alarm every thinking man. It has been estimated by good authority that if we go on at the present rate, the supply of timber in the United States will, in less than twenty years, fall considerably short of our home necessities.

"'It is time that we should turn our earnest attention to this subject, which so seriously concerns our national prosperity.'"

And, after referring to the older settlements of the Province of Quebec being painfully bare of trees, Mr. Joly sums up his report on "the present state of our forests" by saying "that it is very far from satisfactory and leaves much room for improvement." But in his very able report he does not stop short at "the state of the forests," but shows his clear insight into everything appertaining to the subject by accounting for the facts of a continued overproduction of wood side by side with rapidly receding and diminishing supplies. In alluding to the overproduction he says:

"There cannot be a greater waste of any marketable commodity than by overproduction. It is unavoidable, as the extraordinary success of any given branch of industry is certain to produce it; but generally it does not take long after its fatal effects are felt before the evil cures itself. Unfortunately our timber trade is an exception to that rule. In the face of a glutted market we persist in our overproduction, as if we expect to relieve the market by glutting it still more.

"Overproduction in the timber trade is a greater evil than in any other business, as the raw material cannot be replaced for generations. With a few exceptions the lumbermen of Canada, as a rule, cannot stop their production of timber; they can scarcely curtail it.

"The lumbermen have indicated the remedy for overproduction, but have not been able to apply it. Each one is ready to admit that he (or rather his neighbor) is cutting too much timber, and that he would make more profit with a less quantity.

"It is bad enough that so much money should be wasted away in cutting down timber for no good, but if there were an inexhaustible supply of timber on the Crown lands, the Government, receiving a larger amount of timber dues than it might otherwise, would not be likely to interfere, to protect the lumberman against himself. But our forests are getting rapidly exhausted and their produce sacrificed, and it is a loss for Canada and for the lumberman.

"Of course the first result of a decrease in the production of timber, in so far as the Government is concerned, would be a corresponding decrease in the Crown lands receipts. I won't call it the revenue, because there is something deceptive in the use of that word. We are apt to fancy that it always means (as Worcester has it) the income or annual profit received from lands or other property. It is nothing of the kind in this case. We have not been spending the income or annual profits of our forests, but the forests themselves—not the interest, but the capital."

This is a picture drawn some seven years ago of the condition of the Canadian forests by a gentleman thoroughly conversant with the timber trade, an enthusiast on the subject of forestry, and having recourse to every available source of information on the subject. What can we gather from his statements but that Canada is almost in the same deplorable condition as the United States with regard to its stock of valuable pine timber? It may be here worthy of mention that, though Professor Sargent in his remarks made no reference to the condition of the spruce forests of his country, yet an examination of the Forestry Bulletins published by his department shows that the existing amount of spruce timber will have disappeared in as short a time as the pine, if the same rate of cutting should continue. Although Mr. Joly appears to consider that the spruce forests of Canada would supply the home consumption for a great many years, yet it would supply for but a limited period the thousands of millions of feet that will be required by the United States when it has parted with its white pine and spruce timber, and when it has no other source of

supply for this description of wood than Canada, and from no other source can it be obtained so cheaply.

It has often been said that there would be found a substitute for wood. If so, it is quite time the discoverer brought it forward, for up to the present the ingenuity of the "everlasting Yankee" has not even touched the subject. Notwithstanding the fences of wire, the use of iron in buildings, the terra cotta and straw lumber, the consumption of our old friend, wooden lumber, increased nearly 50 per cent. in the ten years from 1870 to 1880, the former being 12,755,543,000 feet and the latter 18,091,356,000 feet (we are now informed by the Hon. Mr. Egleston, Chief of Forestry Division at Washington, that the present production is not far from 28,000,000,000 feet); and though it has always been claimed that iron and lumber keep together, cheap lumber accompanying cheap iron, we now find iron so low that producers claim they are at the lowest rung of the ladder, while lumber, notwithstanding the enormous production, has advanced in price, with every prospect of still further increase; and yet it would appear that we are within five years of the time when the great bulk of supplies of white pine and spruce (which are, in the North, the great stock of this indispensable material) must cease. And this is not the statement of interested parties, which might be open to suspicion, but of those specially employed by the Government of the country to ascertain the true condition of the forests.

It will no doubt be said "What of this? There are still vast forests in the South to be drawn upon." This may be a matter of great value to the South; but to the people of the North, who now make and use four-fifths of the sawed lumber produced, it is a matter of the most serious importance. The value of the lumber now produced in the North exceeds $300,000,000 a year as it falls from the saw. That it is all wanted there is no better evidence than the fact that demand and price are both increasing, and to replace it would cost from two to three times this sum, even if the same lumber could be obtained elsewhere, which it cannot be. Six hundred million dollars a year would not replace it; so that, in a very short time, this section of the country, instead of having a great and profitable industry advancing and helping every interest, will be called upon to pay out hundreds of millions of dollars annually for such material.

But even our Southern friends are interested with us in the preservation of this timber, as the uses to which it is applied are so different from theirs that large quantities are annually sent South, and the government of Canada, recognizing this fact, while imposing a retaliatory duty on the white pine, admits southern pine duty free. It is further to be hoped that the governments of the Southern States may learn a lesson from the prodigality of the North, and preserve their most valuable timber for the benefit and welfare of the community, instead of giving it away to timber-land speculators, or to such an ignorant race of destructionists as have gobbled up the timber of the North, or they, too, will soon be dispossessed of one of the greatest blessings that Providence has vouchsafed their country.

When people talk, as they sometimes do, of the inexhaustible forests of the South they little know the sawing capacity of the Northern mills, which could in twelve months' time convert the whole merchantable pine of the States of Georgia or Alabama into lumber, and could in six months use up that of Florida or either of the Carolinas. In fact, the mind can hardly realize the enormous consumption of timber going on in the United States; but some idea may be formed of it from a knowledge of the fact that the city of Chicago alone received in one year over 2,000,000,000 feet, principally white pine, an amount equivalent to the entire production of the Dominion of Canada during the same period.

The entire annual consumption of wood for building and manufacturing purposes can now be but little short of 30,000,000,000 feet. This of itself must show the enormous destruction of forests going on in the United States, and the serious result a loss

of its timber must have upon its future welfare. It consequently becomes the greatest economic question of the day—one before which all others sink into insignificance in comparison, for nothing can be more true than the remarks of the Glasgow Herald, in reviewing an article on the subject in 1876, when it said: "The knowledge we have gained of a dearth of cotton may help us to appreciate the terribleness of the calamity that would be experienced from a dearth of timber in Canada and the States. In point of fact, both Canada and the States are busy sawing from under them the high-reaching, fortune-making branch, on which, like conquerors, they are now sitting and overlooking the world."

When we consider the importance that an abundance of the most valuable timber has had on the past welfare of the country, and come to realize what "a dearth of timber" means, all will readily see that the foregoing is by no means an overdrawn statement. If we also consider the fact that each human being in the country must have timber in one form or another for his protection or comfort—that our shelter is of timber, the floors we walk on, the chairs we sit on, the tables we eat from, the conveyances we use, even to our cradles and coffins—we can readily see how overwhelmingly important is this great question of timber supply. Then, too, the numerous industries engaged in the various processes concerned in the use of this material, and the hundreds of thousands of laborers directly depending thereon for their livelihood, prove that timber is an article required by every individual of the whole community, and demonstrate that every means should be adopted for its preservation and protection.

When England, which has cheap coal, cheap iron, and cheap labor, and which can get her supplies at the cheapest rates from the north of Europe, annually expends nearly $100,000,000 for timber, one can readily recognize how much it would cost the United States (a country that has yet to be built up) to import its lumber from any foreign source. It has been estimated that it would take the entire sailing tonnage of the world to convey the amount of timber annually consumed in America from any foreign lumber port. But where to get at any price the enormous quantities used in this country is a question that would puzzle those best informed on the subject to determine.

These considerations fully justify the remarks contained in a leader in the New York Sun, when urging Congress some time ago to remove duties from Canadian lumber, in which it said:

"No more vital question can come before Congress. Perhaps no Congress has ever been called on to decide an economic question of greater moment."

The Province of Quebec has, to some degree, acted prudently by restricting the cutting of pine trees below a certain size—12 inches at the butt on the stump; and the policy of charging the same timber dues on small logs as on larger ones has similarly had the effect of curtailing the cutting of the small spruce trees. But in the United States even this small measure of wise economy does not operate, as all trees, both large and small, are cut.

The word "destruction" has in the preceding remarks been used advisedly. American forests are not exploited as in Europe. To remove a large trunk sometimes fifty smaller trees are cut down, and this ruthless destruction is resorted to simply to save a small amount of extra labor; whereas the trees needlessly felled, as well as the tops and branches of the one actually required, are left to rot on the ground or, what is worse, to lie as fuel for the flames.

And respecting forest fires, which the lumberman is constantly parading as an excuse for his reckless cutting of timber, it may be said that, from the condition in which the woods are left during and after his operations, it would appear to require almost the interposition of Providence to prevent their burning in case of an acci-

dental spark falling among them. With proper legislation and an enlightened public opinion to lead Americans to look upon the tree as one of his best friends there should be but little danger from fire.

Moreover, if the timber-land owner would annually expend the same percentage he is willing to spend to insure other property of like value towards putting his timber property in a safe condition he could so place it that it would be difficult to set it on fire so as to do any serious injury.

I shall not advert to the climatic or other effects claimed to be of an injurious character which the clearance of the forests is said to bring upon a country. These matters are best treated by the scientific gentlemen assembled here. The commercial aspect of the question is all I claim to possess a knowledge of, and this I believe is of such paramount importance that it should arrest the attention of all thinking people.

It may be said that the active American mind, always ready with expedients, ought to be alive to its importance; but the truth is that the American mind has, up to the present time, been devoted towards getting rid of the timber, and in this, as in most other efforts, it has been eminently successful; so the question is now how to change the current of public opinion in America from that of antagonism against trees to that of appreciation of them. In my humble opinion this can soonest be brought about by constant agitation and reiteration of the true state of the facts. The formation of Forestry Associations and the institution of "Arbor Days" are having excellent effects, and will no doubt be productive of a great amount of good in this direction.

To the American, whose great aim has been how most quickly to get rid of the forests which, until recently, were the great obstacle in his way in providing himself and family with a home, the familiar refrain of "Woodman, spare that tree" sounded as the hollowest mockery; to him the rapid stroke and sharp ring of the woodman's axe, or the thud of the forest monarch as it struck the earth in its fall, were sounds far more pleasing to the ear. And it is only since the railways have spanned the continent and supplied the knowledge that his country is on the whole a prairie, and a treeless one rather than a wooded one—that the timber is only peculiar to the coasts, lakes, and water-courses, while the vast interior is bare of timber—that such an idea has had a chance of claiming his attention.

Respecting this aspect of the country, Professor Wm. H. Brewer, in the Statistical Atlas for the Census of 1870, writing of "The Woodlands and Forest Systems of the United States," says:

"A glance at the map shows large regions either treeless or very sparsely wooded, and that it is possible to cross the continent from the Pacific to the Gulf of Mexico without passing through a forest five miles in extent, or large enough to be indicated on the map."

And he might also have said from the Canadian boundary line to the same point, for he says:

"The woodlands of the east are separated from those of the west by a broad treeless plain from six to fifteen degrees wide."

And again, when mentioning the value of the "sawed lumber" product, he says:

"Yet this gives but an imperfect idea of the part that wood and timber play in the wants and industries of the people. The great majority of all the buildings of the country are made of it, and it is an essential ingredient of nearly all those which are nominally of brick or stone. It, too, is the principal ingredient in the vast majority of ships, boats, cars, carriages, etc., for transportation; so too of our furniture and of most of the tools and implements in use.

"It is the sole household fuel of two-thirds of the inhabitants of the country, and the partial fuel of nine-tenths of the remaining third. For making steam, reducing metals, and the various processes in the arts it is used in immense quantities. Entering, as it thus does, into the multiform uses of civilization, in every period of life from

the cradle to the coffin, a constituent of so many of our manufactures, and nearly all our structures, from a match or tooth-pick to the railroad or steamship, it forms an element in our needs and our industries which cannot be reached by statistics nor expressed by figures."

Even then he threw out the hint, which has since been realized, when he said—

"That our large timber, suitable for sawing, is diminishing, there is no question; nor is there any question that this will go on until the price so much rises that new timber will be planted as the old is cut, and that a part of this diminution is due to prodigal use and needless waste."

Also referring to this same time (1870), our lamented friend the late Dr. Franklin B. Hough, when Chief of Forestry in the Department at Washington, in his "Third Report on Forestry," p. 285, says:

"The United States, according to the last census, 1870, had an area of woodlands amounting to about 380,000,000 acres of land, belonging chiefly to individuals. It was estimated that 10,000,000 acres are destroyed annually and that not more than 10,000 acres are planted.

"It is only in the United States the devastation of the forests is going on upon an immense scale and made in some sense the order of the day."

Since then fifteen years have gone by, during which time the most terrible slaughter of the forests has been kept up. The increase of cutting for commercial purposes has more than doubled; so that, assuming these figures as correct, there can now remain but little more than one-half this area of woodland, for although, owing to five years of financial depression in the United States, from 1873 to 1878, the consumption of wood may have fallen off during that period, since then the onward stride has been so prodigious that the Northwestern States more than doubled their production of sawn woods from 1878 to 1884.

The 3,629 millions of 1878 become 8,000 millions in 1884, while a similarly large increase took place in the Southern States, so that the total cut of the United States is now over 50 per cent. greater than when the census was taken for 1880; but, considering the increase only 40 per cent. greater, we have for the entire cut of sawn lumber 25,000 millions of feet, board measure, of sawn wood alone; and if to this is added 20 per cent., to include the squared, flatted, and round timber, the wood used in shingles, pulp, etc., and the railway ties, fence-posts, and other forest products, we have a total of 30,000 million feet of wood used in commerce, besides the enormous amount used for fuel, etc., which was valued in 1880 at $321,962,000, and which would to-day be worth not less than $400,000,000. To obtain this enormous amount of material must have required the selection of the best trees from fully 20 million acres of land, equal to a strip of land 10 miles wide reaching from England to America, or more than four times the area of your whole State of Massachusetts.

These figures give some idea of the extent of territory denuded annually, and I will now show the present value of this material.

The value of "sawn lumber" returned for census year 1880 (actually the cut of 1879) was 233 million dollars; adding 40 per cent. to this, for increase since then, makes this amount 326 millions, and an increased value at primary points of 50 per cent. makes 489 millions, or, say, in round numbers, 500 million dollars for sawn wood alone. Then adding 20 per cent. of this value for other wood products mentioned above, equal to 100 millions, and the value of the fire-wood, 400 millions, the whole makes 1,000 million dollars as the present annual value of the forest products of the United States at primary points of production or manufacture.

Moreover, the production and consumption are steadily increasing, while the supply is as steadily diminishing; and when it is seen that this manufacture now stands at the head of the manufactures of the United States in value, as it has hitherto done in the number of operatives employed, and that the white pine, which has been in the past, and is still, the most important factor in this great industry, is rapidly approach-

ing extinction, I feel that we cannot be far astray in considering this, as regards America, what I have already called it, the most important economic question of the day—one before which all the others sink into insignificance.

The white pine, spruce, hemlock, and cedars form the bulk of the light woods of America, and it is probably owing to this characteristic that the white pine and spruce, notwithstanding their original great abundance, are so rapidly becoming exhausted, for, being light and easily floated, they are taken with but little difficulty from the most remote sections of the country, wherever water-courses exist.

It might be as well to remark, as opinions appear to prevail in some quarters that the area of the white pine in Canada is of very great extent; that it covers but a limited area. That this is a fact is shown by Dr. Bell, assistant director of the Geological Survey of Canada, in the report of the survey for 1880, in which he says, respecting the white pine, or what is known as the "yellow pine" of the British markets—*Pinus strobus*, L.:

"This and the next species have so nearly the same limit throughout the greater part of their northward range that they are represented on the map both by one line. The red pine, however, does not extend so far east as the white, so that in this direction the line represents only the boundary of the latter. Contrary to popular belief the white pine is confined to a comparatively small part of the Dominion, as will be observed by an inspection of the map. Its northern limit in Canada extends east as far as Mingan, while to the west it does not reach Lake Winnipeg, or Red river. It reaches its lowest latitude opposite to Ottawa City, about 48¾°, and its highest, about 52°, in the Lonely Lake region. In the country immediately north of Lake St. John the Messrs. Price have cut large quantities of fine white pine timber for export. When coming from Lake Mistassini to Ottawa, by way of the Gatineau river, Mr. Richardson, of the Geological Survey, first met this species at 230 miles north of that city. It occurs of fair size on the headwaters of all the principal branches of the Moose river, and in former times is said to have extended considerably further north along these streams; but, having been entirely destroyed by extensive forest fires, it has been replaced by other trees. Owing to these fires it is now very scarce in most of the region north of Lake Superior, but small groves of it have been observed as far north as represented. It is scattered over the country between Lake Superior and the Winnipeg river and around Lonely Lake, but it is of rather small size. In approaching Lake Winnipeg the limiting line of this tree curves southwestward, and crosses the Winnipeg river about fifteen miles above Fort Alexander, and then runs south to the United States at some distance east of Red river."

In the foregoing remarks I have given the views of gentlemen in whose opinions I have the greatest confidence, and however much they may conflict with the preconceived notions of others, I believe them to be true.

But even if it were to take fifteen years instead of five to use up the whole of the white pine of the United States, or fifty years instead of twenty to use up the whole forests, the matter would be sufficiently serious to justify us in calling public attention to the facts.

In conclusion, I would add a few words written by Dr. Oswald on this most important subject:

"The true basis of national wealth is not gold, but wood. Forest destruction is the sin that has cost us our earthly paradise. War, pestilence, storms, fanaticism, and intemperance, together with all other mistakes and misfortunes, have not caused half as much permanent damage as that fatal crime against the fertility of our mother earth."

Mr. President and gentlemen, I fully appreciate the extent of the truth and the seriousness of the warning contained in those forcible words. We cannot too soon take active and vigorous measures to prevent, or at least to mitigate, the calamity which would befall our country if our timber, that great source of national wealth, is taken from us. From an economic, from a national, and from a domestic point of view I believe that the question of the preservation of our forests is the most important and the most vital one which the America of the present day has seriously to consider.

FOREST PRESERVATION IN CANADA.

BY A. T. DRUMMOND, MONTREAL.

Each of the provinces comprising the Dominion of Canada, excepting Manitoba, has control of its own Crown lands, and hence it is difficult to secure one uniform series of measures for the protection of the timber upon these Crown lands. Circumstances are different in each province. In British Columbia the forests are largely yet untouched, excepting along the Pacific coast, and there is thus the opportunity still there of carefully conserving the forests, so that they may be a continued source of revenue, instead of allowing fires and the lumberman's axe to have unrestricted sway among them. Between the Rocky Mountains and the boundaries of Ontario it it rather a question of how far forests are to be created, as the country is chiefly open prairie. In Ontario and Quebec, along the streams which fall into the Georgian Bay, and at the sources of the Ottawa, St. Maurice, and other great rivers and their tributaries, there is still a considerable area of white and red pine, but the trees are of diminished size compared with the splendid trunks common on the Ottawa twenty years ago. The lumbermen are fast approaching the northern limits of the growth of these trees. In Ontario the provincial finances are in good condition, and the Government there can, if it will, readily curtail its revenues from timber and timber limits, in order to prevent waste of its Crown lands, and to preserve them in condition to yield revenues to the Government and profit to the lumbermen who may work them in years in the future. In the Province of Quebec there is more difficulty in dealing with the question, as the Province has a very heavy funded debt, the interest of which, in addition to ordinary expenditure, has had to be provided for, and as a consequence every possible source of revenue has been made available to the utmost. New Brunswick has still some forests of pine and spruce, but the area is, compared with the Ontario and Quebec forests, relatively small, whilst Nova Scotia has, on the whole, but little timber of good merchantable size left, and has correspondingly less interest in the question of forest preservation. The Crown lands are under Dominion control only in Manitoba and the Northwest Territories, and some steps have been taken to preserve what timber exists there.

As is well known the system prevails in Canada of leasing from year to year large areas of Crown lands under the name of timber berths or timber limits, at an annual rental per square mile. Though the lease is from year to year, yet by custom it is understood that as long as the rent is paid the lessee may continue in possession indefinitely until he has cut off all the timber he desires. Sometimes the holder is merely a speculator; at other times he is a lumberman, who is keeping the limits in reserve for future working, and thus frequently large unworked areas are tied up from year to year by parties who have a quasi right to continue this under the original lease. This makes it difficult to apply new regulations to limits already under lease. Sections of country not yet under lease—and considerable new tracts have in Ontario been rendered accessible by the Canadian Pacific railway—are in a different position, and governments can readily lay down rules for their future working as timber limits.

Germany, France, Sweden, and India have their forests cared for under more or less stringent regulations, and even the small Province of Cape Colony, in South Africa, has its Forestry Department, under government control, and is doing a good work that should put us to shame. The forests there are being arranged for scientific working, the fundamental principle being, the conservator says, that the cutting shall not exceed the growth. Why should we in America, with a splendid heritage in the pine forests of Maine, Quebec, Ontario, Michigan, and Wisconsin, have been so prodigal and reckless, and have shown so little far-sightedness, as to have gone on from year to year for half a century past allowing this heritage to be diminished gradually in value without even an attempt to prevent it? How often are we blind to the future! The Cape Colony Report for 1884 very well puts it that the policy should be pursued of setting our faces against forest destruction as firmly as other moral evils are faced. Further than this, with us here, each State and each Province has an interest in the action which its neighboring State or Province takes or neglects to take on this question. Our great rivers have often their fountain heads, or the fountain heads of their tributaries, in one or more States or Provinces, and then course their way to the great lakes, or the sea, through other States or Provinces. Have not those whose lands along the route are watered by these rivers, the cities, towns, and villages which are scattered along their banks, and the public which makes use of the steamboats and other craft which ply upon their surface, an undeniable interest in seeing that these waterways are not impaired by the burning or cutting away of the forests at these fountain heads? It is the province of every State to legislate for itself, or to withhold

legislation, but in this case the neighboring States have a clear right to ask that their waterways and water supplies shall not be impaired or cut off by its neglect to provide proper legislation or proper oversight.

The remedial measures which I would suggest with a view to the preservation and renewal of our forests are in some respects equally applicable to the United States and to Canada.

The leases of timber areas I would restrict to definite periods of five or, at most, seven years, and when the lease expired the particular area covered by it should have a rest of, say, twenty-five years, to allow of the young trees attaining merchantable value. The effect of this would be to largely check speculation in timber limits and would give ample time to *bona-fide* lumbermen to get out all large-sized timber. It should be incumbent on each lessee to show his *bona fides* by erecting a mill within a given time either at or convenient to the limits, unless he has a special permit to work the limits for square timber.

The timber limits themselves should be restricted in size to about fifty square miles. This is now done in Manitoba by the Dominion Government. The parceling out of the timber country into definite, limited areas would enable each Government to carry out more systematically the plan of alternate leases and rests for the forests.

The production of square timber should be discouraged on account of the great waste of material in forming the square log and because of the additional food for forest fires which this waste material creates.

The cutting on Crown lands of trees under twelve inches at the stump should be punishable by a heavy fine, which would be easily collectible at the mills when the drives of logs come down after the spring freshets. This would have the effect of preserving the younger trees until they attained a merchantable size.

The starting of forest fires should be made criminal. Nineteen-twentieths of the forest fires are preventable. There is no reason why camp fires should not be put out, and the knowledge that to allow them to spread was punished by imprisonment would quickly make camp parties careful, more especially if every member of each party were made responsible.

Not only in the forests which have been cut over by the lumbermen, but wherever fires have swept through areas of Crown lands not specially suitable or available for settlement, resowing or replanting should take place. Where burned areas are left to themselves trees of a less desirable kind almost invariably spring up. How to effect this resowing and replanting economically is a question of some importance. It can be done in part by the forest-rangers, hereafter referred to, but I think that, as a condition of every lease of timber limits, it should be made incumbent on the lessee either to pay a given sum per square mile of territory included in his lease towards the expenses of the Forestry Department of the Government or that he should actually plant and care for a young tree for every trunk he fells. This would not be an expensive proceeding. It would involve the cultivation of one or, perhaps, two acres as a forest nursery and the subsequent setting out of the young trees, and to this might be added the duty of collecting and sowing through the forest of seeds of desirable kinds of trees. When it is remembered that each forester in Cape Colony is expected, without assistance, to annually raise 40,000 young trees, and that his duties involve the transplanting of these to the burned and other districts within his section, it will be observed that the task thus proposed to be imposed on the American lumberman is not formidable.

Lastly, each government, in the case of provinces still possessing forest areas of importance, should organize a Forestry Department in connection with the management of its Crown lands. The objects of the Department would be—

First. The general preservation of the forests from fires and from deterioration by improper working.

Second. The replanting of the Crown forests where burned or exhausted.

Third. The encouragement of tree-planting by land-owners generally, and the dissemination of information about trees and tree-culture.

There should be a Superintendent of Woods and Forests, whose duties should be organization, general supervision, and frequent inspection. Under him would be forest rangers or foresters, who would have given districts, in which they would reside, and for the oversight of which they would be responsible, their duties being to prevent encroachment by lumbermen on unleased Crown lands; to see that small trees were not cut; to investigate the cause of every fire happening within their districts and to punish the guilty parties, for which purpose they should have certain magisterial powers; to raise in a small plantation young trees for replanting the burned districts, and to collect and sow the seeds of desirable kinds of trees. Each forester would probably require the aid of an assistant. The administration of the department need

not be expensive, and whilst the expense could be readily met by a small tax per square mile of timber limits under lease, or per thousand feet of lumber sawn, or cubic feet of square timber produced, the saving annually of timber trees from forest fires alone would pay the cost of the department for many years.

LUMBERING IN CANADA.

BY J. K. WARD, MONTREAL, CANADA.

Mr. President, Ladies, and Gentlemen: I do not purpose on this occasion to take up much of your time with preliminary remarks other than to say that the paper I have prepared will be better understood by practical lumbermen than by scientists or amateurs. My aim will be to speak only of what it has been my fortune to learn in the rough school of experience. A lumberman's life is not passed on a bed of roses, yet there is a charm about it to those who have the stamina to endure its hardships and enjoy its excitements that is not easily forgotten by those who have followed the log drive from early morn to sundown, never feeling the time long, kedging across the lake to the tune of the chanteur or breaking the jam in the roaring cascade, whose noise is drowned by the yells and shouts of the crew on seeing the great mass move off, each great log, as it were, trying to get ahead of its neighbor until they reach still water. What excitement after the risks run and efforts made! Old lumbermen can and do look back to such scenes with as much pride as those who have faced battle. It has been said truly that peace hath its victories as well as war. The lumbermen can reasonably say so. What other business has so many contingencies connected with it, apart from the ordinary mishaps in trade? Sometimes there is too much snow, again too little. On other occasions the ice or the floods carry away your booms and scatter the logs, to be often stolen. Fires also cause much loss to the lumberman, and a great deal has yet to be done by legislation and by private effort to prevent the waste of such valuable property.

I have often thought we might have companies who would make a specialty of insuring this class of property, making the conditions and restrictions so thorough that proprietors would be necessitated to look after all intruders on their lands, whether hunters or careless settlers.

The different Provinces of the Dominion make the regulations and conditions on which the timber lands can be worked. In Ontario and Quebec vacant territory is usually sold by auction (in blocks varying in size from one to fifty square miles) at prices ranging from two to five hundred dollars per mile. In addition to this the lessee pays two dollars annual ground-rent per mile, and also a stumpage on all timber cut on the territory occupied. Each Province has its tariff of prices. In Ontario red and white pine are subject to 1¼ cents per cubic foot—other woods vary in price; pine, bass-wood and cotton-wood saw-logs, 15 cents per 200 feet, B. M.; walnut, oak, and maple logs, 25 cents per 200 feet; hemlock, spruce, and other woods, 10 cents per 200 feet; railway timber, knees, &c., 15 per cent. ad valorem. In Quebec, oak and walnut pay a duty of 4 cents per cubic foot; pine and other square timber, 2 cents; pine saw-logs average about $1.25 per 1,000 feet, B. M.; spruce and hemlock saw-logs, about 60 cents per 1,000 feet; railroad ties, 2 cents each; all other woods, from telegraph poles to spruce spars, shingle woods, &c., pay different prices. All land owned by Ontario and Quebec is leased for lumbering purposes. Much of it, however, is of such poor quality that I doubt if it will be of any value except for producing timber. Lands considered suitable for settlement are surveyed, and as fast as the lots are taken up by settlers and the Government conditions complied with—that is, a house built and ten acres cleared on each one hundred acres—the lot is taken out of the license, the Government, however, reserving the pine, except what the settler requires for his own use on the land. New Brunswick contains a large quantity of spruce, tamarac, cedar, hemlock, and hardwood. The pine, for which this Province was once famous, has mostly disappeared. The timber lands of this Province—about two-fifths of its area—are still vacant, and the output of lumber and timber of various sorts cannot be less than 300,000,000 feet, B. M., per annum. The stumpage on spruce and pine logs is 80 cents per 1,000 feet, B. M.; on pine and hardwood timber, 80 cents per ton; railway ties, 2 cents each—this is in addition to the prices paid for the right of cutting that may be realized at auction, the upset price being $8 per square mile. Nova Scotia contains a good deal of spruce, hemlock, and hardwood. Much of the latter is exported.

Manitoba and the Northwest are not reputed to contain a great deal of timber, and what there is is largely spruce and small pine, and not more than is required for

home use. Canada, west of the Rocky Mountains, contains vast quantities of valuable timber, the manufacture of which is rapidly increasing to meet the wants of the Pacific coasts and islands, and there is little doubt that when the Canada Pacific railroad is finished much of this lumber will find its way east into the treeless prairies.

And now as to Canada's method of lumbering. When circumstances will permit we pile or skid before the snow becomes too deep. When the snow is deep we draw direc from the stump to the lake or river. Our shanty living is not, as a general thing, as delicate as in American shanties, though perhaps as substantial—less apple-sauce, tarts, and sweets and more pea-soup, pork, and bread and beans, with well-cooked tea—less milk or sugar. The style of living and buildings differs in various parts of the country, and until very recently, particularly on the lower St. Lawrence, the fare of the shanty men was very primitive, the commonest tea being quite a luxury, and the only variety in the bill of fare was that it consisted in pea-soup, bread, pork and beans for dinner; the same, with the addition of tea, for supper, and either, less the pea-soup, for breakfast. On the St. Maurice, for many years, the living has been good and substantial, with comfortable shanties provided with stoves, tables, and bunks, the cooking being usually done in an outside apartment. The shanty man's condition, however, is improving with the times. His lot, at best, is a hard one, and I do not wonder at the Curé, whom I once knew, and who visited the shanties periodically, when he said that it was penance enough for any poor fellow to be in the woods all the winter.

Our shanty-men, whether English or French, as a rule, are as good axemen, and, I believe, are as expert drivers and canoe-men as can be found in any country. The improvement in driving tools within the last thirty years has been great. Our people are also well up in dam-building as well as making slides and clearing away and blasting bowlders to facilitate driving. Our rivers as a general thing, being very precipitous and rapid, require extensive improvements, especially for the running of square timber. The quantity of this made at present, I am glad to say, is much less than formerly. Some years ago there were not less than eighteen million cubic feet made in one year, while last year there were only five or six million feet, and the past winter not more than two million feet. There are many reasons for this change. Good pine timber is more difficult to get, and Southern pine is cheaper and better for some purposes, while the British consumer is finding out the folly of paying for and freighting slabs, sawdust, and the poor lumber that is found in the heart of almost every stick of timber. The result is that the quantity of sawed pine has increased, giving more work to our mill-men and others, as well as utilizing much valuable timber that would be left in the forest to rot, or make fuel to burn that still standing. As to the manufacturing of lumber in the saw-mills, it has been done until very recently in all large concerns by gate saws, but of late years circulars have come largely into use. The prejudice against lumber sawed by them was so great that it could not be sold except at a lower price than that produced by gate saws. This was occasioned by the want of skill on the part of sawyers, but this has been obviated to a great extent by workmen gaining experience in the management of rotary saws, so that some of the best sawed lumber going to market is made by them. But I believe that, were manufacturers less ambitious to see how much work could be done by a circular rather than to know how well it could be done, much valuable timber would be saved by working round a log, placing it properly on the carriage with regard to the cracks to be found in almost every large pine log and cutting parallel with the outside of a tapering log instead of with the centre of it, thereby saving the good lumber found on the outside of most logs and throwing away, if any, the poorer stuff found in the heart. The result would be, as every practical lumberman knows, much wider and more valuable lumber, as well as the conservation of that which cannot be reproduced in our day. I am not an alarmist as to our supply of pine timber, but I cannot consider a wanton waste of it other than a sin, when so much good lumber has been and is being thrown away, much of which could be utilized, giving labor and profit to many. It is a pity that more effort is not made to do so. I would suggest, what I have tried to practice for many years, that a person building a mill should put into it fifty per cent. more sawing capacity than some of the fast mills now in use possess.

Sawing, as they do, in twelve hours 40,000 or 50,000 feet with one circular saw, I will not say how well this can be done with one gang of men, but I would venture to say that it could be done, so as to get a good deal more money out of the same logs, by employing two rotaries, with the necessary trimming machinery, and giving the men sufficient time to set their logs properly on the carriage, turning them round as often as necessary so as to get all the wide lumber possible. This could be done by employing, say, one sawyer and three helpers for the additional saw, all the other labor being the same in either case, such as jacking and rousting logs, trimming, culling, and piling lumber by motive-power, almost the same, but this costs noth-

ing, sawdust supplying the fuel. The interest on extra capital employed would be small, and the result would be not to exceed ten dollars per day for wages and interest on cost of extra plant, while there can be no question but that there would be an increased value of from one to two dollars per thousand feet on the output, or from forty to eighty dollars per day saved. It does seem as if the lumbermen of the past, as well as many of the present day, entertained the idea that the supply of pine in Canada is inexhaustible, and were anxious to get rid of it as quickly as possible. Now, as a means of making our timber hold out as long as possible, I am decidedly of the opinion that the United States Government should gratify the lumber manufacturers and stick to protection, though a free-trader myself in all commodities, lumber included.

Now, a few words on the question of the influence of forests on rainfall. In the absence of satisfactory statistics on this point I think there can be no doubt as to the influence of forests in regulating the flow of water and preventing evaporation, thus lessening the danger arising from sudden and often destructive floods, the swamps and glades serving as reservoirs in bringing about this result. In reference to the propagation of timber I am quite satisfied that woods indigenous to our soil and climate require only space, of which we have plenty, and protection from fire and cattle, in order to be reproduced to almost any extent. I have seen lands that have been abandoned because they have been exhausted grow in a few years a good crop of thrifty timber.

Mr. Chairman, in conclusion, allow me to say that if I have said anything that will provoke discussion and tend to further the object we have in meeting here, or will be the means of contributing towards the protection of the material that adds so much to the beautifying and prosperity of our country, my efforts will not have been in vain.

LUMBER INTERESTS—THEIR DEPENDENCE ON SYSTEMATIC FORESTRY.

BY MR. JOHN E. HOBBS, OF NORTH BERWICK, MAINE.

Early Lumbering in Maine and New Hampshire.

On the 18th of July, 1634, the ship Pied Cowe, from London, arrived in the Piscataqua, having as a part of her cargo two saw-mills, and as passengers a party of carpenters to set them up. Both the material and the men were sent by Capt. John Mason, one of the earliest promoters of colonization on the New England coast.

One of these mills was erected at the falls of Newichawannock, at the head of tide-water, near the mouth of the river of that name, in South Berwick, Maine. After discharging her cargo and taking part of her lading on this river, the ship sailed for Saco, on the 18th of August, where she completed her loading with "cloave-boards" [clap-boards] and pipe-staves. This ship, with the barque Warwicke, had made a voyage to the Piscataqua in 1631, returning, probably, with a similar cargo.

Thus early had the settlers begun to cut and utilize the forests, with which they found the land covered. Saw-mills soon began to multiply, and their capacity was enlarged.

In 1650, a mill carrying eighteen saws, moved by one wheel, was erected near the mouth of the Newichawannock, about one mile above the one erected in 1634. We learn that in this later year Richard Leader was granted by a court held at Kittery, on the 11th day of March, "all the right to the privilege or mill-power on the little river known as Newichawannock, with the liberty and like property in all timber not yet appropriated to any town or person." It is said that the magnitude of Mr. Leader's operations gave the name of "Great Works" to the place, which afterwards became the name of the river.

In 1654 there was granted to him "all the pine trees up the little river, so far as the town bounds went, for the accommodation of his mill." For the privilege of cutting all this pine timber he was to pay the town an annual tax or royalty of £15 currency.

About 1640 Major Richard Waldron, from whom I am proud to claim descent, built saw-mills at Dover, N. H.; also other mills in 1648, and about this period grants were made of timber lands on all the branches of the Piscataqua. Just then there was great activity manifested in the development of lumbering as an industry, so much so that laws were required for the protection of the forests. To provide against waste, in 1656 it was ordered that if any inhabitant should "fall any pipe-stave or clap-board timber, and let it lay unused up one month, any other inhabitant might improve it as his own property."

At a town meeting of the inhabitants of Portsmouth in 1660 "a penalty of five shillings for every tree was imposed upon any inhabitant for cutting timber or any other wood from off the common, except for their own building, fencing, or firewood."

Stringent regulations, designed to guard against damage to the woods by fire, were made by several of the New England Colonies previous to 1650. Belknap tells us "that as early as 1668 the government of Massachusetts, under which the provinces of Maine and New Hampshire then were, had reserved for the public use all white pine trees of twenty-four inches in diameter at three feet from the ground. In King William's reign a surveyor of the woods was appointed by the crown, and an order was sent to the Earl of Bellomont to cause acts to be passed in his several governments for the preservation of the white pines. In 1708 a law made in New Hampshire prohibited the cutting of such trees as were twenty-four inches in diameter at twelve inches from the ground without leave of the surveyor, who was instructed by the Queen to mark with the broad arrow those which were or might be fit for the use of the navy, and to keep a register of them. These regulations, however, were easily evaded by those who knew the woods and were concerned in lumbering, though sometimes they were detected and fined." If the wise laws so early established by the first settlers had been continued and enforced by their successors to the present day there would be no necessity for this organization.

Since those early days the vast forests that then covered and adorned the continent, and which had often been renewed by the processes of nature, have been largely displaced by the hand of man, and the agency of man in hewing down these forests has so far outstripped their natural reproduction that the present generation is compelled to consider the best methods of conserving what now remains.

The interest which this wasteful destruction of the forests has aroused has produced nothing more valuable than Prof. Sargent's masterly report on the Forest Trees of North America, issued by the Census Office at Washington.

We learn from this report that the pine and spruce standing in the timber regions of this country in 1880, not including Oregon, Washington Territory, and Alaska, was estimated at about 300,000,000,000 feet, board measure.

This, if evenly distributed over the country in ratio to the population, would supply our present consumption of lumber, estimated at about 20,000,000,000 feet per annum, for fifteen years.

(No estimate is made of the hard-wood lumber or of the second growth of pine and spruce.)

But it so happens that more than one-half of our population, or 26,795,626, are found in the sixteen States north of the Potomac and Ohio and east of the Mississippi rivers. The amount of pine, spruce, and hemlock standing in the timber districts of this region of country in 1880 was estimated at about 111,000,000,000 feet, and we estimate the cut of lumber, including laths and shingles, for 1880 in these districts to have been about 7,434,000,000 feet. The total product in these States was about 13,648,000,000 feet.

This estimate is obtained by a computation confined to the sixteen States, based upon Prof. Sargent's report, which report applies to the entire country.

Thus we see that 6,214,000,000 feet of the entire product must have been cut from the woodlands contained in the farms of these States. These amount to 47,016,767 acres, showing an average product of 131 feet per acre.

This is far above the annual yield per acre of the spruce forests of Maine at the present time.

An annual cut of about 7,500,000,000 feet in the timber sections of Wisconsin, Michigan, New York, Pennsylvania, New Hampshire, and Maine will exhaust the estimated amount standing in these States in less than ten years, allowing nothing for growth. A continued supply of lumber from the woodlands contained in farms to the present extent cannot safely be counted upon.

In some of the States these wooded areas are rapidly diminishing, notably so in Ohio.

In this State the actual condition of the forests from year to year is better known, perhaps, than in any of the other States.

The assessors report annually, since 1873, the number of acres covered with wood, and from a comparison of these reports a constant diminution of these forest areas is shown.

In 1853 the woodlands covered 55.27 per cent. of the total area of the State. In 1870 they had fallen off to 38.51 per cent., and in 1881 they occupied only 22.53 per cent. These are awkward facts, which may be true to a somewhat less extent of many, if not all the other, States we have been considering.

The rapid rate at which the old forests are disappearing and the constantly diminishing area of woodlands contained in the farms of these States, as shown by these statistics, emphasize the fact that the present annual consumption of wood and lumber is far greater than the annual increment, and that the time is not far distant when these sources of supply will be entirely exhausted.

To prevent such a calamity, as far as possible, we should at once set about cultivating the forests we have, so as to increase to the utmost their productivity, and the reinvesture of all land now lying waste.

According to the census of 1870 12,755,543,000 feet, board measure, with other lumber products, were produced, valued at $210,159,327. In 1880 the product of lumber had increased to 18,091,386,000 feet of long lumber, and with other lumber products was valued at $233,367,729.

It must be borne in mind, however, that the average premium on gold in 1870 was 25.3 per cent.; consequently the value of the product of 1870 should be reduced 20 per cent. in order to make it compare with the value of the product of 1880, and thus diminished it will be $168,127,462, showing an increase in the value for that decade of 38 per cent., while the increase in population was 30 per cent. for the same time. The increase in the quantity of lumber manufactured was more than 41 per cent. in that of long lumber, and 70 per cent. in that of shingles, showing that the price of lumber, owing to overproduction, had diminished more than the premium on gold.

The timber lands remaining in the possession of the Government in 1880 amounted to 84,564,207 acres, being a small fraction of what once belonged to the public domain, and this is rapidly diminishing.

In California the destruction of the timber districts is swift, wasteful, and criminal on the part of the Government by permission. Occasionally some poor fellow is prosecuted for cutting trees for "shakes" (a rude kind of shingles used in the mountains), just to give out the appearance of zeal on the part of the officers charged with the duty of enforcing the laws, while the great combinations, constantly formed for the purchase of timber lands, continue their fraudulent entries and wrongful purchases of millions of acres of the best of it, and hold it in large tracts, and cut it up to suit the demands of the lumber trade.

Large tracts in Washington Territory, Oregon, and California have been thus entered under the various acts of Congress the present year, and this is all now in the hands of a few holders and mill-owners through secret contracts. Then, the sheep and cattle men set the forests on fire about the first of September every year to make larger the area of grazing in the forests for the following years, and leave the valuable forests of sugar pine covering the mountain slopes to inevitable destruction.

The law in reference to small holdings of timber is violated by most mill men. Their methods is to get their employees, or any one else who is willing, to enter what one individual only can enter, and then they purchase of that individual.

We find it stated from official sources that the total net revenue to the Government for the many millions of dollars' worth of lumber stolen from the public domain, and for which damages were sought to be recovered, amounted, from the beginning of records down to January, 1877, to but $154,373.74.

In strong contrast with the destructive and wicked policy prevailing in California is that of the present systematic working of the extensive timber lands of Northern Maine, which, as a recent writer says,* "still cover an extent seven times that of the famous Black Forest of Germany at its largest expansion in modern times. The States of Rhode Island, Connecticut, and Delaware could be lost together in our northern forests and still have about each a margin of wilderness sufficiently wide to make its exploration without a compass a work of desperate adventure."

The reckless and wasteful methods of cutting the timber which once prevailed in these forests have given place to a more sensible and conservative management, which insures the continuity of the present lumber supply, with a possible large increase.

Maine, whose escutcheon bears the image of the tree which has been the theme of the poet and the admiration of lovers of the beautiful, has also upon that escutcheon the word *Dirigo*. May we not hope that she will in this matter of systematic forestry point the way.

It is proper to state that the hopeful increase will be to a greater or less extent the result of the construction of railroads opening up timber lands in the past inaccessible for lumber operations.

The last commission for the valuation of the lands of the State increased the valuation of wild lands nearly $11,000,000, and the construction of the Megantic and International railroad through 130 miles of unbroken forest will add immensely to the value of those lands.

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* Prof. Walter Wells.—"Water Power of Maine," Second Report, p. 24.

The system of cutting only the large trees and leaving the small ones to grow, allows the spruce forests to be profitably worked at stated periods, varying from ten to twenty years, and producing an amount equal to 100 feet per acre per annum. The land owners, generally, are not the "operators" in cutting and hauling the timber, but "permit" the right to cut at so much per 1,000 feet, retaining a lien upon the lumber for the price of stumpage. The licensee often assigns his "permit" to the merchant furnishing goods or supplies, as security, and generally sells his logs to manufacturers who own or lease the mills.

The "permits" to cut are restricted to some well-defined portion of the township, and the balance is undisturbed. The supervision of the lands is generally accomplished through the agency of the scaler, in winter months, while the cutting is going on; but large land owners keep surveyors employed at other times exploring and looking after trespassers.

Maine has stringent laws against fires, but private interest has generally proved a better preventive than litigation or severe penalties.

Along the rivers in Northern and Eastern Maine, which are the route of the logs to the mills, one can see signs posted warning persons to extinguish their fires. Hunters, fishing parties, and tourists, who were formerly careless, have learned better in late years.

Forest fires, which formerly caused serious damage every year, are now much less frequent in Maine and are the result of carelessness on the part of those who set them.

Tornadoes, which blow down trees, generally have been followed by fires in this State after the lapse of one or two years; and fires are sometimes caused by sparks from locomotives along the line of railroads in dry seasons, and they would be more frequent were it not for the naturally damp nature of the soil. Spark arresters have largely diminished this risk, however.

The best judges estimate that less than one-third of the wild lands of Maine has been cleared of original forest growth. That the reproductive power of our Maine forests is outstripping the axe-man at the present time there can be no doubt.

These forests were first worked for the pine timber, which is now nearly exhausted, large bodies of it remaining only in localities at present inaccessible. The townships in which this pine grew, for a number of years after the pine had been cut away were left unmo'ested. The pine in these townships was very generally followed by spruce and hard woods. These forests are now worked for the spruce and are yielding larger fortunes to their owners than were made from the pine.

The history of one township will illustrate the renascent power of these timber lands.

About sixty years ago, or about 1825, township No. 7, R. 5, Aroostook county, was sold for the pine to Gen. Hastings by Massachusetts for $7.50 per acre.

This land reverted to the State after the pine was removed and was sold about twenty years later for 25 cents per acre. It is now worth $2 an acre and has upon it 70,000,000 feet (board measure) of spruce. Cutting of an average of 100 feet per acre per annum is regurlarly carried on there.

As the cost of transportation to market enters largely into the question of profit, the construction of railroads in Northern Maine will add immensely to the value of her forests and make hard woods yield greater fortunes for their owners than either pine or spruce have done.

Systematic forestry involves a knowledge of the best systems of preserving the great natural timber areas of the land, together with an acquaintance with the conditions best adapted to the cultivation of forest trees.

Let us now turn our attention to the latter branch of our subject.

We have already stated that the present average product per acre from the woodlands contained in farms in the States lying north of the Ohio and east of the Mississippi rivers is 131 feet per acre.

This product can be increased from two to four fold by systematic cultivation.

In the State forests of Europe it is found that an acre of pine will produce on an average thirty thousand feet, board measure, in a century, which is equal to 300 feet per acre per annum.

Authorities can be multiplied to prove that 50,000 feet of white pine can be grown on one acre in from seventy-five to one hundred years here in New England by having the ground well stocked with trees in the start and by judicious thinning afterwards. The thinnings will pay a profit after the trees are twenty-five years old.

Natural Succession.

The principle of the rotation of crops, and this is found to produce the best results in agriculture, is believed by many to apply equally well to forestry, and so it is

thought that the alternation of the different species of trees is a law of nature, and that this is her method of renovating a forest.

It is well known by European foresters, however, that some species of trees have been propagated on the same land for centuries, and that the production increases with each succeeding crop.

That land is made richer by the growth of forest trees upon it is a fact well known everywhere, and every one knows that it is made poorer by the growth of field crops. These live largely upon the mineral products of the soil, while forest trees tax the ground to the minimum.

The inorganic elements of the soil vary considerably in the quantities and qualities that enter into the composition of the different plants we cultivate, while these elements differ but little in the different species of trees. The alternation of species in tree growth, therefore, which is often observed, must be assigned to some other cause than exhaustion of the soil, for like begets like in the forest as everywhere else in nature, and such changes will be found, upon examination, generally to be due to causes external to the forests themselves.

The spontaneous renewal of a patch of forest that has been cut clean should not be expected, unless the ground has been seeded by the trees before their removal, or unless the seeds for a new growth can be readily supplied from an external source.

There are many isolated patches of forest, scattered over the farms of the Northern States and Canada, enclosed with pasture land, which are sometimes composed entirely of white pine trees, but more frequently they are a mixture of white pines and deciduous trees.

Such forests are often cut clean when they have come to maturity or before that time, and it frequently happens that only a sparse growth, if any, succeeds.

Occasionally, however, a dense growth of white pine immediately follows the forest removed, be it all or partly of white pine.

And this will always be so when the forest is cut in the winter following an abundant seeding of the white pines, and for this reason: Most of the deciduous trees seed annually—the soft maples and elms in May and June—and these vegetate in the season of their growth, if at all, and the seedlings of all, with few exceptions, are browsed by animals as soon as they spring up.

On the other hand, the white pines, which seed less frequently, mature their seeds in the autumn, and these will germinate in the spring, following the clearing of the forests, if the conditions be favorable thereto. But if such forests as above described are cut in a non-seeding year of the pines the natural reseeding of the land is precluded, or at least doubtful, and its seeding must come from an external source, and the character of the succeeding growth, if any, will be governed thereby. Hence the importance of the common practice in Europe of clearing narrow strips through a forest, the reseeding of the land being expected from the strips left standing on either side. In order to adapt this plan to the small woodlands found upon our farms it would be advisable to commence the clearing on the leeward side of a pine growth, leaving a strip standing on the windward side until the land cleared has been seeded from it, when that can be removed, excepting the fringe or outside trees, which should be left to complete the seeding of the last clearing.

Every one must have noticed how much more thickly the young pines come up on the leeward side of a pine growth or of a large pine tree standing alone than on other sides.

The westerly winds seem to do the most of the seed sowing for these trees.

By this plan an uniform growth, without vacancies, is quickly secured, which only occurs, as before stated, when the forest is cut in the winter following the seeding of the white pines in the autumn.

In forests that are composed of contiguous patches of white-pine trees and of deciduous and other trees, which completely shade the ground and from which live stock is excluded, the seedlings of the deciduous trees and those of the fir, spruce, and hemlock may be found growing in the shade of all the trees in the forest; but the seedling pines will be found growing only in the shade of the deciduous, and never in the shade of the parent trees, so long as the roof of the patch of pine forest remains unbroken.

Now, if such a forest be removed in a non-seeding year of the pines, the succeeding growth would be largely composed, if not wholly, of the other kinds of trees.

From these facts we infer that the alternation of white-pine forests and forests of deciduous trees, which is so often observed, is dependent upon the frequency of the seeding of the different kinds, the shade they require or can exist under in early life, together with the agency of man in cutting them, of animals in browsing them, and of fire in destroying both seedlings and seeds, rather than upon the exhaustion of any elements in the soil such as is produced by field crops.

From the fact that, although seedlings may spring up in the shade of their parent trees while the roof of the forest remains unbroken they will soon die, the working of a white-pine forest requires different management from that of a spruce forest. The spruce, while young, grows best in the shade.

Total clearance of a pine forest when the trees have come to maturity is better than partial, which leaves the tall and slender trees to be easily overturned by the wind.

That white-pine forests do succeed each other without any diminution in the vigor of their growth is evidenced in my own town, some sections of which have been noted for the production of this noble tree ever since the first settlement of the country.

The most valuable lot of white-pine timber cut within my remembrance was upon the homestead farm and the birthplace of the late Governor Goodwin, of New Hampshire. There yet remain on this land stumps of white-pine trees, which stumps were old one hundred years ago.

There is good reason for believing that some of them are the stumps of the pine trees reserved for masts for the navy, and marked with the broad arrow in Queen Anne's reign. To-day the entire tract where these growths stood is thickly covered with young pines that have sprung up since the removal of the last growth, there having been an abundant crop of cones on the trees in the autumn of 1879, the trees having been cut the following winter.

Failure of Succession.

Having spoken of the natural succession of forests I will next allude to the failure of succession. Large tracts of land can be found scattered throughout the Northern States of this country, given over to mosses and bushes. Not infrequently these patches of waste land are in the neighborhood of extensive growths of pine, hemlock, spruce, and the maples and other hard wood trees; but in spite of this propinquity these tracts of worthless vegetation will continue to be waste unless they are planted. In many cases the moss is so dense that there is hardly a cranny in which the seed of trees could find a lodgment. The difficulty does not lie in the soil, which is entirely adapted to the growth of pines; for it will be found wherever a tree has succeeded in getting a foothold that it grows as rapidly as the trees of the same kind grow in the surrounding forest.

Waste Lands Profitable for Lumber.

There are few soils so unsuited to vegetation or the raising of crops that they cannot be devoted with profit to the cultivation of forest trees. There are large tracts of land in the forest regions of this country, or where forests, within the memory of man, have been abundant, which are now lying entirely waste.

No farmer would be wise in selecting his arable land for the plantation of a forest; for the investment would be an injudicious one and would be attended with loss. But it is these waste places which can be utilized so as, we believe, to prove a sound investment. All of these facts are of the first importance in dealing with the systematic cultivation of forests and deserve our thorough consideration as fundamental elements in that business.

Increase of White Pines.

The White or Weymouth pine (*Pinus Strobus*) stands at the head of the list of all the timber trees of the Northern States and Canada. It is adapted to a greater variety of soils than any other tree, and it succeeds well on dry, sandy soils where no other than the pines will ever make valuable timber. Such land should always be devoted to the growth of pine forests. There are large tracts of such land in New England, now producing nothing of value, that would yield a good income to their owners if planted with this tree. We can take a hint from nature as to the best conditions for the germinating of the seeds of the white pine on moss-covered land or run-out pasture and field lands that we wish to afforest. None of us can have failed to notice, when riding along a highway through a pine forest, how much more thickly the seeds spring up on the broken edge of the roadside ditch than anywhere else. From this fact we may learn that the scratching of the ground with a harrow before or after the sowing of the seed would furnish the proper conditions for their germination and growth.

The seeds, as is well known, require two years for their maturity, and are ripe in September and October. The cones should be gathered as soon as they are ripe and before the scales have opened. This may be easily done by felling the trees then which are intended for cutting the following winter. In regard to the time for sowing the seed we think it is best always to follow nature in that respect.

The reader will do well to refer to the experience of Mr. Joseph Story Fay, of Wood's Holl, Mass., well known for his successful labors in tree planting on Cape

Cod, which he will find in the first U. S. Forestry Report, 1877, in the Forestry Report by Hon. R. W. Phipps, Forest Conservator of Ontario, 1884, and in several of the Reports of the Massachusetts Board of Agriculture.

Time forbids my undertaking to describe the different modes of planting and sowing the seeds of other forest trees in drills or in hills, where drills are precluded by the nature of the ground, or of the different modes of transplanting seedlings from the forest and nursery—all of which may be found fully treated in works on forestry and in the reports of the Commissioners of Forestry of the States that have such officers. Among them we would cite the Report of the Forestry Commission of New Hampshire for 1885, and the Forestry Report by Hon. R. W. Phipps, Forest Conservator of Ontario, 1884, and in the admirable Reports upon Forestry by Prof. N. H. Egleston and by the late Dr. Franklin B. Hough, prepared under the direction of the Commissioner of Agriculture at Washington. All of these methods, described by these authorities, have been attended with success when properly conducted and are more or less adapted to the different sections of the country.

Thin the Forest.

We now come to the consideration of the most important thing connected with forestal operations—that of thinning the trees, so as to have the requisite amount of light and shade—in order that they may make the most rapid growth consistent with their design for timber. This work has heretofore been sadly neglected by most owners of forest land. Nature has been left to do it in her own way, which is a very slow and unsatisfactory process. The work of thinning should be begun whenever there is too dense a collection of trees on the land. The sooner this is done the better for the trees. Until three or four years old the surplus trees can be pulled up as easily as weeds. Those which remain should have room to develop lateral branches and to assume a conical shape. When three feet high, they should be three to four feet apart. From beginning to end, or to the maturity of the crop, the thinning should be limited to the removal of those trees that have been outgrown by their more successful neighbors and to such as give no promise of making valuable timber—the most vigorous trees always being left to occupy the ground. The due proportion should constantly be preserved between the numerical strength of the trees and the protection to be derived from their mutual shading. Hon. John D. Lyman, of Exeter, N. H., who has given much attention to the subject of thinning, says that when thirty-five feet high at least one-third of the stem should be covered with living branches and should never have less than that in order to make rapid growth.

Modes of Encouraging Forestry.

The discussion of our subject cannot be complete without a consideration of methods by which the destruction of our forests can be modified and of the means which can be adopted to induce men to cultivate forest trees. We know that in the matter of economy nothing can be expected of the individual farmer; and that to engage in forestry as an enterprise, an inducement must be held out to him which shall make him prefer forest culture. A way to accomplish this is by State legislation—one method of which may be the exempting from taxation, or from the full rate thereof, of land which the farmer shall devote to the growth of forests.

Several of the States, those of Nebraska, Kansas, and Iowa, at one time offered considerable premiums for planting trees upon prairie land, but after a while they abandoned this policy. Nebraska, however, has returned to a system of encouragement, but in somewhat different form, giving a moderate premium for a limited time, and exempting from taxation the increase in value of the land derived from cultivating trees thereon.

The American Association for the Advancement of Science, in their memorial to the Governors of the States, adopted at their meeting held in Boston in August, 1880, proposed "a law that shall exempt from taxation the increased value of land from the planting of trees where none were growing, for such period as may appear proper, or until some profit may be realized from the plantation."

Maine, the pioneer, and until a comparatively recent period the leader, among the States in the lumber business, having forty-one per cent. of her farms covered with forests, early saw the necessity of inaugurating a State policy for encouraging the preservation and production of forest trees. Her Board of Agriculture in January, 1869, appointed a committee, consisting of Mr. Calvin Chamberlain and Stephen L. Goodale, Secretary of the Board, to present to the Legislature such suggestions as they might deem important to that end and to call the attention of Congress to the same subject. The memorial, drawn up by Mr. Chamberlain, is well worthy of perusal, but

its length prevents our insertion of it here. This action of the State Board of Agriculture was followed, three years after, by the passage of a law. This law provided for exemption from taxation for twenty years of land which should be planted or set apart for the growth and production of forest trees, and from which the primitive forest had been removed. Since the passage of this act the constitution of the State has been amended, and under that amendment it is a question for lawyers to what extent, if at all, this act is now operative.

We believe that without legislation, either in the form of premium or in the form of exemption from taxation, partial or total, tree culture is a profitable industry. It is the opinion of the Chief of the Division of Forestry, as expressed in his report submitted to Congress in 1882 "That, with due forethought and intelligent care, there is no cultivation that better repays the attention bestowed upon it than that of forest trees." To the extensive evidence tending to show the profitableness of forestry I will add the facts known to me concerning a piece of land in my own town. The land is that of Mr. James Junkins, who sold in 1881 the pine timber standing on about six acres in one body, amounting to 300,000 feet, which netted him $3,300, or about $550 per acre on the stump. This tract originally contained about nine acres.

The Boston and Maine railroad was built through it in 1873, and this cut off a portion of the lot. Mr. Junkins' father settled upon the farm, of which this tract was a part, about 1809. At that time this was the only patch of woodland on the farm, and some of the trees were large enough to split for fence poles. During the intervening period, and for about twenty-five years, ending about 1860, a large part of the firewood consumed and all the lumber used in repairing the fences and buildings on a well-managed one-hundred-acre farm were furnished from the thinnings of this lot. About thirty years ago, $200 worth of timber was sold from the thinnings at one time, and there have been sales at other times. This lot had been systematically thinned and trimmed for the seventy-two years, care having been taken to break off the dead limbs, and a long pole was used upon the lot, with a hook on the end, for the purpose. These trees had increased in diameter slowly the last twenty years. Some had made only two inches in seventeen years, or one inch in thickness all around the tree. They were twelve to thirty inches or more in diameter at the stump. As to the height of the trees, Mr. Junkins mentions one that he cut for shingles some years ago which was eighteen inches through on the stump and 113 feet long.

Mr. Junkins is of the opinion that 5,000 feet per annum had been cut from the lot for about thirty-five years previous to its final clearing. The data here given show, we think, that this lot must have paid a large interest on twenty dollars an acre, in the wood and lumber used on the farm. I will mention here, in passing, that while the year 1879, as above shown, was a seeding year of the white pine, the year 1881, when this lot was cut over, was a non-seeding year in that region, and that the young trees that have sprung up since on this land are few and far between.

If anybody be distrustful of the profitableness of thinning a forest as an enterprise devoted to the end of obtaining a lumber supply, let him consider the same measures from another point of view. Let his attention be directed to the cutting, using, and selling of the less valuable trees in his woodland, leaving the more valuable to grow into timber. If he will judiciously select his trees for wood, he will succeed in thinning his trees, whatever his purpose may be in doing so; and should he be unable to realize from his wood more than enough to pay for the labor involved, he will all the while, and without any cost to him, be improving his property, as a timber lot, in a high ratio.

As the great importance of forest culture is becoming constantly more fully realized, we heartily sympathize with all movements which tend to encourage it. But we believe that if the farmers should feel the force of the reasons which have led the Forestry Department to recommend so strongly the cultivation of trees, there would be less necessity for its stimulation by legislative aid. That the State should do all that is reasonably in its power to encourage forestry, is evidenced by the great importance attached to the subject throughout the Continent of Europe, every government of which has established a system of forest management; and in forests owned by general and local governments, and by institutions, a provision has been made to some extent for a perpetual supply, to the full limit of their capacity for timber growth.

In dealing with the subject of Systematic Forestry in its bearing on the "Lumber Interests," the enormous waste suffered from great fires deserves mention. One vital step in the prevention of this pest is the cultivation of an enlarged sentiment in respect to the worth of our forests. Many a one who would hesitate to trample down growing grain or tall grass, will wantonly expose to fire unbounded tracts of valuable woodland. It is hoped that our efforts in increasing the growing interest in the subject of forestry, will have a tendency to create a more tender care than has hitherto been felt for our woods. But if we cannot prevent the setting of forest fires, we may

be able to recommend methods by which their destructiveness will be diminished, and the loss to the individual owner rendered less severe. Thus an encouragement to the planting and fostering of our forests will arise.

In the first place, in planting tracts which shall constitute, either alone or in connection with other forests, a large area of woodland, we would recommend that roads be laid around and through the growth, and that at the early stages of planting the plow should be used around the plantation; and it has been recommended to double this furrow, burning over the intervening space when there is no wind. And the time suggested is a few days after the first heavy frost of autumn. These measures, we are aware, are not practicable in the great lumber regions of the country; but we regard them as expedient upon farms and large plantations. We think that such measures are advisable, likewise, along the lines of railways.

In some of the States there has been legislation exposing to liability for damages any railroad company whose engines shall set fire to woodlands. In some of these legislations this liability has been limited to the case in which proper preventions had not been taken in respect to the smoke-stacks of the engines and the like. We think that legislation tending to a higher degree of care on the part of railroad companies whose roads lie through farms with tree growth upon them, or through lumber regions, is of great importance to the lumber business of this country, not only in diminishing the destruction of timber, but in lessening a cause of discouragement to systematic forestry.

Another means of encouraging men to cultivate trees is that of forest-fire insurance. The business of insurance has proved an indispensable element in the civilization of mankind; without it commerce upon the seas upon a large scale would have been impossible. The perils to be incurred would have deterred the individual owner from the enterprise but for the protection afforded him by insurance.

But the same system has become almost universal in respect to risks upon land, and, of late years, has been extended on an enormous scale to lives and to accidents. We confidently anticipate that as the business of forestry shall become more attended to a great impetus will be given it by forest-fire insurance. The enlarged interest which the important subject of forest cultivation has awakened in our country within very recent years points unmistakably to the gravity of the subject which I have been discussing.

The framers of our Federal Constitution appreciated the necessity of conferring the power to regulate commerce upon the National Legislature, and could the great public importance of the preservation and cultivation of our forests have been appreciated by the fathers as clearly as they saw the necessity that intercourse between the States should be controlled by the central power, they would probably have recognized this necessity in the Constitution. But the matter has been left to be dealt with by the States individually, and it is hoped that the defect in the law will be supplied by a wide-spread and intelligent public sentiment.

ARBOR DAY OR TREE-PLANTING CELEBRATION.

BY JOHN B. PEASLEE, CINCINNATI.

"Arbor day," for the planting of trees for economic purposes, originated in Nebraska about twelve years ago, but the celebration of "Arbor Day" by planting memorial trees with literary and other exercises originated in Cincinnati,* at the organization of the American Forestry Congress, in 1882, at which time the Cincinnati public schools had the honor of introducing tree-planting celebrations into the public schools of our country; and it is a source of congratulation that our example has been extensively followed by the public schools of the United States and the Dominion of Canada. Through the efforts of State school superintendents Butcher, of West Virginia, and his successor, Prof. Morgan; Holcombe, of Indiana; Apgar, of New Jersey; Higbee, of Pennsylvania, and the school inspector of the Dominion of Canada, "Arbor Days" are designated, and the great school systems of these States and of the

* On the first Ohio "Arbor Day," April 27th, 1882, a great tree-planting celebration took place in Eden Park. The exercises consisted of a procession, of singing, of instrumental music, and of recitations, and speeches on trees and forestry, etc. On that day the following groves were planted and dedicated: "President's Grove," "Citizens' Memorial Grove," "Battle Grove," "Pioneers' Grove," and "Authors' Grove." The former by citizens of Cincinnati and members of the Congress, the latter by the public schools.

"These were the first *memorial* groves ever planted in America—the first public planting of trees in honor and in memory of authors, statesmen, soldiers, pioneers, and other distinguished citizens."—*Higley.*

Dominion celebrate the days after the "Cincinnati plan," as Dr. B. G. Northrop calls it. Two years ago the Governor of Nebraska, the State in which "Arbor Day" originated, in his proclamation, naming the day and offering the State reward to the person who would plant the greatest number of trees, called upon the schools "to plant memorial trees after the plan of some of the Eastern States"—*i. e.*, the "Cincinnati plan:" and last year Kansas followed. The schools in many places outside of the States named above have adopted this beautiful custom of planting memorial trees, attended by appropriate literary exercises.

In these celebrations not only teachers and pupils take part but also thousands of other citizens. In this way myriads of trees are planted and dedicated to authors, statesmen, soldiers, pioneers, and other distinguished citizens; but above all, through these celebrations, not only the children but the public at large are being educated to appreciate the great importance to the climate, soil productions, and to the health and beauty of the country, of the planting of trees, and the cultivation and conservation of forests.

Except in a few of the Western States that are almost destitute of natural forests, where the planting of groves and forests is a necessity on economic grounds, very little attention will be paid to "Arbor Days," however eloquently their objects are set forth in the proclamations of governors and in the circulars and addresses of forestry associations, unless the celebration feature is adopted, and this will most easily be done by having the public schools take hold of it. How important, therefore, that "Arbor Day" celebrations be kept up, year after year, by the public schools of the country.

As an aid to such celebrations, and for further information on the subject, I may be permitted to refer to a pamphlet prepared by me, with a preface by President Higley, entitled "Trees and tree planting, with exercises for the celebration of 'Arbor Day.'" The pamphlet contains, besides the exercises for celebration, many important facts relating to forestry, such as the influence of forests upon the water supply and floods, the mechanism of a tree, proportionate area of woodland, famous trees, constitution of village improvement societies, &c. The pamphlet is now published by the National Bureau of Education at Washington, and may be had without cost by applying to the Commissioner of Education. Its distribution was the means of inducing the Grand Army Post of New York to plant memorial trees last spring in honor of their dead companions.

ARBOR DAY.

BY J. STERLING MORTON, LINCOLN, NEBRASKA.

No invention to speed steamships across the Atlantic has originated among the natives of inland States, and no machinery for felling forests, extracting their stumps from the earth, and manufacturing lumber, has been created by the native dwellers upon the treeless plains of the West. The stimuli which have impelled the human mind to inventive and useful thought have always been the physical environments of the race.

Hence, forestry—tree planting, esthetic and economic—has received its greatest impetus from the prairies of the Northwest. Treelessness caused us all to think of trees just as poverty makes one work for wealth, or as sickness impels a desire and effort for health. The undulating and majestic meadows which reached from the west bank of the Missouri river to the foot-hills of the Rocky Mountains, when Kansas and Nebraska were first opened to settlement, in 1854, contained in all their millions upon millions of acres not a single forest. The soil, good and fat in food for all plant life, responded to the labor of the home-building pioneers with abundant and generous crops. But the shade and beauty of trees was everywhere absent, and so—just as the coming winter tells the provident man to lay in fuel—our conditions impelled us to plant trees, stimulated us to evolve laws encouraging forestry and conserving timber lands, and, finally, to originate and establish *Arbor Day*, to make it an anniversary for setting out orchards and forests, and to consecrate it by statutory enactment a legal holiday, and award premiums to those who best celebrated it by putting out the most trees in its observance. It has worked well in Nebraska, and we have growing in that State to-day more than 700,000 acres of trees which have been planted by human hands.

But, while we have local laws to protect forests and conserve timber lands, the national laws stimulate destruction of forests and protect the denuders of timber lands by a prohibitive minimum duty of two dollars a thousand feet upon all foreign forest

products. What single act of legislation can do so much immediate and effective service in behalf of forests in the United States as the absolute repeal of the high duties upon imported lumber of every variety? And why should Congress delay such legislation a single day? Protective duties for the lumber lords of Michigan and Wisconsin are destructive drains upon all the forests of the timbered States and upon all the pockets of the prairie States. What can a forestry congress do to preserve forests more effectually than to demand of the United States Congress the immediate and complete annihilation of those high and exorbitant duties upon foreign lumber which now stimulate forest destruction in every portion of the United States?

Observe the inconsistency of our national legislation upon this vital question. By the present tariff we pay a bounty for the cutting down and manufacturing into lumber of almost every variety of tree. And by the timber-culture act we pay bounties in millions of acres of the public domain every year for the sham planting of counterfeit forests—forests which no more resemble in value, in beauty, and in sanitary influences the primeval pines and oaks which we tariff to their destruction than a five-cent nickel resembles a twenty-dollar gold piece. And if such repealing legislation be not enacted—if the present duties on lumber be continued—how long will it be before the treelessness of the whole country shall so environ all the people that every American shall be stimulated by surrounding conditions, by those climatic changes, those constantly recurring swelling floods of the great rivers—such as Cincinnati has so recently experienced in the Ohio—by long-continued droughts and by cyclones careening over the shorn earth, each year with more and more frequency and more and more destructive force—how long, I say, before every citizen shall curse the giant system of legalized spoliation which the existing tariff has vitalized and energized against the woodlands of this fair and fertile country? While we on the prairies make miniature forests, you in the older States, by your daily consumption of forest products, make mighty and magnificent wastes and sustain tariff taxes in Congressional enactments which render impossible any amelioration by the importation of foreign lumber, and hasten inevitably and resistlessly the calamitous end of woodlands.

The inter-dependence of animal and vegetable life is undeviating and perpetual. We declare the animal kingdom superior to the vegetable, and proclaim man emperor of both. But time at last tells the real truth in that terse language whose vocabulary is made up in seconds, minutes, hours, days, weeks, months, years, decades, centuries, and eons. It is the constant and tireless vocation of all animal kind, from the lowest organism up to man, to tear down and destroy the forms of vegetation. The animal subsists and grows, during all its career, upon the destruction, consumption, and assimilation of some variety of vegetable life. The physical individualism of every man, woman, and child around us—in this world—was, not long since, animate in growing fields of grain, in gardens of succulent and nutritious root, and in orchards of brilliant and delicious fruit. Every muscle, fiber, and tissue in these hands, in your hands, was once animate in plant form and growth. So dependent is man upon plants, foliage, and fruit that the intermission of a single summer, the skipping of a single year of plant life, would turn from life into death every animal organism on the globe.

Each particle of vegetable growth is a part of the wonderful dynamic in the deft and occult chemistry of nature—a portion of the constantly absorbing, assimilating, transmuting, and transforming process, which molds into form, beauty, and utility the crude plant food of the earth, and colors and embellishes it with the prismatic glories of the sunlight. The vernal verdure of the opening buds, the luxuriant limning with crimson and scarlet of the flowers of May and June, the yellow gold of the harvest-fields in July, and the blazing colors of orchard fruits and gorgeous autumnal forests in October are only so much of rehabilitated animal life baptized and glorified by the light of the sun.

Plants, leaves, flowers, trees, catch and invisibly imprison in the cells of their growth light itself, and hold it captive for centuries. There is no light which did not originate in the sun. From the blaze of the taper to the flame of the furnace there emanates not a single ray which was not born in the solar system. The oil in the lamp gives up, after uncounted generations, the light which some sort of plant, some time in the misty past, during its period of animate growth, took captive by absorption from the sun. The roaring fires of red and glowing coals which warm us in the winter are merely the emancipators of sunbeams incarcerated ages upon ages ago, when those coals were parts of vast submarine meadows, or of gigantic primeval forests. And before they were either parts of sea-weed fields or of waving trees they were each and all portions of some kind of animal existence.

Had there been no decay and death ordained for man, no life could have been decreed for flowers and foliage, forests and orchards. Man and the beasts of the field destroy the forms of plant life, and seem, for the time, victors over the vegetable

kingdom. But the years and the centuries flow on, like a great and resistless river, sweeping into earthly sepulture all flesh and blood, generation after generation. Then the grass and the flowers send their tentacles, and the trees their rootlets, like detectives, with the keen and unerring instinct of nature's recouping laws, down into our very graves to repossess and reuse every jot and tittle of each organism, in rebuilding the kingdom whence it was ravaged. And giant trees stretching their limbs towards the clouds, their leaves shimmering in the sunlight, whispering and murmuring in the breeze, lure back, even from the atmosphere, the unseen and impalpable fluids which have exhaled from the dead and dying races of all animal forms, and again and again embody them in flowers, forests, and fruits. Ages come and go over this globe, as shadows and sorrows come and go over each individual life. The animal kingdom of this age was the vegetable kingdom of some age which has been. The physical men—all the animals—of to-day will be the plants, flowers, fruits, and forests in some age yet to come. These metamorphoses will succeed each other, with inexorable precision, as long as the sun shines and death remains, as now, the logical result of life. The cycles of transmutation from vegetable to animal life, and from animal back again to vegetable, will roll on forever with the seasons and the sun, inevitable as death, and wonderful in mystery as the depths of eternity itself. Nothing is, however, finally lost—nothing destroyed, for, in her most extravagantly luxuriant moods, Nature is frugal, and permits no waste. Forms change, forms disintegrate and disappear; but substance, both mental and material, is imperishable and lives on forever, defying decay and death with a conscious and ineffable immortality.

Each generation of humanity takes the habitable globe as its trustees to hold until, by order of the court of Death, their relations are dissolved, and the property turned over to their successors in trust. It is, therefore, the duty of each generation of trustees for this great estate of the family of man, and of all the animals, to take care that they pass the property over to their successors in trust in as good and tenantable condition as they took it from their predecessors.

And now, having shown how dependent is animal life upon contemporaneous plant life, we readily perceive that to leave the world in as good condition as we found it upon our entrance thereinto, we ought to bequeath to posterity as much of plant life, and as many forests and orchards, as we have exhausted and consumed.

During her two hundred years of active timber consuming what has Boston done towards reafforesting the country? Imagine some forceful magic which could at once replace in sylvan beauty every tree which Boston, in her sea-going vessels, in her marts of business, in her beautiful homes, has cut down and consumed during the two centuries of her active and successful career, and how grand a forest should be gilded by to-morrow's sun! And yet, with all her culture, her practical utilitarianism, and her philanthrophy, what has Boston, or all New England, accomplished, as trustee in charge of the woodlands, for its descendants?

It has aided largely and thriftily in constructing railways to the West, and through all meat and bread producing sections of the Union. One hundred and twenty-six thousand miles of railway are now resonant with commerce in the United States. Each mile contains 3,000 wooden ties—the average life of the tie is ten years; each year ten per cent. of the ties is renewed—at sixty cents apiece, the annual cost is more than twenty millions of dollars, and ten years from date every tie now in use will have been renewed. Think of the forests thus destroyed, and of the other means of consumption of timber products in bridges, cars, warehouses, depots, and fuel, which the voracious and insatiable railroads also employ, and do they replace any trees?

Not as yet. But the courts have declared the rights of the States to regulate railroads in many ways, and why not as to their utilization for tree planting along their lines on their one hundred feet of right of way? What objection can there be to compelling, either by national or State legislation, every railroad company in the Union to plant trees forty feet apart on the outer limits—either side of its tracks—of its right of way? And the law may prescribe that the trees planted shall be of useful varieties, adapted to the soil and climate which the road traverses. Why cannot this be accomplished? And is it not fair that these great consumers should be made also restorers of forests? Cannot this law be made justifiable on sanitary grounds, on the highest reason for all law, the public welfare—the greatest good to the greatest number? Having such a law faithfully administered for fifty years—even for half that period—and the tourist by rail shall journey from Georgia to Maine and from Boston to San Francisco between continuous avenues of elms and oaks, sheltered from summer dust and heat, and from winter snow and storm. Let us try it.

A painstaking statistician, from seemingly reliable data, declares that the fifty-five millions of Americans cut down and use up, in various ways of manufacture, railroad ties and fuel, each day in the year, an average of 25,000 acres of timber—of forests. Therefore, when we go to bed at night there are 25,000 acres less of woodlands in the

United States than there were when we got up in the morning. One month from to-day there will be, at the same rate of use, 750,000 acres less; and 1886—one year hence—there will be 9,000,000 acres less of forest lands than there are now. This plain statement of practical fact may startle into beneficial activity a class of men who, otherwise, would declare "Arbor Day" a merely sentimental anniversary, a useless holiday, and even deride its statutory legalization.

The denudation of woodlands proceeds with relentless and tireless energy in all the pine-bearing sections of the northwest. The ax of the woodsman and the puff of the steam-engine join, with the hissing of swiftly-revolving saws, in a death song for the fated forests, more foreboding of evil to our race than were those of the savage tribes who originally domiciled in their verdant fastnesses. The latter presaged only individual deaths; but the former portends floods and droughts, infertility, barrenness, and the extinction of entire communities.

Mr. Geo. W. Hotchkiss, secretary of the Chicago Lumberman's Exchange, a most reputable and entirely credible gentleman, officially declares that, during the six years ending January 1, 1885, the receipts of lumber at Chicago alone amounted to 10,728,941,322 feet. Computing that amount at common board measure it would closely, tightly, and completely cover, as a floor, with one inch thickness, 246,301 acres of land. Manufactured exclusively into fencing, it would circumference the globe with an enclosure five boards high, each board six inches wide, fifteen times. It would make a single line of such fence 677,332 miles in length. It would construct 225 just such fences from the Atlantic to the Pacific, reckoning the distance from ocean to ocean at 3,000 miles. Estimated at a value of 1½ cents per foot the same amount of lumber equals in cash $160,934,120. During the same six years ending January 1, 1885, there were 5,235,509 shingles also received in Chicago. At $2 a thousand their cash value reaches $10,471,531, allowing ten shingles to be used to cover a square foot, and they would roof more than 12,000 acres of land.

What is the lesson of present denudation? These figures, showing the enormous consumption of forest products, as indexed by the business of Chicago alone, are enough to incisively suggest the speedy total denudation of all the woodlands in America. Such startling statistics appeal to those who are exclusively devoted to vocations which use up timber and lumber directly, and address facts to those purely practical men who entertain no fancies, and regard life as merely a prose essay upon economic subjects. They go further; and to those who study climatology and sanitary conditions as affecting crop productions and human life, convey the importance of humane concerted action for the conservation of our woodlands and forests. They teach us all the imperative necessity of tree planting, and the retention of tree growth in every State of the American Union, for the welfare of our race.

But, to my mind, over and above mere dollar getting, higher even than mere physical health, stands the love of the beautiful in nature, beseeching us to plant trees, and renew dead land-scapes with the shadow of plant life, flitting amidst the pendant limbs, the willowy boughs, and the waving foliage of sturdy woods. That is a wholesome and commendatory ambition which inspires one to endeavor to make the world better because he has been a dweller therein. And as our ancestors planted orchards to bear fruit for us, and embellished homes to shelter us, so should we, by the law of gratitude and compensation for those who come after—in the long procession of humanity, which laughs and weeps, and sings and sorrows, in that little journey from the cradle to the grave which we call life—leave similar *souvenirs* of our affectionate regard and solicitude. In some countries of Europe it is a family custom to plant a tree for every new-born child; and, in others, to set apart a few acres and devote them to trees, which, upon the infant becoming of age, shall be its heritage. Thus, the beautiful and the useful, the sentimental and the practical, are welded together in a good and vital deed. Thus, the tree planter of to-day "arborphones" his good wishes, his name, his character and taste to generations yet unborn.

And we are yet in the early days of forestry—in its January—and it is not too late, for all who will, to join the "Argonauts" and embark with us in pursuit of those golden fleeces of autumn-dyed foliage which shall clothe with undimmed lustre from year to year the grand forests with which the waste places are yet to be crowned and glorified. In no system of religion—in no form of belief—can be found a ceremonial which vitalizes faith as does the act of tree planting. Composing the roots and fibers in their soft and loamy bed, confident that each of the chemical agents of the earth will do its complete and perfect work of nourishment, and then looking upward to the sapphire sky, and the Source of All Light, with the serene certainty that the sun's rays shall warm and color into loveliness every leaflet, and that the mists and rain drops shall water and cleanse each from year to year, is an act of devotion to the Supreme Law, to Nature—the declaration of a sublime faith. It is faith expressed in a deed; and it is a deed which conveys health, happiness, and consolation to other generations besides our own.

In all the sacred books of all ages of civilization, the life for which man is constantly longing—the immortal, mental life beyond the grave—is portrayed as by still waters, and amidst all the luxuriant splendors of tropical woods and ever-blooming gardens, filled with the fragrance of exquisitely beautiful flowers. A monk of the seventeenth century has spoken of it as "a substantial world, where grass will grow, flowers will bloom, fruits will ripen, forests will wave, rivers and rivulets will roll, high hills will tower, valleys will wind, and vales expand, and beyond them all, as far as the eye can reach, vast blue oceans will forever heave and sigh and swell—where such as we shall go to enjoy the faculties we carry with us." The fact that, from its portrayal of the first home of our common parents amidst the pensive shades of the garden of Eden, up to its grandest and most realistic visions of heaven—in all its concepts of supreme satisfaction—the human mind has interwoven ideal happiness and consummate contentment with gardens and flowers, and forests and foliage, shows how the brain of man has always depended for its imagery and metaphor upon man's vegetable cotenants of the globe. This being the concept of consummate contentment in all ages, let us endeavor, then, by our works on "Arbor Day," and upon all opportune occasions, to so embellish this world with plant life, trees, flowers, and foliage that our temporary homes shall simulate in beauty that eternal home which the prophets, poets, and seers of all ages have depicted as a restful and refreshing paradise.

ADDRESS OF HON. GEO. B. LORING.

Dr. Loring commenced by referring to the peculiar and unusual position of forests and woodlands in this country as distinguished from the other countries of the world. The forests with their savage inhabitants were an obstacle in the way of advancing civilization and were the most discouraging difficulty which the early settlers were obliged to remove. The land was to them an untrodden wilderness, occupied by a gloomy and towering growth of trees—the "primeval forests," which have always conveyed the idea of untamed and often untamable nature. To substitute homesteads and cultivated fields for this wide-spread desolation was a work requiring great force, courage, and patience, and arrayed an enterprising and hardy people against the uncleared lands which lay all around them. The feelings engendered in those early days have hardly yet died out. The American people are tenacious of opinions, methods, and policy, and the warfare begun by their ancestors on the forests which stood in their way, and which have been violently removed to make room for the teeming towns and fair fields of a cultivated continent, has left an impression on the public mind which no theory of economy and no fear of loss have yet been able to remove entirely. To the careful and intelligent observer of our industries the value of our forest growth appears to be so great as to require the most careful legislation and the most thoroughly well-conducted private enterprise. But to the occupants of new lands, to the dwellers in those vast regions but just now occupied by an industrious people, this great timber growth presents itself as an antagonist to be speedily and ruthlessly removed, and as a people we have yet to learn that the wealth of wood with which our lands are clothed is entitled to the same care and protection as is bestowed on the cultivated crops, on our fields and orchards.

The organization of this Association, the constant search after judicious and applicable legislation, the introduction of forestry investigation into our educational institutions, the establishment of commissions to take charge of this great industry, all indicate the present estimate of the importance of forestry investigation, and the earnest, popular desire to restore and protect our timber land. The question is one of a purely practical character, and belongs to that class of economic subjects which occupy the minds of those who are interested in the growth and prosperity of our country. It is of the utmost importance that the business of forestry should be thoroughly understood. We would know how to use existing forests with economy and the largest profit to the owner. We would know the best methods of protecting the forests against natural decay, against accident and deliberate waste. We would know the best methods of encouraging nature in the work of renewing the forests, in which she is so busily engaged. We would know the best system of tree-planting—the trees best suited to each locality. We would know when and how to resign land once cultivated to the encroachments of the forest and what land to select for forest growths. The cultivation of a taste for ornamental tree-planting should never be neglected. The occupation of the Arbor-Day in many of our States, the work of the village improvement societies in all parts of our country, the study of landscape-gardening as a part of the necessary information of a tasteful community, deserve and

demand our most liberal encouragement. But, confident that this æsthetic work having been begun will never be neglected, we turn to that vast industry which within the last fifty years has risen into an importance not surpassed by our textile manufactures or our mechanic arts.

Notwithstanding the excessive forest supply with which this country was burthened in the early days, suggestions were made many years ago with regard to the protection of our woodlands, or "wood-lots," as they were called in New England, where every farm has this important attachment. As long ago as 1826 one of the brightest writers on agricultural topics in Massachusetts recommended very strongly the fencing of woodlands as a matter of economy. The question has now become broader, and, in a commercial point of view, much more important, including as it does not only the timber and lumber supply, but that vast consumption of wood in the manufacture of furniture, boxes, pegs, agricultural implements, vehicles of all kinds, pulp, and a long list of articles which enter into our domestic economy. The trade has an estimated value of $350,000,000 annually, in some of the States amounting to $40,000,000, and in the State of Maine, the pioneer in the business, to $7,000,000, notwithstanding the carelessness and waste which have attended the work for years.

It is fortunate, indeed, that while man has been reckless and extravagant in the development of the forest business to this important point, nature has been busy in restoring what he has destroyed. No sooner is a tree removed than the earth rallies to supply its place. The laws of creation seem to be opposed to an unoccupied piece of land; and there is no doubt that between the deserted farms of the older States and the newly-stripped forest lands which are engaged in producing a new growth of trees there is a larger supply of growing wood in New England and all the other States than there was fifty years ago. To him, however, who would secure from his waste lands a forest crop, as he would a hay or a corn crop from his cultivated acres, the choice of trees, the modes of planting, the best methods of handling are all important. The trees that grow most rapidly and vigorously are those which spring up spontaneously in some favorable spot from a chance-sown seed. Is it too much to say that a tree standing on the spot where it sprang up and where all its surroundings are genial—the spot where it sprang up, because it found every encouragement of soil and climate—will make more wood in ten years than its transplanted neighbor is likely to make in fifteen? Consider, then, the seeding of the forest as you would the seeding of the hay-field, and apply the same judgment in selecting the variety of seed for the one as you do for the other. If the choice is wise and appropriate, nature will do the rest of the work. That a tree crop is the most sensitive of all crops there can be no doubt. Corn can be made to grow on almost every variety of soil, and by artificial means can be made to yield a fair crop. Grass of some one variety will grow in almost every latitude. The crops of the garden flourish in Maine and Florida alike—each in its due season. But not so with trees. The pine will not flourish on every soil. The chestnut will withdraw from the seaside and find food for its rapid growth along the inland hillsides. The Norway spruce dislikes the hard, salt gales of the ocean shore. The monarch of the forest, standing on some favorable spot, towers above its fellows standing not far off, but dwarfed and stunted by the absence of that food which has fed the great proportions of the fortunate plant. How seldom do we see a forest of uniform growth—how seldom a nursery of forest trees presenting one type of size, shape, and thrift! Of a hundred trees transplanted we hardly expect to save more than two-thirds or three-quarters. Of a hundred cabbage-plants set out we expect to lose none. It is not easy to tell why one plantation of trees will make ten times as much wood in ten years as another plantation not many rods away. The sensitiveness of the tree makes its management most difficult—that sensitiveness which prevents its being planted indiscriminately with any hope of success. It should not be forgotten that nature is the best guide in the selection of varieties for each locality.

The natural renewal of forests, however, is one of the most interesting of all the important questions relating to this important subject. The spontaneous growth of the white pine on the sandy plains of the Northern States, the luxuriant up-springing groves of spruce which give such a vital beauty to the secluded swamps and hillsides of our extreme North, the rich verdure of the vigorous young chestnut forests, which adorn the inland hillsides—all bear witness to the diligence with which nature works in clothing the earth with its most attractive and useful product. To co-operate with this work of nature is certainly one of the most imperative of all agricultural duties—a duty which belongs to the individual and the State. In the older countries of Europe the value of the forest crop has been so thoroughly recognized that all the power of the State is exercised in preserving and developing it; and while the landowner is allowed to manage his annual crops in his own way, this growth of years is placed under the most careful and stringent protection of the laws. Alarmed by the waste of forest product and by the growing scarcity of timber, the most important of the European

States adopted long ago a system of forestry which has rescued them from the very danger which now threatens us. It was exactly the forest condition of America to-day which enlisted the most careful consideration of these continental governments. To restore this valuable possession private rights in land were extinguished, permanent forests were laid out and placed under the direct care of the Government, departments of forestry were organized, regulations with regard to cutting the timber were laid down, and every measure was adopted to increase the profit of lands devoted to timber-growth. The result has been all that was anticipated. And I can conceive of no more useful legislation than that which would enable every owner of timber-lands to realize that he is protected against all encroachments—that he is not exposed to the usual thoughtless causes of forest-fires—that his domain of forest is as well enclosed as his domain of corn—that his forest property belongs to an interest of which the State is particularly watchful, and that the development of his waste lands into woodlands will receive all the encouragement the State can bestow without creating invidious distinctions. Considering the amount of public and private timber-land in this country, and the foremost importance of this industry among all its industries, the Government should promptly enter upon a system of forest legislation which will protect all our national forest domain and encourage the landowner to enlist in this as he would in any other branch of agricultural industry.

The destruction of forests, to which our attention is now so earnestly called, and for the prevention of which State and National Legislatures are appealed to, and deliberative associations are liberally organized, has been an object of solicitude for a long time. We are in the habit of presenting a startling array of figures to show the rapid waste going on in this country at the present time, and to indicate what we may anticipate for the future, should this waste continue. To be told that, at the rate the cutting is now going on, even the spruce forests of New Hampshire and Vermont will be exhausted in a very few years, and that the pine forests of Maine will be destroyed in four years, and those of Wisconsin in twenty years, and those of Michigan in ten years, and those of Minnesota in ten years, is enough to startle the most indifferent observer of the industries and resources of our country. But this warning is not new or unusual. More than two hundred years ago it was predicted by one of the most eminent statesmen of France that the kingdom "would perish for want of wood." It took a century and a half to impress this fact upon the mind of France, and she was roused to action by the increasing destruction of her forests and by the disastrous consequences which ensued. Her necessities became great, and her exertions to remedy the evil were great in proportion. An appropriation amounting to $250,000 a year for ten years was provided by the government, and the work of restoration began with great energy. Along the banks of streams and on the borders of ravines trees were planted and protected, and a nucleus of forest growth formed which is now of inestimable value, and which, if commenced when the first warning was given, would have made France the richest forest-growing country of Europe both in quantity and quality.

This example of France should give us a warning and teach us a lesson. Not that this country is likely "to decay for want of wood," but the emergency seems to be fast approaching which will require remedies as heroic and expensive as those to which I have alluded. The efforts already made in this direction on a small scale have met with abundant success. Many a barren waste has been clothed with pines, and along the Western river valleys, formerly stripped, are now growing belts of trees increasing in extent as they are protected from prairie fires by advancing civilization, the natural forest-growth of the region. Here and there an illustration of the success which attends properly-managed seeding may be found. The well-known wooded hillside of Major Poore, from whom we have heard this evening, is too familiar to all interested in the cultivation of deciduous trees as a crop to require any additional description. The pine forest of Mr. Fay, at Falmouth, Mass., consisting now of nearly a hundred and fifty acres, is so successful an experiment in this kind of tree-planting that I venture to present it as stated by himself. He says that when he came into possession of the tract of land he has so successfully cultivated "it was a barren waste, the soil dry and worn out. On a hundred acres there was not a tree of any kind, unless an oak sprang out of the huckleberry bushes here and there, but hardly lifting its head above them. Indeed, when I bought my place in 1853, except a few stunted cedars on Parker's Point and in the swamps, there was not an evergreen tree within three miles of my house and hardly any tree of any kind in sight of it. It was maintained that trees could not be made to grow there. The seeds sown were of the native pitch-pine, with some white pine, the Austrian, Scotch, and Corsican pine, the Norway spruce, and the European larch, in all about thirty-five thousand imported plants and many thousand native pines. As to the kinds which have done the best the Scotch pine from the seed, including prompt germination, has proved the best grower and very hardy. The Norway spruce and English oak have done well. The larch did not

start well from the seed, but from the nursery or as imported it has grown remarkably. The hardy Scotch pine does finely, either from seed or the nursery. All these imported trees have done better than the native pitch-pine. The larches are about forty feet high and fourteen inches in diameter one foot from the ground. Some Scotch pines, from seed sown in 1861, well situated and in good soil, are thirty feet high and ten inches through a foot from the ground. As to profits one thing is sure, the land, originally poor, has been enriched by the deposit of thousands of loads of leaves upon it and by the shade afforded, while the soil has been lightened and lifted by the permeation of the roots of the trees, and though no present profit has been realized (which already might have been done by sales of the wood) it should be considered as an investment for future results. Considering the position of my place, on a coast exposed to violent sea winds permeated with salt spray, the vigorous growth and promising appearance of my forest plantations are very encouraging to those more favorably placed. Not only may the destruction of our forests be partially remedied at a cheap cost, but the waste and sterility of our land by long cultivating be replaced with fertility by the simple process of nature."

The planting of pines on Cape Cod has been pursued with great success, and the groves of Major S. B. Phinney, of Barnstable, are an admirable illustration of the beauty and profit of this branch of tree-culture.

When we remember the long-continued efforts in Europe and the smaller enterprise in this country to cultivate forest trees, almost all of which have been successful, it seems surprising that any argument should be necessary to prove the importance of this industry or to demonstrate its value as a profitable enterprise. We survey the apparently inexhaustible forests of the United States, and, notwithstanding the local destruction which is going on, we persuade ourselves that they will not fail to supply the increasing wants of our people. We rely largely on nature to restore the exhausted regions, and we turn to the vast wooded regions still untouched with confidence that they will respond liberally to every call. The temptations to the lumberman have been and are great; but there is no reason why the work of the lumberman should not be followed by a systematic, well-organized, and well-endowed effort to restore what he has destroyed.

In no better way could a portion of the idle capital of the country be employed than in the cultivation of forests on denuded lands. The returns may indeed be slow, but the investment is secure; and if Government is ever to stretch forth its hand for the encouragement of private enterprise it may with propriety assist and protect a work upon which so much industry, health, and comfort depend. The United States, of all nations, has almost alone neglected its forests. Great Britain has adopted measures to restore the forest-growth of India, whose mountain sides she stripped in her wars of conquest and in the industrial enterprises which followed. The forest system of Canada, on our very borders, is an example well worthy of study and imitation. Every country of continental Europe considers a forestry commission an important branch of government and every European people look upon schools of forestry as an important part of a system of popular education.

It must be evident to all that forestry legislation will be of no avail without forestry education. The protection of forests against destruction by cattle, against fires, against wasteful cutting, and the encouragement of tree-planting and forest cultivation by legislative enactments can only be properly carried out by the co-operation of skill and knowledge. It is only through a thorough understanding of the habits of trees and of the best modes of producing them and a full appreciation of the importance of a judicious selection for each locality that the true value of the forest industry can be acquired. A forester well equipped with the knowledge of physiological botany, of climatology, of entomology, so far as it relates to the protection of trees against destructive insects and of the foreign literature of the subject, might, if employed as a teacher in a conspicuous and influential industrial school, open the way to a systematic and intelligent organization, which would elevate forestry to the rank of the great industries of our country. As a guide to judicious and effective legislation and an instructor of the best practical methods, he might soon bring the laws of the land and the labor of the investigator and planter up to a standard of the best and most thoroughly organized forestry in the world, and place them beyond the reach of pseudo-science and imperfect legislation. Were every agricultural college endowed by Federal land grant supplied with a teacher of this description and an arboretum sufficient for his work the way would be opened to a great improvement in the business of tree-planting for use and ornament and to a system of State and national forestry which would commend itself to a practical business community.

It is to be regretted that the suggestions made in 1880 by a Committee of the American Association for the Advancement of Science have not been carried into effect. After stating that we are to look to the owners of land "for the adoption of measures

tending to avert the injuries in prospect" they urged upon the legislative bodies of the country the passage of laws protecting trees planted along highways, exempting from taxation the increased value of land from the planting of trees, endowing of Agricultural and Horticultural Societies to enable them to offer liberal premiums for forest culture and to publish prize essays on forestry, encouraging forestry education in schools and colleges, tending to prevent forest fires, establishing model plantations, and appointing commissioners of forestry. These measures would lay the foundation of a forestry system in this country which would render forest property comparatively secure and would put an end to the wasteful and destructive use of standing wood and timber now existing throughout the country.

The discussion of all questions relating to forestry has been so long and so elaborately continued in this country that hardly a point remains unexplored. Of the importance of preserving and restoring the forests no one now entertains a doubt. Their value, in an economic view, is perfectly apparent. It is generally accepted that they have a great influence on the climate—the heat and cold, the droughts and rainfall—of every country. Their contribution to the mechanic arts and to the implements and utensils of life is great and important. That their management should be systematic and business-like is everywhere recognized; and yet there is no property in this country in such doubtful condition. In one section the forest product is hastily crowded into the market in order "to escape the taxation" levied on woodland and in order to "realize" upon it as promptly as possible. In another section no market exists for most valuable timber lands on account of unorganized lumber industry and absence of convenient transportation. In another section thrifty growing forests are cut down to supply a cheap and common article of trade—forests which by their growth alone would earn large interest upon their money value. The axe and fire continue their desolating work. True ornamental tree-planting increases everywhere. Trees along village streets, trees along highways, trees along our city avenues, trees in parks, and groves on estates increase and flourish under man's care and protection. Arbor days have in many States become legalized holidays. And so far as taste and sentiment are concerned the tree receives its full appreciation. But it cannot be said that either on our national domain or on State reservations or on private lands do our forests receive that systematic care to which they are entitled. The application of laws long since adopted in other countries seems to be impossible in our own. Institutions devoted to education in forestry have not yet been transplanted from the old world to the new. The system under which the public lands of the United States have been managed has thus far admitted no measures of economy with regard to the various resources of those lands in mineral agriculture or forestry wealth. The tenure of land in the States hardly allows statute interference with the methods by which it is managed, and the difficulties which lie in the way of an organized forest economy, State and national, are not easily removed. We have computed to a fraction the amount of wood consumed in railroad sleepers, in shoe pegs and pill boxes, and machinery and implements, and building materials annually, and how much oak and hemlock bark is required to supply our tan-yards; but how best to obtain and care for and increase the supply of raw material we have not yet ascertained. It is interesting to contemplate the efforts which have been made in this direction. Our attention is called to proposed systems of management of "forest lands in mountain regions," to "proposed reservations of timber land," to the "different modes of payment for privileges," to "timber management in Canada," to the advantages of "experiment stations," to the "prevention of forest fires" by legislation. It is provided by law that any railroad company shall be liable for damage by fires along its line, but "said company shall not be held so liable" if it can prove that its fire-boxes, smoke-stacks, &c., are in good order. It is also provided in the same statute book that a justice of the peace shall call out the people to extinguish field and forest fires, and said people shall be fined if they fail to obey. It is provided by law also that no person shall "willingly, intentionally, negligently, or carelessly" set fire to woods under a penalty of from five to a hundred dollars, unless he shall have given his neighbors one day's notice of his intention to start a fire on his own premises. By law we are warned not to set fires, but we are not prevented from setting fires on wild and unappropriated lands between the first of February and the first of May, "or from setting on fire rubbish, leaves, or brush on the farm or plantation of any person or persons as often as occasion may require, if the same be done without the intention of setting on fire the adjacent woods, marshes, or prairies not owned, possessed, or occupied by such person." The "meshes of the law" are so large in legislation like this that any offender can easily escape, and this is an illustration of the difficulties under which we labor in all directions.

Nothing can provide a remedy for these evils and difficulties, both in practice and in law, but an enlightened and determined public opinion. That this country is entitled to all the benefits to be derived from forestry legislation and forestry manage-

ment no one can doubt. True, the power of private interests may ultimately develop all necessary remedies for existing evils, but behind and attendant upon these private interests must go a popular understanding of the importance of the questions involved and a consequent popular readiness to support measures necessary to accomplish the desired object. For the education of the popular mind to this standard all the efforts of colleges, schools, scientific investigators, and associations should be encouraged in their work. In this direction the American Forestry Congress may well continue the valuable work upon which they are engaged.

THE STATE OF LEGISLATION IN REGARD TO FORESTS.

BY N. H. EGLESTON.

Legislation in respect to forests takes the two general forms of laws for the protection and preservation of existing forests and laws to encourage the planting of new ones. By far the greater amount of legislation is of the former kind, it being only within a few years that any noticeable provision of law has been made to promote the planting and cultivation of new forest areas.

It is remarkable also, that almost from the beginning of our history as a nation there was more or less anxiety on account of the early inroads made upon the timber. Among the earliest enactments of the Colonies, particularly the northern ones, we find some designed for the preservation of the trees, and there are records of numerous votes of towns for the same purpose. For instance, the Provincial Assembly of New Hampshire, as early as 1708, forbade the cutting of mast-trees on ungranted lands under a penalty of £100 sterling. The Province had at that early time also a surveyor-general of forests, appointed by royal authority, for the purpose of preventing depredations upon timber. The office was held at one time by Benning Wentworth, subsequently the well-known Governor of the Province. In 1640, only two years after its settlement, the inhabitants of Exeter adopted a general order for the regulation of the cutting of oak timber. Other towns manifested a like concern for the preservation of their forests, and adopted similar measures.

In Pennsylvania, well wooded as its very name assures us it was at the time of its settlement, and well wooded as it still is, ranking as the third State of the Union in the amount of lumber which it produces, in an instrument entitled "Conditions and concessions agreed upon by William Penn, Proprietary and Governor of the Province, and those who are the adventurers and purchasers in the said Province," dated July 11, 1681, and intended as a charter of rights to the colonists, the following provision was made in reference to the maintenance of the timber supply:

"XVIII. That in clearing the ground care be taken to leave one acre of trees for every five acres cleared, especially to preserve oak and mulberries for silk and shipping."

In Massachusetts a similar care for the trees was manifested, and towns, as well as the General Court, took action for their protection.

As the early action for the protection of trees, by the Colonies and by individual towns under the colonial government, was caused principally by the apprehension of a scarcity of timber for marine and naval construction, so the same apprehension, after the country had passed out of the colonial condition, led to the adoption of measures by the Federal Government for the protection of such trees especially as were most desirable for ship building. The well-known scarcity of such timber in Europe led to the fear that the countries across the Atlantic would make such large demands upon the forests here as would render it difficult to procure an adequate supply for our own wants. Accordingly, it was only a few years after the action of the Federal Government, in 1794, authorizing the construction of four ships of forty-four guns and two of thirty-six guns, for the protection of American commerce against the Algerines, that a vote was passed appropriating $200,000 for the purchase of growing or other timber, or of lands on which timber is growing, suitable for the Navy, and for its preservation for future use.

Florida and the Gulf coast, where grew that specially valuable tree for ship-building, the live oak, did not belong to us at this time, and the amount of that timber growing within the limits of the Union was comparatively small. Some purchases were made along the coast of Georgia under the act of 1799, but nothing more was done by the General Government for the preservation of timber until the year 1817, when an act was passed directing the reservation of such public lands having a growth of live oak or cedar suitable for the use of the Navy as might be selected by the President. Under

that act commissioners were appointed, and two islands on the coast of Louisiana, containing about 20,000 acres, and supposed to have growing upon them 37,000 live-oak trees, were reserved for the use of the Government. Ten years later, it having been found that an extensive exportation of live oak, averaging one hundred and fifty cargoes annually, had been going on for several years, the sum of $10,000 was granted for the purpose of purchasing live oak and other timber lands for the Navy, and a tract on Santa Rosa Sound was purchased, and for a time considerable was done in the way of planting and cultivating the live oak.

By another act—that of March 3d, 1827—the President was authorized to take proper measures to preserve the live-oak timber growing on the lands of the United States, and to reserve such lands in sufficient quantitities to render the same valuable for naval purposes.

By an act of March 2d, 1831, provision was made for the punishment of persons for cutting or destroying any live oak, red cedar, or other trees growing on any lands of the United States, by a fine of not less than three times the value of the timber cut and imprisonment not exceeding twelve months.

Under the act of 1817 and subsequent acts there have been reserved in Florida, Alabama, Mississippi, and Louisiana about 250,000 acres of timber land.

Aside from these reservations of timber for naval purposes, no action has been taken for the preservation of timber until quite recently, when the Yellowstone Park was made a reservation. With this exception the Government has been strangely neglectful of the timber land in its possession. It has scarcely given sufficient attention to it to ascertain its location with definiteness or the character and value of the trees growing upon it. It has allowed trees to be cut and burned almost with impunity. It has made enactments, indeed, forbidding the destruction or theft of its timber, but has adopted such feeble and irresolute measures to enforce its laws that they have had little practical efficacy. At the present time the timber on the public domain is being plundered both by individuals and corporations, and hardly any check is put upon it.

Of the several States, in distinction from the General Government, it may be said that all of them have recognized the forests as having some value as property and have protected them on this account to a certain extent. Most, if not all of them, have made enactments against the cutting or injuring of timber growing upon the land of another or belonging to the State. But in making these enactments they have estimated the trees only according to their value for lumber or firewood, except the comparatively few planted along the roadsides or in parks and other public inclosures for purposes of shade and ornament. In these instances a somewhat higher value has been assigned and a heavier penalty decreed for their destruction. In all the legislation that has taken place in regard to forests, however, it may be said there has been no recognition of their importance from a sanitary or climatic point of view—their influence upon the distribution of moisture, upon the growth of crops, or upon the flow of streams and the consequent effect upon commerce and manufactures. Only in the lowest view of their importance have the forests been taken into account or efforts made for their protection and preservation. This is the general fact.

In all the States and Territories, and from an early date in their history, there have been laws designed to prevent injuries resulting from forest fires. Injuries from this cause have been so great at times, and are so constantly threatened, that protection from them becomes one of the earliest subjects to receive attention and to gain the aid of legal enactments. As might be expected, there is a general similarity in the laws enacted on this subject. The willful setting on fire the woods of another commonly exposes the offender to a fine or imprisoment, and in some cases to both, while it also renders him liable for all damage that his act may occasion. As willfulness can be proved, however, only in rare cases, laws of this class are operative, if at all, by their threat rather than their execution.

Another class of laws are those which inflict a penalty upon persons who set fire upon their own premises and allow it to extend to the premises of another. Such persons are usually made liable for all damages thus occasioned, unless they use all means in their power to prevent the extension of the fire beyond their own grounds, and, in some cases, unless they give notice beforehand to adjacent proprietors of their intention to kindle the fire. Persons are also made liable for the acts of their servants in this respect and to pay damages which they may occasion, and the servants themselves are also made liable to punishment. In some cases constables or other officers are authorized or required to call upon citizens to aid in extinguishing forest fires, and persons so called upon are liable to a fine if they refuse to give their aid. In some cases double damages may be claimed. Whipping has also been inflicted by many States in the case of servants or others unable or refusing to pay fines.

From the earliest period to the present the laws for the protection of forests from fires have been modified more or less with the purpose of making them more effective,

but the general testimony is that they have had but little efficacy. The forests are consumed now as frequently and extensively as ever. One reason of this is to be found in the difficulty of proving either malice or criminal neglect or carelessness. But another reason is the inadequate sense of the value of the forests and of the great loss involved in their destruction which is possessed by the mass of the community. The laws will be inefficient until the public sentiment in regard to the forests is changed. When old and young, educated and uneducated, understand and feel that the trees have a value for something else than as lumber or fuel; that they have a close connection with human welfare, with the health and comfort of man and beast, and are among the most precious possessions we have, then, and not till then, will forest fires be suppressed or kept within such narrow limits and made so infrequent that they will not be a serious concern to us. Then the school-boy, the sportsman, the poorest day laborer, will all alike look upon the trees with friendly interest and be their protectors, even without the incitement of law and penalty.

If we turn now from what has been done for the protection and preservation of the forests to what has been done to extend the wooded area by planting new ones, we shall find it but little and of recent date. While the desirableness of planting trees may have been felt here and there from a very early period, especially where trees have been somewhat deficient, or for the sake of securing new varieties, the first recommendation of tree-planting by any society or public body of men, so far as I am aware, was made in 1791 by the New York Society for the Promotion of Agriculture, Arts, and Manufactures. A committee was appointed for the purpose of considering the best mode of preserving and increasing the growth of wood and valuable timber. The committee reported in favor of devoting the lands least valuable for agriculture to the growth of trees, and that they should be stocked for this purpose. They insisted upon the importance of fencing out cattle, and, in short, advanced opinions and made recommendations on the subject which show a very enlightened understanding of it, quite in accordance with much of the best judgment and knowledge of our own times. If the recommendations of this society had been, to any considerable extent, adopted and carried out in corresponding action, the result would have been a great addition to the wealth of the State. By an act of the Legislature of New York, passed in 1869, tree planting is encouraged by allowing the overseers of highways to abate from the highway taxes of any land-owner the sum of $1 for every four trees set out along the highway opposite his land, the abatement, however, not to exceed in any year more than one-quarter of the highway tax. In the present year the Legislature has appointed a Forest Commission, to which are given extensive powers of control over the public lands of the State. Provision is made for introducing instruction in forestry in the schools and for publishing tracts and circulars on trees and tree-planting. More effective laws have been made also for the protection of forests from fire.

Colorado is in advance of all other States in having a constitutional provision in behalf of the forests. The eighteenth article of her constitution provides that "The General Assembly shall enact laws in order to prevent the destruction of and to keep in good preservation the forests upon the lands of the State or upon the lands of the public domain, the control of which shall be conferred by Congress upon the State." The appointment of a Forest Commissioner this year was the first decisive action taken in compliance with this mandatory provision of the constitution. The Forest Commissioner has the care of all woodlands owned or controlled by the State. He is to make rules and regulations for the prevention of trespass upon such lands, for the prevention and extinguishment of fires, and the conservation of forest growth. He is also, so far as possible, to promote the extension of the forest area, encourage the planting of trees, and preserve the sources of water-supply. The County Commissioners are also enjoined to encourage the planting of trees along water-courses and irrigating ditches and in other proper places. By other acts persons are made liable in triple damages for any injury to the trees of another, whether on enclosed lands or on the highway. The increased value of land, occasioned by planting fruit or forest trees upon it, is not to be assessed for the period of ten years after the trees are planted. A premium is also offered, for six consecutive years, for every one hundred forest trees planted along irrigating ditches.

In California the Board of Supervisors of any county of the State are empowered to authorize the planting of shade and fruit trees along the public roads by persons owning the adjacent lands, and persons planting such trees, according to the regulations of the Board, are entitled to one dollar for each tree so planted and growing thriftily four years after the time of planting.

In Connecticut a law was passed in 1877 to encourage tree-planting. It was provided by this act that planted woodlands which, at the time of planting, were not worth more than fifteen dollars an acre should be exempt from taxation for ten years. By an act of 1881 a bounty was offered for planting trees on the highways.

In the so-called Prairie States, lacking trees to a great extent at the time of their settlement, the people became tree-planters almost from necessity, and those States have been among the earliest to encourage tree-planting by offering bounties directly, or by the exemption from taxation for a certain number of years of land devoted to trees. They have been the first also to adopt Arbor Day and to prove its efficacy.

More than ten years ago (1874) Illinois passed a law for the encouragement of the planting and growing of timber, by allowing the Board of Supervisors or the County Commissioners' court in any county to offer a bounty, to any person who should plant one or more acres of forest trees and properly cultivate the same for three years, of a sum not exceeding ten dollars per annum for three years for each acre so planted.

Iowa in 1868 passed an act exempting from taxation the real and personal property of each tax-payer, who should plant and suitably cultivate one or more acres of forest trees for timber, to the amount of $100 for ten years for each acre so planted and cultivated.

Kansas in 1868 passed a similar law, offering a bounty of two dollars for every acre of prairie land that might be planted, within ten years, with any kind of forest trees, excepting black locust, and successfully grown and cultivated for three years. A like bounty was offered for each half mile of trees planted along any highway and cultivated and protected for three years. The bounty was to continue twenty-five years if the plantation was continued in growing condition so long. This act was subsequently repealed, not because the people of Kansas did not continue to favor the planting of trees, but because the further offering of bounties was not needful.

The Legislature of Nebraska in 1869 provided an exemption of $100 a year for five years on every acre of trees planted and suitably cultivated. The constitution subsequently adopted forbade the exemption of private property from taxation, but made it allowable that the increase in value of land, by reason of its being planted with trees or live fences, should not be taken into account in the assessment of the same. Towns are required to plant shade-trees, and taxes are levied on this account. Arbor Day, which originated in this State, has been heartily adopted by it, and more than 500,000 acres of planted forests are now beautifying and enriching the plains of Nebraska.

In Missouri, by an act of 1870, every person planting one acre or more of prairie land, within ten years from the passage of the act, with any kind of forest trees except black locust, and successfully growing and cultivating the same three years, and every person planting, protecting, and cultivating for three years one-quarter of a mile or more of forest trees upon his own land, to be set not more than one rod apart and to stand at the end of three years not more than two rods apart, shall be entitled to receive for fifteen years an annual bounty of two dollars per acre and two dollars for each quarter of a mile so planted. This act was amended in 1876 by extending the time to ten years from that date as the limit within which planting might be begun.

Michigan, which is cutting off her rich growth of forest with fearful rapidity, has done nothing to replace the trees removed. She has, however, encouraged the planting of trees along the roadside by allowing any one to pay twenty-five per cent. of his highway tax by planting trees on the margin of the road adjacent to his own land. By an act of 1881 any one injuring such trees is made liable to an action for damages from $1 to $25 for each offense.

In 1871 Minnesota passed "an act to encourage the planting and growing of timber and shade trees." This has been modified and amended at various times since. It provides that every one planting and cultivating from one to ten acres of forest trees for six years, and every one planting and keeping in growing condition half a mile or more of trees along the highway, shall be entitled to three dollars annually for each acre and two dollars for each half mile of such line of trees for six years. This State has also appropriated $5,000 to its State Forestry Association, to enable it to publish a manual of tree-planting and to secure lectures and experimental cultivation of trees, to distribute trees and tree seeds, to give information as to the best method of preventing forest fires, &c.

Nevada, ranking among the lowest of our States in respect to timber supply, and rapidly wasting that supply, has passed an act similar to that of Minnesota for the encouragement of tree-planting. Every person planting one acre or more of land, within ten years after the passage of the act in 1877, with any kind of forest or shade trees, and cultivating the same for three years, and planting and cultivating for the same time one-half mile or more of trees along the highway, is entitled to receive for twenty years, commencing two years after the trees are planted, an annual bounty of ten dollars per acre and ten dollars for each half mile so planted. The taxable value of the land is not to be increased by such planting, and stringent penalties are provided to protect the trees from injury.

Maine, the Pine Tree State, has been one of the first of our States to legislate for the preservation and extension of forests. In 1872 the Legislature enacted a law, pro-

viding that any landholder who should plant or set apart any cleared lands for the growth and protection of forest trees, within ten years after the passage of the act, and cultivate the same for three years, the trees being not less than two thousand to the acre, the lands so planted should be exempt from taxation for twenty years. The act also encouraged the planting of trees along highways by a similar exemption from taxes, and provided proper penalties for the removal or injury of trees thus planted.

The general statutes of Massachusetts prescribe that the Agricultural Societies receiving the bounty of the State shall offer premiums, at their discretion, for the raising and preserving of oaks and other trees best adapted to perpetuate a supply of ship timbers. They also encourage the formation of societies for the purpose of improving streets and public squares by planting ornamental trees thereon. Massachusetts was the first State in the Union to institute a special survey of its forest resources. This was in 1837, and the Report of Mr. Geo. B. Emerson on the Trees and Shrubs of Massachusetts, in two volumes, is not only an honor to the State but a treasury of information in regard to a large portion of the trees with which our country abounds. The subject of forestry has been discussed by the Agricultural Societies and the public journals more amply and for a longer time, perhaps, than in any other State, as a result of which, or at least coincident with which, numerous tracts of land, especially in the eastern portion of the State, have been planted with forest trees and are to-day the most conspicuous instances of successful forest-tree planting to be found in the country. As long ago as 1804 the State Society for Promoting Agriculture offered, among other prizes, one "To the person who shall produce from seed the best growth of trees, not less than 600 in the whole, and in the proportion of 2,400 to the acree, of any of the following kinds of forest trees, viz: Oak, ash, elm, sugar-maple, beech, black or yellow birch, chestnut, walnut, or hickory, $25; if all of oak, $50. In 1876 this Society offered premiums, ranging in amount from $400 to $1,000, for the best plantations on poor or worn-out land, not less than five acres in extent, of European larch, Scotch pine, and Corsican fir. Prizes were also offered for plantations of the white ash. In 1882 the State passed an act authorizing towns and cities to provide for the preservation and reproduction of forests. They may take or purchase any land and make public domain of it. The title of all such land vests in the Commonwealth, and is to be held in perpetuity for the benefit of the town. The State Board of Agriculture is also to act as a Board of Forestry and have the supervision and management of all such public domains.

New Hampshire in 1881 appointed a Board of Commissioners to inquire as to the extent of the destruction of the forests, the effect of forests on rainfall and the condition of streams, and in regard to the wisdom or necessity of forest laws. The Commissioners have attended to their duties faithfully and have made an extended report of the result of their inquiries. They deplore the rapid and inconsiderate manner in which the forests have been destroyed and urge the adoption of effective measures to secure the preservation of what remain and their proper management. They set forth the fact that the mountainous character of the State adapts it especially to the growth o trees rather than of agricultural crops, and that the most profitable use of a large part of the land in New Hampshire will be found in devoting it to the cultivation of forests. No action has been taken in regard to this report, but by existing law towns may raise money to set out shade trees and abate taxes to persons who do so.

Ohio established in 1882 an Agricultural Experimental Station, part of the operations of which are to be the planting and testing of trees in an arboretum and the encouragement of tree-planting throughout the State. Later a Forestry Bureau has been created in connection with the State University at Columbus. This bureau is engaged in establishing forestry experiment stations.

Vermont is similarly situated to New Hampshire, and takes her name from her green, forest-covered mountain ranges. She has more land of an arable character than her neighbor State, and a considerable portion of her surface is adapted to the purpose of grazing, but the cultivation of her crops and of her flocks will be most successful only as her forests are cherished and protected. In 1882 commissioners were appointed "to inquire into the subject of the forests of Vermont as to their extent and condition, and what, if any, measures should be taken in respect to their preservation." The committee made a carefully-prepared and instructive report to the Legislature in October of last year, recommending certain enactments for the better protection of the forests, but no action has yet been taken by the Legislature.

It is not necessary to make mention further and specifically of the existing condition of forest legislation in the several States. In most of the older States, especially those of the North, there has arisen within a few years past a sense of the value of forests for something besides their lumber products, and some measures have been taken to guard the existing forests from too rapid destruction and to encourage forest-planting. The Southern States, most of them being heavily wooded and with less

demand made upon their forests than has been made upon those at the North for lumber products, have not felt as yet the necessity of planting trees, and their legislation has been limited, for the most part, to guarding the existing woodlands against the ravages of fire and from the plundering of thieves. The newer States, many of them comparatively treeless, have been the most forward to promote forest-tree planting. This they have done by offering liberal premiums—by exemption of planted forests from taxation for a term of years and by the adoption of Arbor Day, which from year to year appeals to all the people of the State to unite in the simultaneous work of tree-planting.

The condition of legislation on the part of the General Government in distinction from that of the individual States may be given in few words. We have seen already that in the early years of our history measures were taken by the Government to protect such timber as was suitable for the construction of naval vessels, and to acquire a larger supply than it then had, by purchasing certain islands and land upon the seacoast where such timber was to be found. In recent years the Goyernment has made various enactments for the purpose of preventing depredations upon its timber lands by thieves. These enactments have been suitable to the case, but, like other enactments, they will not execute themselves or inflict the proper penalty upon evil-doers, and the appropriations made by Congress for the purpose of guarding the public forests, or bringing the depredators upon them to conviction and punishment and recovering the stolen property, have been quite inadequate, and so the plundering goes on to the extent of millions annually in value.

The Government has also sought to promote the planting of new forests by means of the Timber-culture Act, in itself most commendable and promising great benefit to the country, but which has been so often evaded, with the result of the acquisition of land without cost and under false pretenses, that many are of the opinion that the act should be repealed.

Largely through the efforts of a recently-deceased member of this congress and one of its officers, the attention of the National Congress has been directed, within a few years past, to the general subject of forestry, and an inquiry has been set on foot, in connection with the Department of Agriculture, in regard to the existing condition of the forests of the United States; the annual amount of consumption, importation, and exportation of timber and other forest products; the probable supply for future wants; the means best adapted to the preservation and renewal of forests; the influence of forests upon climate, and the measures that have been successfully applied in various countries for the preservation and restoration or planting of forests. A Forestry Division of the Department of Agriculture has been created for the purpose of prosecuting these inquiries, and four volumes of reports from this Division have been published, embodying a large mass of information in regard to the subjects embraced in the scope of its inquiries. It may be said without hesitation that nowhere else within an equal compass is there to be found in the English language such an amount of information in regard to the subject of forestry. Facts of the utmost importance have thus been brought within the reach of the people, and if appropriate action is taken by them it will be of immeasurable value to the country, evils and disasters which have fallen upon other countries as the result of the loss of their forests may be avoided by us, and the trees may be converted into the most important means of our continued prosperity.

WHAT ARE THE ESSENTIAL FEATURES OF AN EFFICIENT FOREST-FIRE LEGISLATION?

BY S. W. POWELL.

In the nature of the case answers to this question can be definite and specific only upon the negative side. There *has been* sufficient experiment to ascertain some features which are not desirable. We know several things that *will not* work, but do not, as yet, know exactly what *will* work. The object of this paper is merely to indicate, upon the positive side, some of the general features or characteristics of any successful legislation designed to prevent forest fires or, when they do occur, to limit their *range* as much as possible.

The first point that suggests itself is this: Such legislation must be framed with a proper understanding of its *importance*. As we are not now considering the need of such legislation—a large subject in itself— it will serve the present purpose merely to allude to the fact that the direct damage done by forest fires is probably not less than three hundred million dollars a year, and that the indirect damage in the way of denuding steep slopes and sending the ashes resulting from burning the soil, and what grew out

of it, down stream, to the lasting detriment of navigation and manufactures, and also in the way of discouraging efforts to plant new and develop old woodland, is, in the long run, perhaps as great as the direct, or even greater. Only those who have some proper notion of the size and power of an enemy can plan a successful campaign against it; and right here comes in the importance of such statistics as only the General and State Governments can collect. Much has been done, but those who know most of what has been accomplished are the most desirous of something far more complete.

In the second place such legislation should not be so far in advance of public sentiment as to produce reaction. While those who draft the laws should know the importance of what they are after, they should have balance enough to recognize the fact that enactments that are not enforced—especially when the failure results from the apathy or the opposition of the public—generally weaken rather than help a cause.

Again, these laws should discriminate between localities where the damage is mainly direct and immediate and those in which it is remote and cumulative. *E. g.*, in the level coast-pine regions of Georgia and the Carolinas the damage done by fires is measured mainly by the value of the timber and forest products consumed, and by the injury done to the soil by burning up its vegetable substance and the tree-seeds it contained. In the Adirondacks, on the contrary, the loss is likely to be indirect for the most part. The damage to the Hudson, the Mohawk, the Erie Canal, and to hundreds of small streams which will be capricious and irregular in their flow, and to the great and rapidly increasing interests connected with summer travel, and besides all this, the permanent injury done to the climate of Eastern New York—all these are likely to vastly outweigh the direct value of the timber burnt, or of that which would afterwards grow upon those steep slopes. Once change the Upper Hudson to a torrent and no one can measure the harm that it will occasion.

Another feature of such laws is that while making free use of the experience of other countries where forest administration—both public and private—is so much more developed than in America, they should not attempt to adopt foreign systems without the modifications rendered necessary by the different conditions of climate, density of population, price of forest products, cost of labor, and habits of thought.

Again such legislation should be devised and often largely administered and supervised by Commissioners or special officers who give their entire time to the necessary experiments and investigations, and those who are charged with these duties should be so appointed and the tenure of their office should be such, that they will be entirely above the influences of partisan politics.

Another important feature in such legislation is this: it should distinguish everywhere between enforced and aided fire-prevention, as the French Reboisement Law of 1860 did between enforced and aided reboisements. In some cases proprietors may have so much at stake, may be so intelligent and be possessed of such resources, that all they need will be help. The administration and enforcement of the laws can in such cases be largely entrusted to them. *E. g.*, in the Adirondacks the business of entertaining summer travelers and serving them may become so lucrative and at the same time be so put in jeopardy by fires, that the hotel keepers and guides will need nothing but the authority afforded by suitable laws, to prevent or arrest fires. The same may become true of more thickly settled regions. In them farmers may come to appreciate the advantages of timber culture and the extent to which forest fires hinder success in it. In such cases nothing will be needed but enactments which such communities can mostly enforce and administer through the ordinary courts and officers.

In other regions the immediate and direct damage likely to be done by fires may be slight as compared with those which are indirect and consequential, while at the same time the local proprietors may be few in number, poor, and unintelligent. In such localities the State or even the National Governments may fitly charge themselves with the execution of the necessary preventive measures. Such a case may arise upon the headwaters of the streams tributary to the Ohio. Residents of Western Pennsylvania, West Virginia, Tennessee, Kentucky, as well as those of Ohio, Indiana, and Illinois, may be chargeable with acts and neglects which occasioned, or at least aggravated, the floods of 1882–'83–'84. In many cases these residents may be scattered over wide areas, few in any one locality, and at the same time be poor, ignorant, and lawless. It would be folly to expect them to appreciate the importance of cutting timber and preventing fires in such a way as to minimize the likelihood of floods, whose chief damage would be done hundreds of miles down-stream. The State governments might not feel able or willing to expend the sums necessary to instruct and restrain these people and to induce them to co-operate with, rather than to oppose, the needed regulations, and yet it might be a grand economy for the National Government, with the cordial consent of the States concerned, to charge itself with the needed outlay of money and labor.

It may be in time that, with the consent of the Northwestern States, the General Government will carry out a system of forest administration that will make it reasonably certain that fires shall not rage in the woodlands covering the mountains, hills, and bluffs of the regions drained by the Upper Mississippi and Missouri rivers.

Another example of aided prevention has reference to the vexed question of leaving the tops of trees and the other *débris* of logging to feed—and, indeed, invite—forest fires. Among the lumbermen themselves there are two opinions. Some advocate—and upon their own lands practice—such a disposal of this rubbish that fires are not the almost inevitable sequel of logging. The *Northwestern Lumberman*—which, however, is not always consistent with itself—has warmly advocated the enforcement of such treatment of this stuff. Now the time may come when conservative lumbermen will be glad to have the power to compel their more reckless associates to do what the common good demands. In such case it is clear that the wisest thing might be to pass a law merely aiding and enabling the prudent to restrain the reckless.

But I will go no further with these general statements. As to specific details they must vary so much with change of conditions that to prescribe them here and now would savor of quackery.

LETTER FROM H. C. PUTNAM, ESQ., OF EAU CLAIRE, WISCONSIN.

Mr. Putnam, being detained in London and so prevented from attending our meeting, as he expected to do, wrote at the last moment to express his keen regret and to testify his great interest in the object and work of the Congress. He gives an interesting account of what he had seen during the summer, in a quite extensive tour among the forests of France and Germany. He was especially impressed by the care with which diseased and wind-fallen trees were removed and their places filled by young and vigorous ones. In the little province of Baden, which is about as large as a medium-sized county in Wisconsin, he found one hundred carefully-trained foresters. High upon the mountains, in almost inaccessible places, trees that were blown down were cut and saved. He thought that great emphasis should be given to the fact that all over the continent of Europe rainfall and other climatic conditions are much more favorable to tree-culture than they are in our own country, and besides, stone, brick-clay, and other building materials are much more plentiful than in most of our prairie States. In Europe also, most of the buildings needed are already in existence. Yet they seem much more desirous to avoid extreme denudation than we do, who have an immense and rapidly-filling treeless region, while the stores upon which it must depend are swiftly vanishing before the reckless destruction of our white pine. We may, and should, cut the merchantable pine, but should take care to preserve an ample area of forest for a future supply. The most important means to this end, he thought, is the careful removal of the débris of logging, since white-pine land, especially when once burnt over, will produce nothing but deciduous trees for a long time afterwards.

In conclusion, Mr. Putnam urged thorough organization for work, to secure needed legislation and to arouse and direct public sentiment. We may, said he, meet to read papers and pass resolutions for a thousand years, but unless we do something more definite we do not make progress.

SMOKE-CONSUMING DEVICES FOR LOCOMOTIVES.

BY J. N. LAUDER, SUPERINTENDENT OF MOTIVE POWER, OLD COLONY RAILROAD.

In presenting this paper on smoke-consuming devices for locomotives it is not my purpose to enter into the details of the mechanical construction of the various devices that have been experimented with in a practical way during the last thirty years, or, to speak more accurately, ever since the locomotive was brought into existence, but to give, in a general way, what has been done in the past and what is being done at the present time to mitigate the evils of the discharge of unconsumed products of combustion from the chimney of the locomotive.

The smoke and sparks that are discharged from the locomotive are so annoying to passengers that on some of our lines a trip by rail on a hot day is something to be

dreaded, and the danger to forests and other property from fires set by these sparks is in the aggregate enormous.

To the novice the remedy for all this would seem to be to so arrange the furnace that perfect combustion would take place. This may be done on stationary or marine engines, where heating surface enough can be provided to allow of slow and perfect combustion, but in the locomotive the weight and size of boiler is limited, and artificial means must be used to provide for such rapid combustion as is required when the engine is developing its full power.

The attention of locomotive mechanics has been drawn to this question of fuel-combustion ever since the birth of the locomotive, but their efforts to make it perfect have been only partially successful, and while the heating surface of our boilers is so small in comparison with the requirements of the engines a forced draft will have to be resorted to. This fact being recognized, it necessarily follows that when the engine is developing its full power the artificial draft is so strong that small particles of coal will be lifted from the fire and drawn through the flues unconsumed and discharged out of the chimney in the form of what is called sparks. The fact that some solid matter will be drawn through the flues from the fire being established, I will now briefly consider the various mechanical contrivances that have from time to time been brought forward to arrest and dispose of these solids.

Among the earliest contrivances (when wood was the universal fuel used in this country) was a chimney shaped like a funnel placed with the broad mouth upward. This broad end was covered with a wire screen, and inside of this chimney was placed a straight pipe somewhat smaller than the smallest diameter of the chimney, its height being about two-thirds that of the chimney. Over this, and near the wire screen, was mounted a deflecting plate with edges curving downward. A spark reservoir was placed in some suitable position near the smoke-box, and pipes were made to lead from the annular space between the chimney and the inside pipe to this reservoir. The operation of this arrangement was as follows:

The unconsumed products of combustion that were drawn through the flues were driven by the exhaust steam upwards against the curved deflector at the top of the chimney, and the larger and heavier particles were forced down and into the spark reservoir. The lighter particles would pass to the atmosphere through the wire screen, but would rarely have life enough to set anything on fire. The reservoir, however, was soon abandoned, as it was found in practice that with wood for fuel the sparks were so reduced in size by friction in their passage through the flues and chimney that they could all pass through the screen to the atmosphere with little danger of setting fires.

When coal came to be used as fuel the old arrangement of chimney was found to be unsuitable, and new appliances had to be devised. A new and annoying element had to be met—that of gas and smoke, caused by imperfect combustion in the furnace. When fresh coal is added to the fire a vast quantity of gas is evolved, and unless a sufficient quantity of atmospheric air is brought into immediate contact with it it will pass off in the form of smoke.

Various plans to furnish the requisite amount of air, and at the proper time, have been tried, but the varying conditions under which the engine is working have so far made it practically a failure.

Letting air into the furnace over the fire, while it will prevent the formation of smoke if let in in sufficient quantity, will also lower the steam-producing qualities of the boiler. Air mixed with a jet of steam driven into the furnace over the fire has been tried at various times and in various ways, but it has always ended in failure. D. K. Clark, the eminent English engineer and author, in his work on the locomotive, describes a method of injecting air and steam mixed into the furnace of a locomotive boiler to promote the combustion of the gases.

Recent so-called inventions brought out in this country are almost exact duplicates of appliances described by Clark long ago.

Rotary blowers have been used to drive the products of combustion from the smoke-box back to and into the furnace to be subjected to a reburning process, but such methods never got beyond the experimental stage. Double or twin furnaces have been tried, but while producing good combustion the mechanical difficulties to be overcome have thus far interfered with their success. Mechanical devices in various forms for driving the solid, unconsumed products of combustion from the smoke-box back through suitable tubes to the furnace were several years ago quite largely used, but they have nearly all given way to more modern and better methods.

I will now proceed to discuss the most approved methods of promoting combustion, and also the mechanical means employed to prevent the escape of sparks from the chimney, drawings of which will accompany this paper.* And here let me say, curi-

ous as it may seem, the wonderful discoveries made in the last twenty years in the production of steel have a direct bearing on the question under discussion.

The substitution of steel for iron in rails and tires has made it possible to so increase the weight of the locomotive that larger boilers can be used, and therefore a very much greater heating surface in proportion to the cylinder area. This fact makes it possible to do what could not be done were soft iron rails and tires still in use.

The modern locomotive boiler has little to distinguish it from its prototype of thirty years ago. All combustion chambers, water tables, and complications of all kinds have been discarded, and we have the plain rectangular furnace, with plenty of tubes to freely carry off the products of combustion. Its leading feature is its size and large heating surface. Its enormous evaporative power will be recognized when I say that this boiler, when pushed to its full capacity, will convert three thousand gallons of water per hour into steam. To accomplish this amount of work on a grate surface of only eighteen square feet very rapid combustion must be maintained, and this can only be done by a forced draft. A forced draft means imperfect combustion, and imperfect combustion means particles of unconsumed coal drawn through the tubes. These unconsumed solids must be arrested in their course to the atmosphere and deposited in receptacles where their presence will not be harmful. This is measurably accomplished by the use of the appliances shown in the drawings.* The smoke-box is made twice the usual length; a coarse wire screen is drawn across high enough to be above all the boiler flues; the chimney is a plain, open pipe, smooth and free from obstructions; the exhaust pipes are carried up through the screen, terminating in a single nozzle. In front of the flues a deflecting plate is placed at a suitable distance from the ends of the flues, and is set at an angle of about twenty degrees. The functions of this plate are twofold—first, it equalizes the draft through the flues; and, second, it deflects the sparks downward, and instead of their being shot upward through the chimney they are banked up in the forward end of the smoke-box, there to remain until they are removed at the end of the trip. In the furnace is placed a fire-brick arch, extending entirely across the furnace and from the flue-sheet under the flues back about two-thirds of the length of the furnace. The gases, as they arise from the coal, are forced to travel back and over this arch on their passage to the flues, and by the delay thus caused, and also by their contact with the intensely hot fire-brick composing the arch, are very thoroughly consumed. The unburned solids lifted from the fire are also prevented from being drawn directly into the flues, the force of the draft caused by the exhaust steam in the chimney causing them to impinge against the hot brick, where the heat is so intense that a large percentage of them are consumed that would otherwise be drawn through the flues in a solid state. The brick arch is supported on four iron tubes, placed diagonally in the furnace, connecting the water-space under the flues with the water over the furnace crown. These tubes not only make a reliable support for the brick, but best promote the circulation of the water in the boiler.

The arrangement of smoke-arch described is not of recent design, but was patented in substantially its present form about twenty years ago by Mr. John Thompson, of East Boston, who was then connected with the Eastern railroad in the capacity of master mechanic. It was tried thoroughly by him at that time, but was abandoned, for the reason that a comparatively few miles' run would fill up the smoke-arch with sparks and so interfere with the draft that the capacity of the boiler to generate steam in sufficient quantities to supply the wants of the engine was destroyed. The small furnaces used at that time and the powerful artificial draft made necessary thereby produced this result.

As I stated in a former paragraph, the introduction of steel for rails and tires made the use of larger boilers possible, and with their introduction came the successful use of the spark-consuming and arresting devices described. The railroad with which I am connected has had these appliances in use on a limited number of engines for the past two years, and in no case has a forest or other fire been set by them, and if kept in proper order I believe they are absolutely safe.

In conclusion, I wish to say that careful and intelligent manipulation of the fire by the fireman is imperative, and will do more to prevent the formation of smoke than any mechanical contrivances.

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* The illustrations being familiar to our readers, it is not thought necessary to reproduce them.

THE FUTURE OF THE FORESTS OF THE LOWER SOUTHERN STATES AND THEIR PROBABLE TIMBER SUPPLIES.

BY CHARLES MOHR, OF MOBILE, ALA.

It is a well-known fact that the tree-growth of a forest is, in the course of time, succeeded by another of a different kind. Such a change in the character of the forest vegetation proceeds either slowly, by the gradual encroachment of the invading species until those occupying the ground originally have disappeared or are rapidly disappearing, or by the more or less sudden destruction of the original forest-growth. From a closer study of the struggle going on amongst the trees for the possession of the soil important inferences can be drawn, first, as to the species which succeed best in adapting themselves most readily to the change of the conditions involved in the gradual or more or less sudden removal of the original growth, and, secondly, as to the resources of timber and other forest products to be expected from those by which it is succeeded.

In view of the changes which have taken place in the forests of the Northern States by the clearing away of the largest part of the original tree-covering, and which begin to affect seriously the industrial and commercial interests of large populations as well as those of agriculture, it might be well to consider the facts which in this respect present themselves in the lower Southern States, and especially in those of the eastern gulf region, with their great timber districts, the seats of important and vastly increasing industries, based upon their resources.

That the rapid depletion and final destruction of the forests of this section, by the devastation attending the existing methods of management of their resources, is inevitable, with little or no hope for their restoration, can be regarded as certain, and in contemplating this grave fact the questions in regard to the future prospects offered by the second forest-growth suggest themselves forcibly to the mind.

Considering, first, the supplies existing in one of the most extensive and important timber regions of the South, the maritime pine-belt of the Eastern Gulf States, we cannot fail to arrive at facts fraught with important results, pointing to the measures to be adopted for the maintenance of its timber resources, and well calculated to arouse the attention of the intelligent citizen who, looking beyond the narrow limits of self-interest, bestows a thought upon the present and future general welfare of his country.

This coast pine-belt, reaching from the Chattahoochee river to the lowlands of the Mississippi river, covers about 38,000 square miles, inclusive of the lands covered by water, cleared or otherwise, not covered by the long-leaf pine. In its extent through Alabama and Mississippi the merchantable timber of long-leaf pine standing at the end of 1880, according to the estimates made for the tenth census, amounted in the first of these States to 16,055,000,000 feet, board measure, and in the latter to 18,200,000,000. In the light of the scanty information obtainable the annual cut during the past five years, beginning with the close of the census year, can be estimated to have averaged 140,000,000 feet, board measure, in Alabama and 102,000,000 feet in Mississippi.

This cut reduces the amount of the supplies standing in this pine-belt at the end of the present business year in the first of these States to 15,355,000,000 feet, and in the latter to 17,660,000,000 feet, board measure.

Under such present strain the timber supply of Mississippi will last a little over 170 years, a period of sufficient length to afford the time needed for the production of the same kind of timber equal in quality to that of the original growth. The long-leaf pine can be said to furnish in from 150 to 175 years timber of the size and quality required. Hence, if care were taken to restock the denuded acres by natural seeding, and to protect the new growth from the invasion of objectionable species and from the inroads of fire and cattle, the resources of the pine forests of Mississippi could be fully restored before the exhaustion of the original stock. With the stock on hand their maintenance would be a matter of comparatively small expense, if managed properly under the guidance and protection of laws enacted by the State and upheld by an intelligent and patriotic community.

Nature has wisely provided that timber will flourish on lands the soil of which is too poor to yield profitable returns under cultivation for any other crop, and lands of this class should be forever devoted to the purposes for which they are naturally best adapted and intended. To that class of lands belong by far the greater part of those covered with the long-leaf pine forests. Deprived of their timber-wealth, these lands are rendered entirely valueless. They will, however, under the system indicated soon

become valuable, and thereby the prosperity of the State and the individual, both for the present and future, would be greatly advanced.

In Alabama, where at present rates of consumption the timber supply will last, to all appearance, but little over a century—that is, about two-thirds of the time required for its restoration—no wiser policy could be adopted than to reduce the cost accordingly.

Such reduction alone, in conformity with the natural law of reproduction, would have a tendency to advance the prices of all kinds of timber and other products of the forest to a height more in accordance with their intrinsic value, based on the cost of production, if it had to be effected at the expense of time and labor of men, and, furthermore, offer a safeguard against over production leading to the ruinous depressions in the trade by glutting the markets. Any one engaged in the lumber business, timber trade, or the production of naval stores will have to admit that thousands upon thousands of acres of the best timber lands have been uselessly destroyed and their products wasted in having been disposed of at prices affording no profit whatever to any one connected with the business, not to mention the irretrievable destruction of values, which has caused the financial ruin of many.

It must not be overlooked that the drain of these forest resources will rapidly increase with the increase of population in the timberless regions and with the impending depletion of the white pine of the Northwest.

According to the above statements, the demands made during the last five years upon the timber supplies in this pine belt within the two States cited, required the depletion of over 400,000 acres, tending to a total destruction of the original timber growth of that area. The restoration of its tree covering being left here as elsewhere solely to the effort of nature, the second growth, uncared for by man, must be expected to satisfy the requirements of the future.

Beginning in the tidewater region with the examination of the resources held thus in prospect in the different districts of the Lower South, and particularly the Eastern Gulf region, it is found that in the coast plain there is no prospect for the spontaneous restoration of the long-leaf pine. The offspring of this tree, in the struggle for the possession of the soil, has to succumb to that of its allied species, the Cuban pine (*Pinus Cubensis*) and the loblolly pine (*Pinus tæda*), the first supplanting it to the largest extent in the openings made in the original forest, the latter gaining a foothold in the exhausted fields abandoned by the settler. The Cuban pine, most frequent in the flatwoods of Florida, extends along the coast westward to Eastern Louisiana; it is never found to ascend to the pine uplands or to enter the banks of the water-courses intersecting them, above the level of the tide. In the coast plain it is found in all stages of growth on the land not originally occupied by the long-leaf pine, showing a remarkable rapidity and thrift of growth. Stately groves of trees seventy to eighty feet high, and from sixteen to twenty inches and over in diameter, perfectly clear of knots for fully two-thirds of their height, furnish supplies of fuel of good quality in the surroundings of Mobile. None of these trees of second growth have been found to show over fifty rings of annual growth.

The wood of the Cuban pine is less resinous than that of the long-leaf and the loblolly pine, compact, but of a coarse grain, and the timber is inferior to that of the long-leaf pine. The specific gravity of the wood is 0.750, exceeding that of the latter species, and, according to the experiments recorded in volume IX of the Tenth Census, it is not inferior in its relative fuel value and its ultimate power of resistance under pressure; hence, entitled to more consideration than it receives at present by the trade. In view of its quick growth and the qualities of its timber the fostering of the young growth in the unpromising soil of the low pine barrens or flat woods, not improperly called in this district pine meadows, which extend over many hundreds of square miles along the eastern gulf shores, cannot be too strongly recommended.

Amongst the prominent resources of valuable timber found in the overflowed lands of the coast and in the wide alluvial river valleys with low-water level, the mighty cypress (*Taxodium distichum*) takes a conspicuous place. On account of the excellent qualities of its timber, of late years eagerly sought for, this tree is rapidly disappearing in all localities easy of access. In such the exhaustion of the supplies is a question of very short time. Those existing a few years ago in the delta of the Mobile river are almost depleted, and to meet the demand of the mills on the Tensaw river have to be brought from the distant swamp lands along the Alabama and Tombigbee rivers. The same can be said of those but a short time ago abounding in the alluvial forests of the Mississippi and Yazoo delta. It is only in the remote and at present practically inaccessible cypress-brakes in the upper parts of this alluvial region that these supplies are yet untouched. The time is, however, rapidly approaching when these will be brought into requisition, and when capital and the skill of the engineer in transporting the gigantic trunks to the streams will find proper returns for over-

coming the difficulties presented in making them available. It is almost impossible to get the data upon which an approximate estimate of the cypress timber standing in the Gulf States could be based. Certain, however, it is, that the existing supplies are rapidly brought under the control of capital. There can be no doubt that with their depletion cypress lumber will nearly disappear from the markets. Comparatively few trees below the size demanded for the manufacture of lumber are found in these alluvial forests. A young growth of this tree is found on the borders of the cypress-swamps, and its seedlings spring up in the greatest abundance whenever the rays of the sun can reach the patches laid bare after a long season of drought by the receding of the water which, most of the time, covers the ground in these forests. Sound trees beyond the first stages of growth, approaching medium size, are rarely seen in the eastern gulf region. A tree felled at that stage, measuring eighty feet in height and little over thirteen inches in diameter, judging from the rings of annual growth, seemed nearly a century old. The logs rafted to the mills average thirty-two inches in diameter and fifty feet in length, equal to 2,400 feet of lumber. Trees of dimensions to furnish logs of such size have required not less than from 200 to 250 years for their growth.

The white cedar or juniper (*Chamæcyparis sphæroidea*) is equally threatened with extinction as a source of timber. Much in demand for its light, durable wood, this timber-tree is rapidly disappearing in the Gulf States, with little prospect of its restoration. Both of the trees last mentioned are easily raised from the seed and grow without difficulty in almost any soil, in cool, damp situations, from the banks of the Ohio to the Gulf shore, their growth making considerable headway during the first twenty-five years.

Amongst the enormous quantities of hard-wood timber of inferior quality, found in the gloomy forests of the alluvial lands of the tide-water districts and commanding at present but little attention, furnished by the water oak, tupelo gum, green ash, white bay, water hickory, the water elm or wahoe is to be mentioned as one of the more valuable trees, being quite abundant and attaining here its best development, trees from two and a half to three feet in diameter, furnishing timber of excellent quality, being frequently found in these low forests.

Entering the rolling pine uplands or pine-hills, the changes caused by the removal of the primeval forest of long-leaf pine present a more striking and totally different aspect.

The seedlings of the long-leaf pine are rarely found to occupy the places of the parent tree. It is a growth of deciduous hard-wood trees which chiefly takes possession of the soil, forever excluding the offspring of the original forest tree. The blue-jack or upland willow oak (*Quercus cinerea*), Spanish oak (*Q. falcata*), black-jack (*Q. nigra*), with the mockernut hickory (*Carya tomentosa*), if undisturbed by fire, make a rapid growth, presenting on the better class of these pine lands, in the course of from forty to fifty years, copses of trees above medium size. The ridges of utmost sterility, with a soil of pure white sand, are soon covered with a dense growth of the turkey oak (*Q. catesbœi*), forming coppices, which, in the vicinity of larger towns, are every ten to twelve years cut over, furnishing fuel of good quality. The second growth of the long-leaf pine is only found in the localities accidentally protected from the invasion of the fires which scourge these woods season after season. It is found to succeed best in the broad expanse of uplands, where the porous, sandy, or gravelly soil, with but a slight admixture of clay, presents no obstacles to its deeply-penetrating taproot.

This tree shows, in the earliest stage of its development, the remarkable peculiarity that up to the fifth year of its existence it remains almost stationary in its vertical growth, until the stem has attained a certain thickness. Until the end of that period exceeding scarcely the surrounding herbage in height, and being full of resinous juices, the young trees have no chance of surviving the ever-recurring conflagrations to which they are exposed or the tramping down by the herds of cattle ranging through the woods. Protection against these destructive agencies during this stage of their growth is absolutely required for the preservation of the species. This having been afforded, the trees show a most thrifty and rapid growth up to the third and fourth decade of their life; after that period the growth proceeds slowly. Trees furnishing logs from sixteen to twenty inches in diameter seem to require not less than from 150 to 175 years to attain such dimensions. No greater benefit could be bestowed upon this section than to assist in every way the attempts of nature to renew the original tree-covering of these pine uplands, upon the existence of which depends unquestionably in such a large measure the welfare of future generations, not only through a supply of timber and other indispensable forest products, but also the preservation of conditions of climate which favor so highly the agricultural interests of these States.

In the upper division of this pine belt or region of a mixed growth, made up of various pines and hard-wood trees, the struggle for the possession of the soil among the different species is most evident. The long-leaf pine, occupying the sandy and rocky ridges, can be said to cover fully half of the area of this region. Here its progeny is brought into competition with innumerable and most aggressive foes invading its territory, to which it is sure to succumb. Of its final disappearance from these hills there can be little doubt. The most formidable and aggressive amongst them is the short-leaf pine (*Pinus mitis*). Numberless seedlings of this tree sprout up every spring; by their rapidity of growth they easily suppress the seedlings of the long-leafed species, encroaching not less upon the forests of hard woods on the more productive soil of these uplands, and taking immediate possession of any opening made in the forest and the exhausted fields thrown out of cultivation. Extensive tracts, less than half a century ago covered with magnificent forests of white, Spanish, red and black oak, brought under cultivation, and by constant cropping, for a succession of years, finally exhausted, afford in these districts good opportunities to observe the work of nature going on in the restoration of the forest. The saplings of the short-leaf pine form at first dense thickets, absolutely impenetrable. Before arriving at the tenth year the work of thinning out begins actively in this growth, by the death of the weaker saplings. Favored by the access of light and air thus gained, the surviving growth shoots rapidly upwards, the young, aspiring trees spreading out their crowns; in the meantime those lagging behind die, one after another, under the increasing shade. Having reached the age of fifty years the trees average sixty to sixty-five feet in height, from twelve to fifteen inches in diameter, standing from fifteen to twenty feet apart, with no undergrowth whatever between them. Before arriving at the age of one hundred years the trees are found to be eighty feet and over in height, with a diameter of twenty to twenty-two inches and more, the trunks clear for about one-third of their height, furnishing timber of fine quality, particularly esteemed by the house-carpenter and fully as durable as that of the long-leaf pine. Spreading with surprising rapidity over every clearing made in these uplands, from the upper part of the pine belt, through Central and North Alabama, over the rolling, loamy uplands of the northern half of Mississippi, throughout the whole of Northern Louisiana and Northeastern Texas, this pine can be emphatically called the timber tree of the future in the States of the Lower South.

It is only the loblolly pine that can be said to compete successfully with this tree in the contest for the possession of the soil, and only on the lands greatly impoverished by cultivation and in localities with moisture and a more sterile soil. One of these loblollies growing with the short-leaf pine on the highlands of North Alabama, measured, when felled, one hundred and twelve feet in height, and twenty-one inches in diameter, showing ninety-two rings of annual growth.

The loblolly pine in the lower division of the pine belt takes possession, almost exclusively, of the worn-out and abandoned lands. If less esteemed on account of the inferior quality of its timber, which quickly decays when exposed to the weather, it gains in importance if it is considered that this tree, in the near future, is to be depended upon as the earliest available resource of crude turpentine from the second growth of this section.

On the rocky summits of the mountains and on the arid ridges in North Alabama, as is also the case in the Southern Atlantic States, the worthless scrub pine or Jersey pine (*Pinus inops*) replaces the hard-wood growth. In the limestone hills and the valleys and ridges of Central and South Alabama, with a rocky calcareous soil, the young growth of the red cedar (*Juniperus Virginiana*) suppresses almost completely that of any other tree wherever the upland oaks, hickories, chestnuts, &c., have been cut down. The most advanced of this second growth furnishes an ample supply of small timber, on account of its durability suitable for posts, poles, and other inferior purposes, but unfit for the higher uses for which that of the first growth is so much esteemed.

The cedar brakes in Alabama and Western Florida are rapidly disappearing.

The clearings made in the more or less extensive patches of hard-wood in the dry, sandy lands throughout Western Florida are taken possession of by the sand pine or hammock pine (*Pinus clausa*), a tree of no value—the Southern spruce pine (*P. glabra*) occupying the ground in the same section of country in the richer low hammock lands.

Less striking are the alterations in the character of the woods which take place in the forests of deciduous leaved trees in the bottom lands, fertile plains, and the uplands, with the most fertile soil. The hard-wood forests in the central and upper parts of the Eastern Gulf States, harboring yet large supplies of valuable timber of white oak, sweet gum, yellow poplar, hickory, white ash, and some black walnut, will surely

melt away with a rapidity that can scarcely be realized now, under the heavy demands of the near future created by the needs of this whole country. With the steady increase of population, the fertile lands bearing these resources, wherever they can be brought under the plow, are certain to be devoted before long, to the raising of the staple crops of this section in the same way as has happened with the rich forest lands throughout the North, where their timber supplies of a little more than a generation past had been deemed almost inexhaustible. The second growth of the rich alluvial woods, as observed in the upper part of the Mississippi and Yazoo delta, has been found to consist principally of sweet gum, red elm, water elm, honey-locust, box elder, and hackberry. Young black walnuts are frequently found springing up in all the openings in the river bottoms. None of the valuable white oaks have been seen amongst the second growth.

It would exceed the limits of this paper to dwell any further upon the details of these alterations in the character of the forests of the lower Southern States. One fact observed in this section, as elsewhere in this country, important in its practical bearings, stands forth prominently—that is, that the kinds of greatest economic value are giving way before those inferior in quality, demonstrating that the resources of our most valuable kinds of timber can only be restored by the establishment of forest plantations.

That such plantations of our most valuable timber trees, found originally only on the richest lands, can successfully be established on poorer lands of comparatively but little value is evident from the thrifty growth such trees as the black walnut, the yellow poplar, the live oak, the cow or basket oak (*Q. Michauxii*), the white ash, and others are found to make under the influences of the climate of the lower South.

Whatever is effected by the spontaneous efforts of nature in the way of the restoration of the forests, the aid of man is required to secure that which is of most value to him.

RECLAMATION OF WASTE LANDS.

BY B. G. NORTHROP, L.L. D.

There are four kinds of waste lands in the Atlantic States, including ten Southern States—

1. Swamps and marshes.
2. Sand barrens.
3. Exhausted lands, once arable and fertile.
4. Rough hill-sides, formerly good grazing ground, now overrun with worthless weeds and brush.

The reclamation of marshes by drainage, both surface and subsoil, has been carried on so long, extensively and successfully as to need no detailed discussion here. England, Ireland, and Holland contain millions of acres of such reclaimed land. Lakes, from ten to fifteen miles in length, have been thoroughly drained, and such bottoms are usually very fertile. The drainage of the Lake of Haarlem, in Holland, was completed more than thirty years ago. The lands thus reclaimed have since been sold for nearly three and a half million dollars. The success of this grand experiment has prompted many others, like the draining of the Zuid Plas, a lake covering over 11,000 acres; an arm of the Sheld, covering 35,000 acres; the enlarging and deepening the tunnel, originally cut by the Emperor Claudius, 1800 years ago, to drain Lake Celano in Italy, a work costing the Italian government over $6,000,000 and recovering 42,000 acres. Though this work of Claudius, the wonder of that age, employing 30,000 men for eleven years, was successful during his reign, it afterwards fell into disrepair, and was neglected for centuries. It is one of the many proofs of the revived enterprise of the present government, rivalling their historic ancestors, that they have restored and surpassed this old Roman work. While in our country, with vast areas of virgin soil, *such* expenditures would be unwise, there are large tracts of marshes that may be easily and economically drained. Much has already been done in this direction on the New Jersey seacoast, along the shores of Lake Michigan, on the Massachusetts seacoast, as at Marshfield, and still more in California, where over 200,000 acres have been improved by protection from overflow. The improvement of low lands by layers of sand is too familiar to need description.

But, will it pay to plant trees on a barren, sandy plain, is the practical question. Here experience is our best guide. Over 10,000 acres on Cape Cod, which thirty years ago were barren sandy plains, are now covered with thriving *planted* forests. I have visited the Cape in order to inspect these forests and observe this great transformation,

and have asked many farmers the question, Does it pay? and always received an affirmative answer. The seeds were sometimes sown broadcast, but usually dropped in furrows. The following statement of one farmer will illustrate the replies of many others. "When I came to this spot, twenty-five years ago, not a tree could be seen from my house-lot, and the land could be bought for twenty-five or fifty cents an acre. Now, covered with trees, it is worth twenty dollars an acre. Besides, it has paid me over and over in the enjoyment of the improved looks of my place."

An interesting, and so far successful, experiment in reclaiming barrens by tree-planting was begun eight years ago by Mr. H. G. Russell, at East Greenwich, R. I., on an arm of Narragansett Bay. I have recently visited this forest plantation to learn Mr. Russell's methods and their results. His previous attempts to cultivate this land were failures. "For every dollar expended in trying to fertilize for crops I could not get a return of ten cents," said Mr. Russell. Here are now over three hundred acres of planted trees. More than 500,000 trees have been "set out," and many bushels of acorns, chestnuts, and other nuts or tree-seeds have been planted in the fields where they are to grow. Sixty acres of this land were a worthless and unsightly "sand blow" drifting before the winds which sweep over these barren reaches. At first these waving sands could be held in place only by brush or other rubbish till the thickly planted trees fastened them with their intertwining, rootlets or dropping and decaying foliage. While Mr. Russell's primary motive was not pecuniary profit, but to transform those unsightly barrens into an attractive forest and form extensive wind-breaks to shelter his estate of nearly seven hundred acres, he is greatly gratified by the success of his experiment, and confident that all his expenditures in tree-planting will prove a remunerative investment. At a fair valuation, present and prospective, of his plantation, the accurate account kept from the beginning of all outgoes for trees, nuts, seeds, and labor gives a balance on the right side of the ledger. This plantation is a sort of Forest School, or rather an object-lesson for New England. Already his young forest has proved a source of great and constantly growing enjoyment, and taught him that there is a peculiar pleasure in the parentage of trees—a pleasure that never cloys, but grows with their growth.

The question has often come to me, "What kinds of forest trees will thrive best on sandy plains or hills?" The answer must vary with the climatic conditions of each State or country. Experience is here our best guide. For the reclamation of the sand barrens of Plymouth and Barnstable counties, Massachusetts, referred to above, the common pitch pine was at first generally used. Recently the Scotch pine and European larch have been widely planted. Said one of the Cape Cod farmers, who has planted over a hundred acres, "My plan, carried on for some forty years, has proved a successful and profitable experiment. Fresh pitch pine seeds, carefully gathered and worth two dollars a pound, are as sure to vegetate as corn. I have planted seeds both with a "planter" and by hand. On our light sands a man and a boy will plant three acres in a day. It will take about half a pound of seed to the acre." Another farmer said that he found the total expense of planting the pine seed to be two dollars and twenty-five cents per acre. The cost of *setting out young trees*, twelve to eighteen inches high, is about eight dollars per acre.

Douglas & Sons, of Waukegan, Illinois, six years ago began the work of reclaiming barren sand-ridges near the shore of Lake Michigan, trying pitch pine, white pine, Austrian pine, and Scotch pine. Here, as on Cape Cod, the Scotch pine proved the best for reclaiming sandy barrens.

Another very successful experiment has been tried by J. S. Fay, near Wood's Holl, in Falmouth, Mass. Mr. Fay says: "Thirty years ago this was a barren waste—the soil dry and worn out. When I bought my place, I was told that trees could not be made to grow there, and hardly any tree could be seen from my house. The Scotch pine from the seed did the best. The European larch did not start well from the seed, but from the nursery it has grown remarkably." Mr. Fay imported 35,000 plants, of which the larch has proved the most rapid grower and is the most valuable tree. He has now a fine forest of two hundred acres, which the members of the American Congress of Forestry were invited to inspect the day after its late meeting in Boston. It was regarded by all as a demonstration of the practicability of reclaiming barrens by tree-planting. In the language of the official report—

"On as bare and wind-swept piece of ground, perhaps, as can be found on our coast, and on poor soil, Mr. Fay began to plant tree-seeds thirty years ago, and here to-day is a dense body of wood, in places almost impenetrable. Many of the trees are fifty or more feet in height, The members of the Congress were delighted to see this proof that forest trees can be so easily raised from seed under such unfavorable circumstances. It was a confirmation of what they had believed and taught, and nothing more convincing or encouraging could be asked for. Said Mr. Fay, "Farming would not pay in such a situation, but raising of forests would."

There is no longer any need of importing larch, or any economic trees. Douglas & Sons, above named, furnish the two-year-old plants for four or five dollars per thousand. G. H. Wright, a nurseryman of Sioux City, Iowa, who sold over ten millions of trees last spring, offers the seedlings or yearlings of white ash, soft maple, or box elder at one dollar and a half per thousand; white or red elm at two dollars per thousand; catalpa speciosa at six dollars, provided that not less than 10,000 are in one order, the purchaser to have the right to select such varieties of trees from his full list as he may desire to make up the 10,000.

An extensive experiment for the reclamation of beach sand lands was tried most successfully nearly a hundred years ago, along the coast of the Bay of Biscay, where the sand-hills, or dunes, as they are called, stretch over a hundred miles. These dunes, ranging from 180 to 320 feet above the level of the sea, are composed of white, silicious sand, rounded and reduced to minute grains by trituration. These grains are still too heavy to be borne aloft by the winds and scattered afar like the ashes of volcanoes. On the Atlantic shore of France the prevailing winds are from the west and southwest. Hence, at low tide, the sands, dried by the sun and the wind, are driven as along an inclined plane, up the slopes which descend seaward, and thus form these growing dunes, which, moving inland, have created great desolation.

The practicability and even the possibility of reclaiming such sand barrens is so generally doubted, that it is needful to show what has been done in this direction under conditions the most unfavorable and where it was confidently predicted nothing could be made to grow. The feasibility of reclaiming our barren wastes is proved by many facts abroad and at home. Our Atlantic sand-planes were once covered with forests. The now bare, white sand-hills of Provincetown were described by the Pilgrims on their landing there as well wooded. The sand-hills on the coast of Prussia were formerly wooded down to the water's edge, and "it was only in the last century" (says Geo. P. Marsh) "that, in consequence of the destruction of their forests, they became moving sands." The history of the dunes of Michigan is the same. Fifty years ago, when that region was scarcely inhabited, they were generally covered with a thick growth of trees, and there was little appearance of undermining and washing on the land side or of shifting of the sands, except where the trees had been cut or turned up by the roots. The sand dunes of Denmark cover over 160,000 acres; those of Prussia, 110,000; those of the single province of Gascony, in France, over 200,000, and in all Europe the drifting sands, according to Pannewitz, cover 7,000,000 acres. Says Marsh, "There is no question that most of this waste is capable of reclamation by simple tree-planting, and no mode of physical improvement is better worth the attention of civilized governments than this. There are often serious objections to extensive forest-planting on soils capable of being otherwise made productive, but they do not apply to *sand wastes*, which, until they are covered by woods, are not only a useless incumbrance, but a source of serious danger to all human improvements in their neighborhood."

This is a subject of practical interest to us, because we have along our coast, as in Massachusetts, in Connecticut, in New Jersey, in Delaware, in Maryland, and other Atlantic States, on the gulf coast, on the eastern shore of Lake Michigan and elsewhere, long tracts of drifting sands that have done serious local damage. To stop their extension considerable expenditures have already been made in several States to cover their surface with a vegetable growth. But this reclamation of barrens and sand dunes has been carried on most extensively and successfully in Europe. Nearly a century ago Bremontier published a memoir on the reclamation of sand dunes. Under the patronage of the French government, he successfully introduced the planting of the maritime pine along the Atlantic coast of Gascony. These plantations have been perseveringly continued from that time to the present, and now cover over 100,000 acres in the single district between the rivers Adour and Gironde. Not only has this wide area been reclaimed and made productive soil, but a still greater extent of fertile land has been rescued from the destruction threatened by the advancing sand-hills. In speaking of the monument erected to Bremontier, in this now stately forest, Marsh says: "He deserves to be reckoned among the greatest benefactors of the race."

In planting the dunes, a barrier along the shore was found necessary at first to protect the young trees from the rolling sands, which otherwise would bury them. A double line of paling was erected parallel to the shore and a hundred meters from high-water mark, the second line being a hundred meters further inland. This paling is made of planks sharpened at the lower end and driven into the sand. Spaces of an inch between the planks, allow sand enough to pass through to bank up equally on both sides and relieve somewhat the force of the wind by allowing it to pass through those openings. As the paling is covered by the sands, the planks are raised, one at a time. A movable frame, with a long lever and mounted on runners, so that it can be slid along the top of the fence, and having pinchers and a chain, is easily carried and

operated by one man. France now draws an annual revenue of 130,000 francs from the resinous products of these forests. But in this case, the greater profit comes from the consequent protection of the adjoining country from the encroaching sands, which had formerly sterilized fertile regions and buried thriving villages. M. Samanos says that "in all France nearly one million acres (400,000 hectares) of desolate land, supposed to be doomed to everlasting sterility, have been reclaimed, and these savage deserts are now stocked with maritime pines, which will become for the country a fruitful source of wealth and supply some day the wants of the whole of France."

I will name a few illustrations of the extent of this work. Hummel attributes the devastation of the Karst, the high plateau lying north of Trieste—until recently one of the most parched and barren wastes in Europe—to the felling of its woods, centuries ago, to build the navies of Venice. The Austrian government is now making energetic, and thus far successful, efforts for the reclamation of this desolate waste, having planted over half a million of young trees and sown great quantities of seed. In the vicinity of Antwerp, less than fifty years ago, was a vast desolate plain. Looking to-day in the same direction, from the spire of the cathedral, one can see nothing but a forest whose limits seem lost in the horizon. Forest plantations have transformed these barren lands into fertile fields. On the Adriatic, Baltic, Mediterranean, as well as the Biscayan coasts, the disastrous encroachments of the sea have been checked by forest plantations. Extensive plains, once barren sands, south of Berlin, about Odessa, and north of the Black Sea, and vast steppes in Russia are now well wooded.

All sand wastes are by no means alike. Trees which will grow luxuriantly on one will pine away and die on another. The climate, too, varies as well as the soil. The soil of Cape Cod and Nantucket is well fitted for the maritime pine, where it has been amply tried. It grows well for a season or two, but is sure to winter-kill in a few years. It suffers from the severity of the winter in Holland and Germany. Sea-spray and saline constituents in the soil or air are fatal to some trees and favorable to others. A knowledge of the natural growths of each vicinity will favor adaptation to local conditions.

Though dry at the top, sand dunes and most sand plains and hillocks are *moist* a little below the surface, by reason of evaporization from the lower strata, retention of rain-water, and capillary attraction. The latter cause depends upon the size of the grains of sand. The finer the grains the greater is the capacity for receiving moisture and the longer is the moisture retained.

The benefits that may accrue to our country from the discussion of tree-planting, were strikingly exhibited 220 years ago, when Sir John Evelyn published his celebrated work, entitled "Sylva; or, A Discourse on Forest Trees and the Propagation of Timber." It was at once received with great popular favor and honored with royal commendation. He had remarkable success in awakening general interest in sylviculture. It was written while he was employed in an entirely different branch of public service, but, as he says, "from an earnest desire to support the credit of the Royal Society, and to convince the world that philosophy was not barely an amusement, fit only to employ the time of melancholy and speculative people, but a high and useful science, worthy the attention of men of the greatest parts and capable of contributing in a supreme degree to the welfare of the nation." He was one of the founders of the Royal Society, and wrote this book at its special request, and that society has originated few books in the last 200 years more useful than this one, which still survives, in its grand results, although his other works on painting, sculpture, architecture, and medals have long since been forgotten. In many ways England has recognized her great obligations to the man who worked so lovingly and so effectively for the good of his countrymen. Disraeli, in his "Curiosities of Literature," fittingly says: "Had Evelyn only composed the great work of his Sylva, his name would have excited the gratitude of posterity. The voice of the patriot exults in the dedication to Charles II. prefixed to one of the later editions, in which he says: 'I need not acquaint your majesty how many millions of trees have been planted throughout your vast dominions at the instigation of this work, because your majesty has been pleased to own it publicly for my encouragement.' Surely, while Britain retains her position among the nations of Europe the Sylva of Evelyn will endure among her triumphant oaks. It was a retired philosopher who aroused the genius of the nation, and who, casting a prophetic eye towards the age in which we live, contributed to secure our sovereignty of the seas, for the navy of Great Britain was constructed with the oaks which the genius of John Evelyn planted."

These successful experiments, tried in so many European countries, on so broad a scale and for so long a period, and even on the most unpromising beach-sands, show the practicability of reclaiming our barrens, not necessarily by planting the same trees, or by the same methods, but by those plans which the study of local conditions may

suggest. Aside from direct profit, what can add so much to the attractions and, therefore, the worth of the farmer's home, as that recuperation of any surrounding barrens which shall literally make the desert "bud and blossom as the rose?"

If one is to be commended who makes two blades of grass grow where but one grew before, how much more the farmer who makes forests thrive, where nothing now grows?

SEA-COAST PLANTING: ITS IMPORTANCE, PRACTICABILITY, AND METHODS.

BY WM. C. STRONG, NEWTON HIGHLANDS, MASS.

Our visitors from the fertile regions of the West undoubtedly receive the impression that the soil of New England is thin and poor—that the hills are barren and the growth of wood is meager and stunted. They notice intervals and selected spots which are highly cultivated and enriched. But the prevailing aspect, it must be confessed, is that of an impoverished soil.

Very different was the impression produced upon the early voyagers to these shores. Though accustomed to the luxuriant growth and the stately forests of Old England, yet they uniformly report in glowing terms of this goodly land.

Gosnold, who is believed to have been the first Englishman who set foot on the soil of Massachusetts, describes the island which he named Martha's Vineyard as "full of most pleasant wood, vines, gooseberry bushes, hurt-berries, raspberries, eglantine," &c. Of one of the Elizabeth Islands he speaks as "overgrown with wood, viz., oaks, ash, beech, walnut," &c.

In 1603 Captain Martin Pring writes of the "goodly groves and wood" along the coast at what is now Saco, Kennebunk, and York, in Maine. Twenty years later the Pilgrim settlers confirmed the fact that the land was well wooded and the few open open spaces were rich and productive.

Emerson is warranted in saying that "a few generations ago an almost unbroken forest covered the continent." (This is true at least of New England.) "The smoke of the Indian's wigwam rose only at distant intervals, and to one looking from Wachuset or Mt. Washington the small patches laid open for the cultivation of maize intercepted not perceptibly the dark green of the woods."

And this growth of trees was extended even down to the sea.

The company sent out from the Mayflower, when at anchor in the roadstead of what is now Provincetown, reported of Cape Cod that it was "well wooded and the appearance of the soil was promising." In Mourt's Relation, printed two years later, this same Cape is described as "wooded to the brink of the sea," "compassed about to the very sea with oaks, pines, junipers, sassafras, and other sweet-wood;" and again, "all wooded with oaks, pines, sassafras, juniper, birch, holly, vines, some ash, walnut—the wood for the most part open and without underwood, fit either to goe or ride in;" and of Clark's Island and Plymouth harbor, "fine islands, wherein are nothing but wood—oaks, pine, walnut, beech," &c. Of Nantasket (now Middleboro) he says "there is much good timber, both oaks, walnut, fir, beech, and exceeding great chestnut trees; and although the country be wild and overgrown with woods, yet the trees stand not thicke, but a man may well ride a horse amongst them." The Pilgrims report Plymouth harbor as "compassed with a goodly land and the country was well wooded." Eleven years later Wm. Wood describes Boston as "being a neck which hath very good land, affording rich corn-fields and fruitful gardens, but as being bare of wood. Their greatest wants be wood and meadow ground, which never were in that place, being constrained to fetch their building timber and fire wood from the islands in boats." To relieve the good people of Boston an order was passed in 1632 allowing them to take wood from Dorchester (now South Boston) for twenty years. The same author describes the islands near Boston as follows: "In any of these harbours, the seamen having spent their old store of wood and water, may have fresh supplies from the adjacent islands, with good timber to repair their weather-beaten ships. Here, likewise, may be had masts or yards, being store of such trees as are useful for the same purpose." "And whereas it is generally conceived that the wood grow so thick that there is no more cleared ground than is hewed out by labour of man, it is nothing so; in many places divers acres being clear, so that one may ride a hunting in most places of the land, if he will venture himself for being lost. There is no underwood saving in swamps and low grounds that are wet."

The early records of Charlestown speak of it as "an uncouth wilderness full of timber." Of the shores of Cape Ann, in 1630, Winthrop says "we might see the trees in all places very plainly."

Morton's New English Canaan mentions "abundance of ash, elm, beech, walnut, chestnut, pine, cedar, cypress, spruce," &c. Josselyn's Rarities, in 1672, states that "the country is extremely overgrown with wood."

Thus we see there are abundant authorities confirming the current traditions that not only the inland, but also the islands and the shores were heavily wooded to the very brink of the sea.

It is foreign from my purpose to consider the climatic changes which have resulted from the destruction of these forests. Neither can we stop to consider the waste to the soil by reason of the exposure of wide stretches of country to the sun, the winds, and the rain, with no fresh deposits of vegetable matter to counterbalance the loss. It is enough for our present purpose that we recognize a vast change in the productiveness, especially on the islands and headlands of our seacoast. So poor is the soil and so bleak are the positions, that the impression prevails that it would be useless to attempt to replant and restore these shores to their former verdure. But the efforts of nature to cover every naked spot with vegetation are so universal and so persistent that we may well believe she would herself, if left undisturbed, in process of time, supplant the lower forms of vegetable growth until she could restore the stately monarchs of the wood. And we cannot doubt that by a judicious observance of the laws of nature, and by a persistent and systematic protection, forest belts may be successfully restored, even upon the bleakest shores, in a comparatively short time. Upon this point we are not left to conjecture. There are abundant experiments which prove the practicability of reforesting these shores.

Referring to the utterly barren sands of Cape Cod and Nantucket, Emerson cites the examples on the west coast of the continent of Europe, particularly in Holland and in Gascony, in France, where are "similar and more extensive wastes of drifting sands, called dunes or downs, which from time immemorial had been barren. These were tossed about by the winds like the waves of the sea, the whole aspect of the desert being sometimes changed by storm—valleys taking the place of hills, and hills of valleys." Quoting from Decandolle, he says (Physiologie Végétale, p. 1236, vol. 3): "The Dutch had for a long time been in the habit of sowing these downs with beech-grass, that its long matted roots might fix the sand. But if this takes from the sand its power of injuring, it leaves it wholly useless. I was struck with this defect and pointed out the advantage of planting trees there. I was not then aware that the engineer, Bremontier, had, as early as 1789, made trials of this very expedient on the downs of Gascony. Its success has since been made public, and I had the pleasure of witnessing it with unaffected admiration. The process of Bremontier is remarkable for its simplicity. He sows in the loosest and dryest sand the seeds of broom (*Genista scoparia*) with those of the maritime pine, and covers the surface sown with branches taken from the nearest pine forest. The object of the branches is to arrest the sand for a time and keep it from blowing away. The plants of the broom spring up first and by their rapid growth serve to retain the sand in its place and to shelter the young pines. These continue to grow for seven or eight years under the shelter of the broom, the leaves of which annually mingle with the soil and fertilize it. After this the pines overtop the broom and often kill it by their shade. At the age of ten or twelve years they begin to thin the forest to make tar and to get branches for continuing the process of sowing. In about twenty years they begin to cut down the trees to extract the resin. These forests, situated on the downs along the sea, protect from the continual action of the west wind the whole space situated behind them, and thus at the same time that they themselves furnish an important product they secure those of the rest of the country."

I have quoted this extract at length because it covers the question so fully, and shows conclusively that the bleakest and poorest shores may be reclaimed. Other instances of success might be cited, and it is proposed that you should personally inspect the extensive and successful plantation of one of our enterprising citizens in this direction. Of course it is evident that our islands and shores are not to be reclaimed by the ordinary methods of tree-planting. They are too poor in soil and too much exposed to the fierce ocean winds to warrant the promiscuous planting of trees of any size. But we may with all confidence follow the example of Bremontier. It is safe to say that we have no more discouraging spots on our entire coast than he found on the shores of Gascony. In most cases we might advance from seeds to seedlings of two or three years' growth as the commencement of the shelter. And we have a native growth in the common pitch-pine (*pinus rigida*), a tree equally as hardy, as valuable, and quite as well adapted for this purpose as the maritime pine. It will not only endure the bleakest ocean exposure, but also the dashing of spray and the temporary saturation of the soil with salt water. It may, therefore, safely be considered the advance guard for all other trees along our northern coast, and it will thrive in the poorest soils, where scarcely anything else will grow.

The average growth of pitch-pine on sandy plains, too poor for cultivation, is from twelve to eighteen inches per annum, and it is found that such soils, in a period of about fifty years, may be covered with pines a foot in diameter and forty or fifty feet high. It cannot be doubted that beginning with seedling pines two or three years old, together with sweet fern (*comptonia*) and our native white birch, a narrow belt might be established along the coast which would soon afford protection for other hardy trees of more rapid growth. The late Frederick Tudor erected a high lattice-work on the bleak promontory of Nahant, behind which, sifting as it were the ocean blasts, he was able to raise all our fruits with eminent success. The Scotch, Austrian, and white pines would require but slight shelter to join the ranks and speedily cover our sandy coasts. For the stronger soils the oaks, the white spruce, and numerous other varieties would speedily follow. Thus, by a wise, patient, and persistent method, from small beginnings, we may with certainty and in a moderate number of years convert the bare and desolate islands and headlands of our harbors and the sandy barrens along the coast into groves of luxuriant verdure. What a protection such a belt would be to the inland country! What a protection to such a harbor as Boston! And especially what a transforming effect in the beauty of scenery! The general impression of the islands in our harbor is that of barrenness and desolation, with here and there a small group of trees as a slight relief. But how exceedingly beautiful might these numerous islands and inlets and vistas be made, if relieved by a healthy growth of pines and oaks and arching elms. It is no wonder that the early voyagers to these shores were enthusiastic in their description of the abundant woods of this goodly land. Even to the brink of the sea they suffered not in comparison with the stately forests of old England.

It is not to be doubted that the extent of forest had not only an effect upon the distribution of rain, upon the humidity of the atmosphere and of the soil, and upon the currents of wind, but that also the soil was annually enriched by fresh deposits of vegetable matter, which was protected by the shade, and not allowed to dry and blow or wash away. The process of deterioration has been going on for more than two centuries and it is true that we now have to start as at the beginning. Yet in manifold ways the end is so desirable that it is worthy of all effort to attain it. It is a slow process to restore the soil to its pristine fertility. But it is by no means such a task to clothe our coasts with the verdure of forest-growth. In a single generation the whole aspect may be changed. And if this were the sole object to be gained, the beautifying of the harbor and the coast, it would yet be worthy of all effort to attain it. The yearly-increasing taste for sea-side residences, the popularity of steamboat excursions and public resorts, the vast amount of coast and ocean travel, is making it correspondingly important that our shores should be made attractive. When such marked improvement might be obtained at slight cost of money, time, and co-operation—when manifold other advantages are also apparent—does it not seem to be wise to secure combined enterprise, and possibly *State* encouragement, to the end that our shores may again wave with verdure?

TRANSPLANTING EVERGREEN TREES.

BY WM. C. STRONG, NEWTON HIGHLANDS, MASS.

In the northern belt of the United States the time for the successful transplanting of trees is so limited that the work is necessarily hurried. In this respect the western shores of Europe, which are affected by the warm breath of the Gulf Stream, present a great contrast. In England, for example, the work of transplanting proceeds in every month from October until May.

We, on the contrary, have a brief limit of about a month in the fall, and but little more time in the spring. For evergreens, the month of May has generally been considered the only suitable time. It is agreed by all that they should not be moved late in the fall, nor even in early spring. As their name implies, evergreens are always in foliage, and consequently are at all seasons demanding a supply of sap from the soil. If a spruce tree, for example, is planted in March or April, when the ground is wet and cold, the roots will remain inactive, while the dry winds are searching through the branches, and in order to supply the evaporation the leaves are making a severe and oftentimes fatal draft upon the sap of the tree. The case is still worse when a tree is transplanted late in the fall, for the roots cannot take hold until the ground becomes warm in the spring, and yet the leaves are in action to some extent, even in winter. It would therefore seem essential to plant at a time when the roots can speedily move and obtain a supply for the demand from above. In May the ground is becoming warm—the dormant life of the tree is aroused—the roots are coming into action and

form rapidly. It is therefore a good month for planting. But the young growth in June is soft, the days are hot, evaporation is excessive, and as a consequence transplanting is often a severe check. It is well known that most kinds of evergreens make little growth for the first season after planting.

Are we, then, limited mainly to the month of May for doing this work? I am sure that both theory and results will answer No. A consideration of the nature and habits of evergreens will indicate that in some respects even more favorable conditions may be obtained in August and early September than in May. The roots of most evergreens continue to grow throughout the summer. If they are summer pruned with a spade new roots are freely thrown out. On the contrary the growth of branches of most kinds is in June and early July. After this the only process is the maturing and hardening of the growth. Now it would seem, upon this statement, that all the conditions for removal are obtained in August. The wood is now fairly hardened and evaporation is much less than in June. There is to be no immediate tax for new growth. At this season the earth is thoroughly heated, and when well pulverized gives a gentle moisture and warmth, which greatly encourages the formation of new roots. Moreover, the nights are cooler and dewy, so that the tree has, as it were, a gentle bottom heat, with coolness and moisture at the top. These are the precise conditions for the propagation of evergreens from cuttings. It is well known that cuttings taken in August will root more speedily than at any other season. And a young tree being only an advanced cutting, it stands to reason that it will as readily form new roots in August and become established in its new quarters.

But may we expect that it will get such hold in the soil as to be able to endure the winter drain? This is a question to be settled only by experiments. In the year 1870 I made a trial so extensive and so severe that I have since considered the question as fully answered. I will state the facts. Having a tract of land which I decided to convert into a pond for the purpose of cutting ice, it became necessary to transplant about 40,000 spruce, hemlock, arbor vitæ, and other evergreens in the month of August. These trees were of the usual nursery size, from two to five or six feet in height. The field to which they were removed was about half a mile distant, rather exposed, and on the north side of a hill. It had been previously well ploughed, with furrows opened as for potatoes. But August proved to be an exceedingly hot, dry, and cloudless month, the sun glaring like a ball of fire day after day and week after week. Yet the work must proceed in spite of the opinion of an eminent planter that every tree would die. At the commencement each tree received the third of a pailful of water after planting; but this process was laborious and was not continued for the bulk of the trees. The work proceeded for weeks in the broiling heat, without a drop of rain, until it was finished about September 15th. I had occasion well to remember the remarkable fall drouth which followed—the projected ice-pond receiving no water until late in November. Yet the result was a complete success, with scarcely the loss of a tree. It was a pleasure to take up samples in November and see the mass of young roots which had formed in the soft, virgin soil. The fact that they had received no rain was more favorable to the formation of roots than cold and excessive autumn rains would have been. And I felt sure that, though the trees had been taken from a sheltered valley and placed on a cold north exposure, yet they had such new root-vigor that they could well endure the drafts of winter. This proved to be so—scarcely a tree being injured in the following winter, and the growth during the next summer was as vigorous as though the trees had not been removed. This trial was so extensive and under such severe tests, resulting in such complete success, that I have since regarded the month from August 15th to September 15th as eminently suited for transplanting evergreens. Of course the usual conditions to protect the roots from sun and air are to be carefully observed, and also a word of caution may be added: that if forwarded in boxes for any considerable distance when the weather is hot, some precaution should be taken to prevent heating.

CULTURE OF THE BLACK WALNUT IN NORTHERN LATITUDES.

BY HON. H. G. JOLY, OF QUEBEC.

I have been asked more than once what induced me to choose, of all trees, the black walnut, which does not grow spontaneously here, being only found as a native tree further South, and why I should risk the expense and trouble of making large plantations of it.

I chose it on account of its great commercial value, so much above that of all our native trees, either oak, pine, or spruce, and I do not regret my choice, as the black

walnut grows more rapidly than any of those trees, and is as easy to cultivate from seed, easier in fact, than the pine.

But will it stand our winters? On that point my experience may be of some use, and I hope it will encourage the culture of such a valuable tree as the black walnut in such high latitude as ours, forty-six degrees forty minutes north, near Quebec.

Until this last summer, 1885, the result of the last twelve years appeared to justify the conclusion that the black walnut can stand even our Quebec winters, with impunity. The effect of last winter's exceptional severity compels me to speak with more reserve, as it killed about three hundred of my young black walnuts which had safely stood the ordeal of several winters. However, I do not regret the loss, as it has shown me how to prevent its recurrence and provide against more serious loss in the future.

When the spring opened, those young trees showed no signs of distress. Their buds began to swell, like the buds of other trees; a few even opened. It took some time to realize that vegetation was at a standstill with them. The stem and branches looked healthy, the bark fresh, the under bark green. A few bore marks of sunburn, but the same marks were found on some of the growing trees. I was quite puzzled, as long as I looked *above ground.*

And here I must express my sense of the great benefits rendered by the Horticultural Associations, whose members generously place at the disposal of the public, in their printed reports, the results of their labors. I found in the Report of the Transactions of the Mississippi Valley Horticultural Society for the year 1884 the explanation, which I had long sought in vain, in the remarks of Mr. Peffer, of Wisconsin, as reported on page 187 of said Transactions. He says: "I could not see how my trees were damaged until I looked below the surface of the ground."

Up to that moment I had hesitated to dig up my trees, hoping that they might still escape. But I followed Mr. Peffer's lead—dug up some of the trees, and found out what was the matter with them. They were completely gone. The bark of the roots was all mildewed, burst, and completely separated from the wood for a depth of from twelve to fourteen inches from the surface; below that it was quite sound, adhering closely to the roots. It was evidently the result of the frost acting on the water contained in the soil and in the roots.

But why, out of several thousand black walnut trees growing on the same soil, and with the same conditions of moisture, did I lose such a small proportion as only three hundred? The answer was easily found. All the trees killed by the frost were standing in parts of the plantation where the first snow had not rested, as there happened to be there no obstruction to prevent its being swept away by the wind, and where the unusually heavy rains of last December left a coating of ice round the foot of the tree.

The trees growing where fences and hedges arrested the snow and caused it to remain on the ground, escaped, without one single exception, though many were just as much exposed to the force of the wind as those that were killed, as they stood *on the same side* of the hedge, but where the ground was covered with snow. That made all the difference. The snow had protected the roots from the frost and prevented the formation of ice round the foot of the trees. Three different plantations, widely apart from one another and on different soils, gave exactly the same results.

It is easy enough to cause the snow to remain where it is wanted, especially by means of hedges. A willow hedge costs next to nothing—just the trouble of sticking the cuttings into the ground at the proper season, when they will never fail. Those hedges are as useful in summer for the young trees as they are in winter. A knowledge of the direction of the prevailing winds will help to place them where they can be most effective in collecting the snow, which I consider as the real protection for young trees, orchard trees as well as forest trees, against the severity of our winters; fences, rails, branches, stones, any temporary obstacle that will arrest the snow will answer the purpose until the permanent hedges are ready to do their part.

I am now taking those precautions, for the purpose of sheltering the young walnuts transplanted last spring, and will make you acquainted with the results at our next annual meeting.

THE RED CEDAR AND OSIER WILLOW.

BY EDMUND HERSEY, HINGHAM, MASS.

Among the valuable trees that are indigenous to Eastern Massachusetts may be classed the Red Cedar. Few, if any, of our native trees possess so many points of excellence as this. It is valuable as a timber tree, highly ornamental as a shade tree, and surpassed by few trees or shrubs for a hedge when kept properly trimmed. It may

be trimmed so as to make a wind-break, or it may be kept low simply for an ornamental hedge. It possesses the important qualities of hardiness and freedom from destructive insects. It will grow not only on the rich intervals but also on the sandy plains or barren hill-tops, in the most sheltered nooks, and on the bluffs that are sprinkled by the ocean spray.

It is the opinion of too many, whose opportunities should have taught them better, that it requires nearly a century for a red cedar to grow from the seed large enough to make a fence-post, but there is abundant evidence to prove that it requires but from thirty to forty years for a tree to grow large enough to be worth for this purpose one dollar. As 500 trees can be grown on an acre of land, it is evident that on land that can be bought for ten dollars per acre it would be a profitable tree to grow, simply for posts.

The bright red color and the spicy odor of the heart-wood of this tree renders it very valuable for cabinet work, especially for chests or drawers in which to keep clothing from destruction by insects; but to grow trees for this purpose, like the black walnut, requires some years to ripen the wood after it has grown. To obtain lumber of a rich dark color requires from fifty to seventy-five years. The most profitable way to grow it for this purpose would undoubtedly be to permit not more than fifty trees to grow on an acre, and use the land for a pasture, as this number would not injure the feed but very little, if any, the red cedar being a tree which, on dry land, increases the amount of grass over which its shadow passes, and decreases it only on a very small space directly around the trunk of the tree.

Whenever division fences are to be made of wire, the red cedar will make one of the best line-posts of any tree we have. It grows upright, with a very straight trunk, shades but little, is of medium size, does not extend its roots to a great distance, and will grow well on a great variety of soils; all of which are desirable qualities in a line fence-post.

If farmers, when they put up a wire fence and attach it to posts such as are usually used, would set a small cedar tree between the posts, by the time the posts decay the trees would be large enough to attach the wires to them, thus making a very cheap fence that would last for generations, and when changes required its removal the trees could be utilized for lumber.

There are varieties of the red cedar which, when set in groups a few rods from the dwelling, possess a natural beauty which is not surpassed by any of our native trees. Without any effort to shape their form, there are varieties which will grow a perfect cone twenty to twenty-five feet high, and not more than six or eight feet in diameter at the base, the lower branches growing very closely to the ground.

The variety that will thus grow may be known when small by the cone form, fine branches, and bluish cast of the foliage. No doubt the want of the knowledge of how to select, when small, the right varieties of this tree for ornamental purposes, has kept it out of the list of trees most desirable for ornamenting public and private parks. The variety which has open branches, extending widely from the trunk, with foliage of light green color, is not desirable as an ornamental tree. The two varieties can be very easily distinguished when very small by those who have informed themselves of the difference between the two. The specimens which I here offer for your inspection show the two varieties; these are the extremes; they cross with each other and produce all shades between them.

For a hedge, the red cedar has the advantage of hardiness, beauty of form and color, and its wonderful power to adapt itself to any soil. It has been made to grow on a gravelly knoll, a sand hill, and in both a northern and a southern exposure; bears trimming very closely, and will grow so thick that a fly cannot pass through it, providing the variety with fine branches and blue cast of foliage be selected.

The red cedar ripens its seed in October and November, which should be gathered during the winter and planted as early in the spring as the frost leaves the surface of the ground. If sown on the surface of even grass land, and harrowed in with a heavy harrow, it will grow; or it may be sown in rows on ploughed land, covering lightly or just deep enough to keep the soil moist.

When small trees can be readily obtained, as they can in many towns in Eastern Massachusetts, several years may be gained by transplanting the young seedlings when six to eighteen inches in height. Trees growing in loamy land that is free from rocks and stones, can be more readily lifted without disturbing the roots from the soil that surrounds them than if they grow in a stony or gravelly soil. To properly lift a tree, a pointed shovel should be used to cut the sod and earth around it, cutting in a circle about the diameter of the height of the tree—the ball of earth, when carefully lifted with the tree, to be in the form of a bowl. For large plantations, or for hedges, trees not more than twelve inches in height should be selected. When not larger than this, and transplanted in cloudy weather, some time in the month of May, by one who

understands it, not more than two per cent. will fail to grow. When, in lifting, the roots of a tree separate from the soil that surrounds them, the tree should be at once rejected, as it is very difficult indeed to make a cedar, or, in fact, any other evergreen tree of any size above six inches in height, live when once the roots have been exposed to the light and air.

When only a few trees are to be removed but a short distance, with care, trees from two to three feet in height may be transplanted with success; but, as a rule, it is best to select trees less than twelve inches in height; then there will be but little, if any, check in their growth, providing the trees be selected, as they should be, growing singly in grass land, where they have had the unobstructed rays of the sun. Trees growing in the shade and trees which do not have limbs in vigorous condition growing close to the surface of the ground, should be rejected as unfit to transplant.

THE OSIER.

Very few who have attempted to cultivate this variety of willow have understood its characteristics, and so have failed to realize fully its value. Nearly every cultivator has attempted to grow it on moist, cold land, and has failed to obtain the best, or even satisfactory, results—it not being a tree that is adapted to low land, but grows naturally on high, warm land, where it makes a wonderful growth even when left to gather its substance from a thin, unfertilized soil. As it grows quite as well from cuttings as from roots, it is very easy to start a plantation. The cuttings, when set on good corn land, will make a growth of from two to four feet the first year. That the roots may become well established, the osiers should not be cut until the second year, when early in March they should be cut close to the ground. The first product is of but little value except for cuttings for new plantations. The following season the osiers will grow from four to nine feet in length, surpassing in quality the best imported European willow.

To give you an opportunity to examine and judge for yourselves how well this variety of willow will grow on very light land I have brought these specimens, which are the growth of the present season. The longest one measures nine feet and three and one-half inches in length, and less than one-half an inch in diameter at the large end, after the bark is taken off. The roots from which these were cut have been set about twenty years; the soil is a light, sandy loam, good mason sand being within a few feet of the surface. The land has never been cultivated or manured within many rods of where they grew until within three years; since then the land north of them has been plowed and a peach orchard set. The first year the land was manured with barn manure, the second year nothing was applied, and this year a few pounds of muriate of potash was applied to each peach tree; but no fertilizer was applied within ten feet of where the willows grow. When desired for basket-work, the osiers should be cut the next March after they have made one year's growth from roots more than two years old, and peeled as soon as the bark will readily slip. If not in a locality where they are wanted for basket-work, the osiers should be thinned out by cutting one-half of the smallest, and as soon as the leaves begin to show on the stems of those left uncut they should be removed by passing the thumb and finger from within a few inches of the top down to the ground, thus leaving only a tuft of leaves on the top, and preventing the growth of lateral branches. If the osiers thus stripped be permitted to grow two years longer they will be large enough for hoop poles, and being very smooth, straight, and of uniform size, they make one of the best materials for hoops for kegs and for binders for boxes in which merchandise is shipped.

Where there is a market for the willow for baskets and the method of peeling is understood, it is more profitable to cut every year for basket-work than to cut only once in three years for hoop poles; but in many localities it would be difficult to find men ready to buy the osiers for basket-work or to find those who understand the process of peeling them, though the process is very simple and requires but little time to learn it.

On good land three tons of peeled and dried osiers can be obtained from an acre, worth in the market $125 per ton. To peel the osiers by hand labor costs sixty dollars per ton, but by machinery much less, though as yet I have seen no machine that has been perfected which will do the work as well as it can be done by hand-labor; but no doubt there will be. A fair crop, on ordinary soil, is about one ton to the acre, thus giving a yearly profit of more than sixty dollars.

As the demand for osiers for basket-work is somewhat limited and confined to the cities, if very large quantities should be grown the market might be overstocked; but the demand for hoop poles is so large in all parts of the country that there is no probability that it will be overstocked for many years to come, and the profits for this purpose will exceed that of almost any crop which the farmer can grow.

In setting a plantation of willows, the land should be prepared by plowing and manuring as for Indian corn, and if it be grass-land it would be better to plant it one year to corn. The cuttings should be about twelve inches long, cut early in the season

before the sap starts, and set as soon as the ground will work easily; the cuttings should be set well down, so as to leave not more than two inches above ground, and on an angle of about forty-five degrees. If for basket-work, set in rows two feet apart each way; if for hoop poles, three feet each way. The land should be kept well pulverized the first two years, and the weeds and grass kept out, after which no further cultivation will be needed, as the crop will so shade the land that nothing else will grow. Unless the land be very poor, no manure will be needed after the first year; the leaves falling among the willows, which cover the ground so thickly as to prevent them from blowing away, gradually decay, and enrich the land the same as they do in a thick forest.

When the best methods of growing this tree or shrub are fully understood, a new and very profitable industry will be added to those which we now have.

SOME PRACTICAL HINTS ON TREE-RAISING.*

BY JOSEPH STORY FAY, WOOD'S HOLL, MASS.

There is a great attraction in watching the growth of trees. Children often plant peach or cherry-stones, apple-seeds or horse chestnuts for the sake of seeing them sprout and grow. There is no object in nature more generally admired than a thrifty tree. Then, too, there are many inducements to plant them. Like money at interest they grow while we sleep, and they are always a good investment. As the larger trees and finer timber are cut down, and the prices of lumber and wood in all their forms increase, we see a value in the smaller and more inferior ones, and realize the necessity of caring for them. On almost every farm and garden there are neglected corners and rough patches that are unused—too rough and stony to plow, too poor for pasture—where the spade cannot penetrate, but into which a tree-seed once planted sends down its roots and makes a home for itself. Nature is availing herself of these opportunities all the time, but the intelligent helper can hasten the work.

A good deal of labor is involved in the transplanting of a hundred trees, but little time is required to plant a hundred acorns, hickory-nuts, chestnuts, butter-nuts, beech-nuts, or black walnuts. It is necessary to put the seed away in fall for spring planting. Nature plants these various nuts or seeds in the fall, by dropping them among the fallen leaves in the little depressions of the earth, and there, if they were undisturbed, many would germinate and grow. But the mice and squirrels and worms devour many, while others fall under the trees, so that if they grow they are not in the right place and are shaded out. Thus but a small proportion of the seeds or nuts become trees. Mr. John Kenrick, of South Orleans, in this State, has made extensive tree-plantings, both of pine and of deciduous trees. The seed of the pine, protected by its shell, preserves its germinating power very well through the winter and can be planted in the spring. Acorns and the various nuts, unless cared for, dry up and mould and lose their vitality. To remedy this Mr. Kenrick puts his acorns or nuts, mixed with sand, or in layers, in a box or barrel, the bottom of which is bored full of holes. He then covers the top of the barrel or box with wire cloth to keep out rats and mice and, digging a hole in the earth, buries it five or six inches below the surface and covers it up. When the frost is out of the ground in the spring, he exhumes the box or barrel and finds all his acorns or nuts sprouted and ready to plant out. With a trowel they can be set just below the surface of any rough or stony ground, lightly covered, and they will grow with great certainty. Many hundreds can be planted in a day. This is a work that any one can do, and it is very practical and valuable. As we have said, now is the time to get the acorns or chestnuts or other nuts and to put them away for spring planting.

The fall would do equally well for planting but for the ravages of squirrels and mice. The seeds of the various kinds of pine and spruce do not require the same care. If kept in a dry place they will germinate without fail when sowed or planted in the spring. As most people know, these seeds are borne in a cone, which, when ripe, generally opens under the action of a sharp frost and the seeds fly out. Having wings, these are often carried to a considerable distance, and plant themselves in the open fields. After a cold, frosty day in autumn, with a strong northwest wind, the air to the leeward of a pine grove may be seen full of these flying seeds, and so the forests are enlarged. This is nature's process, and being very irregular, there are many parts of the open fields which are not seeded. The land-owner who wants to improve all waste or vacant space gathers the pine or spruce cones, dries them, and when they crack open shakes

*These notes have been written by the well-known pioneer of forest planting on the Massachusetts coast, and at his request find a proper place in this report.

out the seed and plants them in one of two methods. The first and simplest is, when there is a light fall of snow in the spring, to scatter the seed on the surface of the ground, so that it may be seen where it falls. Seeds are then not sown too thickly. The second method is either to plow shallow furrows about five feet apart, running around the hills rather than over them, following with a common vegetable seed-planter, or a man may, with a common corn-hoe, dig flat holes about four or five feet apart, a boy with a pail of seed passing along with him and dropping three or four in each hole. The man then flaps his hoe on the seed or treads his foot on it. Pine seeds need very slight covering. From six to eight acres can be planted in a day with a plowed furrow—three or four by the hoe. The work should be done as early in the spring as the frost will admit. Early planting does the best—that the seed may germinate before hot, dry weather sets in. If the season is very dry it may not all germinate the first season, and sometimes, when it does, the hot midsummer sun will wither it.

The method of broadcast sowing has been successfully practiced by me at Wood's Holl, while planting by the plow or hoe has been for the most part just as successfully carried on by Mr. John Kenrick, of South Orleans, and by others in the eastern part of Barnstable county. Perhaps the former method would be less laborious on very rough land. For the cape and the seashore the Scotch pine seems to have done the best in its vigorous and thrifty growth and its freedom from the insects and diseases which attack the native pitch pine. It makes a good shelter for other trees, but its value as timber or lumber has yet to be tested or its usefulness as a forest tree. It is, perhaps, too sappy and coarse-grained, but as a cover to oak or other deciduous trees in their early growth it is excellent and of undoubted use. The white pine does not do well where the salt wind touches it. It needs shelter on the coast, and so it is with the larch. For the interior the white pine is the most desirable, but probably the chestnut would pay better in the long run than any other tree. Pine seeds may be obtained of our principal seedsmen, who import them.

Much planting is done on a limited scale with trees raised in nurseries at the West, where, when the trees are six to twelve inches high, they are sold at about one cent each, but this requires more outlay of money at the start and more time and labor to do the work. Planting trees from the seed is like money put in savings banks and left to accumulate by compound interest. The land improves in value, as the crop grows, quite as rapidly as money is multiplied by the addition of interest, and probably more so. As the trees grow up from the seed they may be too near together, and from time to time will need thinning, and here will be found a supply of fuel which, in these days of open fireplaces, is always of value.

Mr. John M. Forbes, of Naushon, has fenced in this fall upwards of 300 acres of old pasture land on his island, which he proposes to plant in the coming spring with pine seed. It is well to remark that cattle and sheep should be kept off land thus planted, especially in the winter. Indeed, it is a well-accepted axiom that cattle should always be kept out of woodland, if it is to do its best.

"PRUNING THE FOREST."

BY B. E. FERNOW, OF NEW YORK CITY.

In a recent hearing of testimony before a committee appointed by the controller of the State of New York to investigate the needs of forestry in the Adirondack Mountains, it is reported that the lumbermen, besides laying all the blame of forest destruction and devastation of the hillsides to the ravages of fires, described their own operations as harmless and without any detriment to a continuance of forest growth; nay, some one advanced the cheering proposition that the lumberman was doing nothing but "pruning the forest." This most happy expression for the work which the axe and saw are performing in our forests has since been seized upon on all sides by those who have an object in shielding the operator of logging and saw-mill enterprises, representing them as benefactors rather than enemies of the forest.

We, on the other hand, can only consider the use of the term pruning, in this connection, as the grossest misapplication. "Pruning," derived from the French *provigner*, and closely allied to the verb "to propagate," means "to trim or lop off the *superfluous*," with the implied purpose of benefiting the remaining.

Now, not even a lumberman will nowadays maintain that he is removing from the forest only what is superfluous. From our statistics it would almost appear that we have not much of forest left that is superfluous, and if it is to apply to the single species which the lumberman finds it his duty to remove we would point out that the

superfluity of white oak, the most valuable hardwood, is not apparent anywhere; that the white pine has been removed in some regions—Pennsylvania notably—almost to the last stick; that the hemlock is following fast; that good ash growth is becoming so scarce in the North as "to make it too expensive to be commonly used for oars;" that the better qualities of walnut are commanding excessive prices; that, to sum up, the advancing prices of high grade and the diminished price of low grade lumber of any kind are a sure indication that the former grades are growing scarce and scarcer, and that the lower grades must be resorted to by the mills in order to keep them at work. We may agree, then, that the lumberman does not operate on waste and superfluous material, but that he takes the very best he can take hold of.

Now let us see whether the remainder is benefited. Taking the forest as a producer of valuable material we do not perceive that by leaving the inferior kinds and the inferior individuals of valuable kinds the aspect, after the lumbering, is improved.

The methods of lumbering now in vogue, necessitating the leaving of top ends and brush in the forest, increase the danger from fires to a greater extent than is even admitted. Often where the fire, under natural circumstances, would be confined to what is termed a "running fire," quickly consuming the fallen leaves without injury to the growth, the dry rubbish left, *when kindled*, will intensify the heat so as to damage and kill the standing timber.

As to any benefit to be expected from the present methods of lumbering in regard to a renewal of the forests, by allowing the aftergrowth and younger trees to fill up the gaps, this may be true with some species which are capable of sustaining the shade of the surrounding timber; but European experience of more than a century tends to prove that this method of renewal has rarely the desired effect, and resorting to it for the purposes of benefiting the forests can only be excused by the impossibility of applying other methods.

The last argument which the lumberman may advance to strengthen his position would be, that by not removing the entire forest cover from the surface he avoids interference with the meteorological and hydraulic influences of the forest with which he has been charged so extensively.

We are sorry that even on this point we cannot accept the defense.

Leaving aside the question whether the forests exercise the influence on the water supply of streams claimed for them, or on the amount and distribution of rainfall over adjacent fields, which is undeniable, we will here only compare the effects of the system of selection, as I will call the lumberman's operation, and of those systems which contemplate the simultaneous rejuvenation of the whole forest by natural or artificial reseeding or planting, which I will call timber forest.

That the amount of the atmospheric precipitations which reach the soil in the timber forest is larger—much larger than in the other case—does not allow of doubt. In the forest, resulting from the method of selection, soon the crowns of the old timber develop largely and denser as effect of the increased access of light, and the amount of evaporation from the increased foliage increases proportionately. Whatever of rain does not evaporate from the taller, densely foliaged trees drops onto the lower growth and there evaporates, so that of a slight rain either nothing reaches the ground or else so little that it soon evaporates from the moss and *humus* cover without penetrating. In the same way the snow reaches the soil in less amount, and, deposited on the lower growth, especially where the wind has no power to shake it off, it evaporates without increasing the moisture of the soil. This is especially the case in evergreens, and is the more detrimental as it is the hydrometeors of the winter which furnish the reserve of moisture to alleviate the summer droughts.

To this add that where the young growth is distributed through the forest in batches under the older timber, the temperature being higher on account of impeded circulation of the air, a greater amount of moisture is evaporated during the period of vegetation and the drying up of the soil thus accelerated.

In the timber forest not only a larger amount of meteoric precipitations reaches the soil, but the mould cover condenses and absorbs more moisture, when the colder more nearly saturated air enters the forest at night.

We abstain from adducing here a further accumulation of reasons which tend to condemn the system of selection from every standpoint of rational forestry.

We find nothing that will warrant this system as a benefit to the soil or the forest and its influences, except in the rarest cases in high mountain ranges, where the mechanical effects of the forest as barriers against avalanches and torrents must be maintained to the exclusion of all other considerations.

Do not let us hide the truth. The present system of lumbering is in every respect detrimental to a continuance of forest growth. It is *excusable only* on the plea that the lumber business is a legitimate business; that those who engage in it cannot be expected to care for more than immediate financial returns; that peculiar circum-

stances and conditions of this country have inaugurated the system in vogue, and that ignorance of better methods and the anticipated danger of losing valuable property by incendiarism will tend to continue it until conditions of lumber supply change, until better protection is offered, or until the Government itself steps in and protects those forests which it seems desirable to preserve in continuance.

The object of this paper originally had not been to expose so lengthily the mistaken idea of the lumberman's "pruning of the forest." It was rather to lay down the principles involved in the correct pruning of the forest. I do not allude to the pruning of forest trees individually—a subject I wish to discuss at some other time—but to the interlucation or thinning of growing forests, with the purpose of improving the remaining growth; a subject which is worthy of the whole attention of a beginning forest-grower, on which more has been said, and is being said at present in European forestry literature, than on any other; one which in this country seems to be little understood, and even in Europe, though thinning has been practiced for a long time, the opinions as to particulars are still divided.

As every question in forestal operations, so that of thinning or interlucation has to be considered from two points of view, the financial and the mere forestal. The object of interlucation being an increase of yearly accretion to the single individuals remaining, and thus an increase of the aggregate crop of wood, as is claimed, it is evident that if this primary object be attained the secondary, consequential one, of increased financial value will also be arrived at, if the operation either pays for itself at the time from the extracted material or if the cost, considered as a principal, with compound interest up to the time of clearing added, represents a sum smaller than the consequential increase in value of the remaining growth.

In this paper, however, it is not our intention to discuss the financial aspect of the question, but to explain the rules which should guide the forester in the operation and the principles upon which it rests.

First, let us consider what interlucation purposes to accomplish and what its effects are physiologically.

If we compare single specimens of trees grown in the full enjoyment of light along avenues and fields with their equals grown up in the density of the forest, other conditions being alike, we perceive, in ascertaining their yearly accretion, that whilst the former have in the same number of years attained a greater circumferential accretion, the latter excel in the length of their shafts. In dense, evenly-grown plantations the growth of height is favored at the cost of sidewise expansion of the crown and circumferential accretion. Under such conditions the stems attain a greater total height, longer, straighter, more cylindrical, and easily-splitting shafts, and thus make more valuable wood; but at the same time the single individual does not attain the same diameter and mass of wood as the isolated tree.

As the nourishment of the tree and the formation of wood is almost wholly dependent on the functions of the leaves, it is natural that the trees with the largest amount of foliage should make the most wood; and as, again, the functions of the leaves are dependent on the direct influence of the sunlight and are performed in proportion to the amount of direct light available; and, again, the amount of foliage itself is greatly dependent on this life-inciting influence of light, it is natural that those trees which enjoy the greatest amount of light make the most wood. Then, we find that the yearly circumferential accretion of trees, *ceteris paribus*, stands in direct proportion to the extent of their crown in breadth and height and to the mass of their foliage.

The first object of interlucation, then, is to give more light and room for the development of the crown to those specimens which we want to favor by removing others.

In this operation, as in all others of forestal management, the first requirement is a thorough knowledge of the laws which govern forest-growth (such as I have partly described in a paper read before the American Forestry Congress at Montreal). In this operation, above all others, the judgment of the forester and due consideration of all influences is called for, as, by a misapplication, serious injuries may be inflicted upon a promising growth.

We may here shortly repeat that the greater amount of their food, the carbon, is derived by the trees from the carbonic acid of the air through assimilation by the leaves; that the chemical constitution of the soil is almost irrelevant; that the office of the soil is mainly to furnish the great bulk of the water, of which almost fifty per cent. enters into the composition of the wood. It is, therefore, the *physical* properties of the soil which are of the greatest importance, above all its humidity influenced by different degrees of depth and looseness, nature of subsoil, surface-covering, and its humosity (depth of vegetable mold), which tends to mitigate extremes of these properties, and is, therefore, a most desirable accessory to a forest soil. The formation of this *humus*, or vegetable mold, from decaying leaves is favored, as well as the

necessary humidity of the soil preserved, by absence of the drying effects of sun and winds.

For the forest cultivator, then, the whole problem of forestry lies in this precept: "that his principal effort must be directed to the conservation and increase of the 'soil-quality,' calling all the requisites just cited by one word, since upon it depends the productivity of the forest, and this can only be done by depriving as little as possible any portion of the soil of the protecting cover of the crowns."

We have, then, in our thinning to balance the requirements of a careful forestry for continuancy and the desire to promote the accretion of the individual components of the forest, and to take care that, whilst we try to gain an advantage for the present, we do not do so at the expense of the future.

We see in any young growth from an early age a natural thinning out going on, when those parts of a tree which are shut out from a sufficient enjoyment of light die off, and some trees, in the struggle of life, gaining supremacy, exclude from this necessary factor of existence and shade out their neighbors. In this respect we may group the trees of a forest, as regards their access to light, into two classes:

1. The foregrown; which might be graded again into

   { *a*, predominant;
   { *b*, codominant, and
   { *c*, followers.

2. The overgrown; with the grades of—

   { *d*, overshadowed;
   { *e*, suppressed.

We imitate, assist, anticipate nature in this process by interlucations; and according to the grades into which we extend our cutting, we speak of a dark interlucation, in which only the suppressed, dead, or dying stems are removed; a moderate one, which takes all the overgrown, and a strong one, which attacks even the last grades of the foregrown and interrupts somewhat the upper crown-cover.

The degree of the thinning depends greatly on the soil and the exposure. In accordance with the rule given above in regard to the conservation of the soil-quality a dark interlucation only is in most cases permissible and sufficient. The necessity of a stronger interlucation offers itself in a growth with an unusually large number of stems of uniform calibre, where sometimes the struggle for supremacy is unduly prolonged and the extraction of overstock is needed to assist the development of larger dimensions. Predominant stems ought only to be taken exceptionally, when a more valuable kind which we want to favor—as, for instance, white oak—is threatened to be overwhelmed by a less valuable overgrowing neighbor, or when, on account of some peculiarities of a foregrown kind, detrimental consequences must be anticipated, as, for instance, when the birch (which only too easily finds entrance into our plantations), with its whipping branches, may injure and strip the young buds of the pine or fir.

A deep, rich soil, with abundant moisture, on north and northeastern exposure, will suffer a strong interlucation with less injury, because the vigorous growth due to its favorable conditions will soonest close any gaps in the crown-cover. On the other hand it will be almost always well to leave even subdued stems on thin and dry soils and such exposures, where, by their removal, entrance is given to drying winds.

The degree of thinning depends also a great deal on the species forming the forest. On a former occasion I have pointed out the importance of a classification of the different species, with reference to their relation towards light and shade, in shade-loving, light-enduring, and light-needing. This classification has some bearing on the degree of interlucation. Those kinds which, for their development, require a larger amount of light would naturally show in a dense growth a greater amount of suppressed stems, and consequently a stronger interlucation would be indicated. On the other hand, these very species are those which are least capable of preserving the soil-quality, because their naturally thin foliage not only does little toward the increase of the layer of *humus*, but does not efficiently exclude the rays of the sun, especially as they have the tendency with increasing age to thin out by themselves. They are, therefore, the most difficult to manage, and the continuity of their crowns must be most carefully preserved.

The time when the first thinning should take place is generally determined by the possibility of marketing the extracted material at a price which will cover at least the expense of the operation. This is, however, not always possible; and the consideration of the increase in value of the remaining growth, or rather of the detriment to the same by omission of timely thinning, may then be conclusive.

On good soil and on mild exposures interlucation may take place earliest, because here the growth is ranker, and a difference in the development of the different stems is

sooner noticeable. Light-needing and quick-growing kinds offer a similar aspect to those grown on *good* soil; and here, therefore, early thinnings are indicated. In these cases the thinnings have also to be repeated oftenest, especially during the period of prevalent height accretion.

Absolute rules as to the time for interlucations and their periodical reiteration can evidently not be given; the peculiar conditions of each individual case alone can determine this.

The golden rule, however, is: Early, often, moderately.

The right time for the beginning of these regular and periodical interlucations is generally considered to have arrived when the natural thinning out, mentioned before, commences and shows the need of the operation. But it may be urged that the density of the growth before its maximum, evinced by the dying of some parts, would present an optimum for the most advantageous development, which it would be wise to maintain. This optimum would be different for different localities and conditions, and its evidence will be difficult to determine; at present, at least, the data for the determination are still lacking.

Different from these interlucations, which begin, say, at the fifteenth year of the growth, the need and value of which for the better development of dimension timber is now generally recognized, are the thinnings during the earlier stages of the growth. Here we touch the realm of controversy and unfinished history of a theory which just in our time strives after completion by gathering experimental and statistical data which up to this time were lacking.

It may be of interest to review briefly the history of the theory of interlucation in Germany.

Since the middle of last century thinning out of older growths was known and practiced, but it was rather the economic utilization of those trees that had succumbed in the struggle for supremacy—not the shortening and determination of the crisis—which recommended the measure. The theory of the promotion of the remaining growth by means of interlucations was only developed in 1802; but though von Cotta, one of the old masters of forestry, recommended this measure as a means of education from the earliest stages of the growth, the practice, even until to-day, has been reluctant to accept it so broadly—partly because the extracted material did not find a ready market—partly because the dangers to the preservation of the soil-quality by this early interference seemed too great and the effect of the measure in the end too uncertain.

Cotta recommended these thinnings as a means of accelerating the growth to begin when the most dangerous period of young plant-life and all fear of injuries by frost or heat was removed, then to take away those stems which had fallen behind, and allow to remain only as many "as could grow without injury or interfering with each other; the branches should touch, but not interlock." These "cleanings" were to be repeated as often as the plants impeded each other's growth. The practice confines these early extractions to the removal of inferior and injurious kinds, to extraordinarily dense growths and poor soils, where the development of predominant stems is retarded too long.

Lately, however, the necessity of a more energetic advancement of dimension timber has raised the question of educational forestry again, and though no definite answer may be expected in the near future, the necessary experiments have been instituted to determine the effect of thinnings on the remaining growth as well as on the soil-quality.

In conclusion I may mention two methods which are growing more and more in favor for the production of dimension timber—the so-called "modified timber forest," in which at the age of seventy to eighty years—*i. e.*, when the height accretion is mostly completed—the number of stems is gradually, with a view of seeding the ground, reduced to such an extent that the continuity of crowns may be expected to be re-established in thirty to forty years, during which time the trees have had a full enjoyment of light inducive to circumferential accretion. To counteract the detriment of thus laying bare the soil the eventual undergrowth of young beeches is repleted by sowing or planting different shade-enduring species, which soon cover the ground.

The other method found its origin in the peculiarity of some light-needing species, which in unmixed forests cannot attain the most valuable age and size without thinning out by themselves, and which, without soil cover, are liable to deterioration themselves as well as to allow the soil to deteriorate. To prevent this the inferior individuals are removed and a soil cover created by sowing or planting species which will endure the shade of the foregrown forest. The oak especially is thus undergrown with beech.

From the foregoing remarks on the principles of interlucation, it will have appeared that many important questions of forestry are still in the field of controversy; that

forestry, though practiced abroad for centuries, is by no means an abstract and finished science, but, depending largely on the development of natural sciences, has, like those, only of late taken a more progressive start. Its progress is, besides, so much slower than that of any other science, because the answers to many of its questions and experiments are given only in decades and centuries; and, therefore, were even the time when necessity demands attention to this subject in this country further removed than it seems to be, it would be wise and provident to prepare for the coming need without delay.

LUMBERMAN'S WASTE AS A FERTILIZER.

BY B. E. FERNOW, OF NEW YORK CITY.

When we assert that there exists an undeniable relation between agriculture and forestry, our thoughts at once are led to the discussions on the mitigating influence of forests on the surrounding climate, their equalizing effect on the distribution and amount of meteoric precipitations. We may also think of the employment which the wood-lot gives during the winter to unemployed rural labor.

But it may be that besides these benefits, accruing from natural conditions, a more immediate and tangible interdependence might be established which would benefit the two economies.

Such relation has existed for some time in the European countries, but to the detriment of agriculture as well as forestry, while it was maintained as affording relief at least to the former.

The practice of using the fallen foliage for bedding and manuring purposes largely prevailing in the poorer agricultural regions of Germany, whilst it has impoverished to ruin large areas of timber forest, has not in the same degree benefited agriculture; it has tended to deteriorate the already slovenly management of the small tenant, who, unable to feed stock, sold his straw, whilst using the easily-appropriated gift of the forest with minimum fertilizing qualities.

The effect of withdrawing the foliage covering from the forest soil, which forms its most potent protection against drying influences of sun and wind and against extreme changes of soil temperature, and which presents the best and only fertilizer of the forest, has shown itself in diminished growth, difficulty of rejuvenation, disappearance of more fastidious species, and at last total devastation of forest areas. In the following notes I wish to indicate only, how a reciprocal, beneficial relation between the farmer, the lumberman, and the forester might be established, which, while furnishing a desirable fertilizer to the one, will help the other pay his expenses without experiencing the objections of the third.

The use of sawdust for bedding purposes has long been known. I read in a German agricultural authority of 1853: "That sawdust, like straw, may be used for humification, need not be specially proved, since it substantially contains the same elements as straw, only its decomposition is slower, and it should, therefore, be mixed with substances facilitating decomposition, like the liquid and solid excrements of cattle."

But the proposition is now made not only to extend the use of sawdust, but to prepare a material for bedding and manuring purposes by disintegrating the inferior dimensions and brushwood left in the woods, generally called lumberman's waste.

If this could be done in a practical manner on an extended scale the advantages to the farmer as well as to the lumberman would be immense. The vexatious question of the lumberman's leavings would be largely disposed of, and the additional receipts from the hitherto unprofitable product would enable the lumberman to look with more equanimity at the demands of the foresters.

That agriculture would welcome such a cheap fertilizer, especially in the Eastern States—in fact is in great need of some such manuring material—may be estimated from the yearly-increasing number of worn-out farms and from such statements as I read in agricultural reports: "That, after all, for a permanently-improved condition of the farm, we must rely upon old-fashioned, barn-yard manure as against the volatile, short-lived commercial fertilizers," or "that the best yields are reported from mixtures of mineral fertilizers with barn-yard manure."

To bring about such a happy solution of two difficulties we will have to show whether a practical, inexpensive method of preparing and shipping wood-litter can be devised for the lumberman, and whether the mechanical and chemical properties of such wood-litter, compared with the price, will recommend it to the farmer. I am aware that sawdust has been recommended for manuring purposes and condemned, but I cannot find any convincing proofs that such objection is more than an assertion based on a misapplication of this material.

It is, on the other hand, asserted, upon experiments on an extensive scale—

1. That wood-litter furnishes a better, especially cleaner, *bedding* for cattle than straw; the liquids are at once absorbed and the dry excrements are quickly enveloped with wood fibre, preventing soiling of the cattle. The cleaning of cows requires only about one-quarter the time it does where straw is used. The removal of the bedding requires less time, as only parts of it need be changed. The air of the stables is less damp, and kept purer in consequence of total absorption of all moisture and slower decomposition of the urine, which, especially in horse-stables, where ammonia is quickly formed, seems to be of importance, and a guard against sore eyes and other diseases.

2. That the *manure* from wood-litter is better than from straw, because it binds better, especially the liquid excrements, and retards the decomposition and loss of valuable plant-food, especially the nitrogenous compounds. The mechanical effect on the soil is said to be in no way inferior to that of straw manure. That humification of wood manure goes on more slowly cannot be denied, but this may often prove an additional benefit, when the process of decomposition takes place in the soil instead of on the manure heap, and the soil profits from the heat due to the chemical action and retains the ammonia developed.

As the testimony of European experience, from which the above conclusions were drawn, may not be acceptable to you, I have tried to get some on this side of the water. My opportunity has not been very large. I find, however, specific testimony before the Ontario Agricultural Commission, in 1881, charged with ascertaining the practice and possibilities of agriculture in the province.

Says Mr. Matheson, of Perth:

"I do not use any straw for bedding; sawdust is the cheapest thing I can get for the purpose, and it soaks everything up, increases the bulk of the manure, and makes its quality very fine. One load of this manure is equal to two or three loads of what I formerly turned out. I have had from it 500 bushels of roots (turnips, mangolds, carrots, and sugar beets) to the acre."

Mr. Benson, of Cardinal, says:

"I bed my cattle on sawdust, which is an absorbent and makes a vast pile of manure. The sawdust I use is not common sawdust from a saw-mill, but the shavings and sawdust of seasoned lumber from a stave and box factory; the lumber is kiln-dried. The sawdust, therefore, absorbs all the moisture that comes from the cattle more rapidly than straw. I never use pine or cedar sawdust, because it is difficult to rot; but I confine myself to basswood and elm, which decompose quickly. Very few people have equal facilities for getting such a pile of manure from such good material."

These experiences have been with sawdust; but our proposition is to use a litter made of disintegrated brushwood, which would greatly surpass the former. The more fibrous condition of such material would augment its absorbing capacity; besides, those parts of the tree contain in larger amount the important plant-food which we desire in a manure.

I find, from analyses of Wolff & Stoeckhard, in 1,000 parts of air-dried substance—

	Potash.	Phos. acid.	Nitrogen.
Rye straw, containing	8.6	2.5	4
Spruce litter, containing	7.4	3	6
Wheat straw, containing	6.3	2.2	4.8

Taking four, nine, and twenty cents as the price of the ingredients, respectively, the mere intrinsic fertilizing value of the straw would average $2.78 per ton, whilst the wood-litter figures at $3.53 per ton.

This would show the wood-litter by twenty-seven per cent. superior to straw as a fertilizer. But in both materials their mechanical properties are the most essential, and these appear to be more favorable in wood-litter, unless it should be found that the amount of tannin in the bark is sufficient to act injuriously on the valuable plant-food contained in the excrements and on the crops, which has been denied.

To make a comparison between the fertilizing and the feeding value of straw sufficient data are still absent, but it is apparent that a considerable gain must accrue to the economy of the farmer who can extract from his straw the animal food before it goes into the manure heap. I see it stated in a German paper that whilst the value of plant-food in straw is equal to three dollars, the value of animal food is equal to $8.40 per ton (straw selling at twenty dollars). But those figures cannot be applied to our circumstances here, though they would lead us to believe that the value of straw for fodder exceeds its fertilizing value, and that even at ten dollars per ton we pay a considerable amount for its bedding value, which may give an acceptable margin for the preparation of a wood-litter.

The other side of the question, namely, the practicability of preparing this material, I regret not to be able to present as fully and convincingly as the advisability of using it.

At first sight the difficulties of manipulation would seem to indicate a financial impossibility, yet I have faith in American ingenuity to overcome such difficulties and to devise economical methods as soon as it can be demonstrated beyond doubt that a valuable material with an almost unlimited market may be produced out of waste.

If it is possible to manufacture and ship over a distance of more than 300 miles charcoal at a price of six dollars per ton, or to haul bark for fifteen to twenty miles at four to five dollars per ton, I cannot see any practical objection to handling the leavings as economically, and, when an eight-horse power ore-breaker reduces two tons of ore per hour, why an economical preparation of wood-litter should not be possible.

From the scant experiments made in Germany not sufficient data could be gathered to make practical inferences for this country. A factory in Hesse offers pine-litter in bales at $4.50 per ton, which is half-price of straw. A disintegrator of Carter's, in England, is said to be a good producer, but the quality of material was not acceptable. A machine, of German invention, with automatic feeder, which promises to use up any brushwood up to one and three-fourths inches in diameter, full length, requires five to six horse power to make three tons per day; first cost, without motor, $135.

It is probable that a division of the operation into several stages will be most advantageous and allow a more extensive use as to sizes of raw material. I should propose the employment of a cutter preparatory to the disintegrator.

Shortly before finishing this paper I find that in New York city a planing-mill has at work a machine, consisting of two cylinders with rows of cutting-teeth, revolving in opposite directions, which grind the shavings coming from the planer to suitable meal.

This material is sold in bags containing thirty-five pounds each, at one dollar per bag, or $5.70 per ton. This factory sells about five tons daily, whilst other factories, selling unground shavings, may double this amount of daily use.

My friend, Mr. Hicks, of Roslyn, tells me that he and his neighbors have been using the sawdust from his mill for years, at five dollars per ton, to their entire satisfaction in the stable and on the field.

There seems, then, a fair prospect of utilizing the inferior material left now to waste by the lumberman, and the importance of the problem to both agriculture and forestry should be sufficient to invite close investigation without prejudice. Regretting that I have not been able to present more fully the experiences thus far had on the subject, I would hand over the suggestion to experimenters and inventors.

Mr. C. M. Hovey, the well-known nurseryman of Cambridge, favored the Congress with a list comprising one hundred and fifty forest and ornamental trees, growing in his grounds, planted by himself from 1840 to 1860, the trees being now from twenty-five to forty-five years old and from fifteen to sixty feet high.

As the age of the several trees and the conditions of growth were not given a reproduction of the list here would not be specially serviceable to the interests of forestry.

FOREST ENTOMOLOGY.

BY E. B. SOUTHWICK, OF NEW YORK.

Prof. Southwick interested the congress by a finely-prepared exhibit of forest botany and forest entomology, and in a short paper pointed out the necessity of studying the nature, causes of phenomenal increase, and means for arresting the depredations of the host of forest enemies represented by the insect world, for the development of which the removal of natural forest-growth, artificial drainage, and artificial forest-planting prepares more favorable conditions from year to year.

RELATION OF FORESTS TO FLOODS.*

BY THOMAS P. ROBERTS, PITTSBURGH, PA.

When, at the request of the Secretary of the American Forestry Congress, I promised to prepare a paper on the subject of the destruction of forests as affecting the floods of our great rivers, I confidently relied upon finding ample time at my disposal. So, now, after having been an almost incessant traveler for several weeks, and but a few days left before the convention, I hesitate to lay before so distinguished a body my hastily prepared contribution; and I would not do so if I did not realize that meteorology and the kindred department of sciences into which your discussions naturally drift, are progressive—that no writer is expected to exhaust them, and that errors are pardonable.

Your estimable Secretary in his note intimated that as I had read a paper last year bearing on this subject before the Engineers' Society of Western Pennsylvania, in which he thought I had antagonized the views of the great majority of the friends of tree culture, an excellent opportunity would be now offered for a larger hearing and more animated discussions.

I accepted the intimation as a kind warning. There is one minority man on scientific subjects still living—the Rev. Jasper, of the Baptist church in Richmond, Va. He also was invited to discuss his views before an adversely thinking audience. Nevertheless, the newspapers report that the "jury" decided he was right, and "Dat de sun do move around the earth."

But the pre-eminence of being "alone with your views" is a most undesirable position, and the pride it could engender could affect only peculiar minds.

But I will hasten to say that I have said nothing nor advanced any ideas which can be used to refute the arguments in favor of forestal laws and regulations. I have simply taken the ground that the destruction of forests from the light of records, both in this country and in Europe, has had no appreciable effect in increasing the height and frequency of our great river floods.

The phenomena of the discharge of rivers vary greatly in different parts of the world according to the areas of their valleys, geographical positions, mean altitude, rain-fall, climate, and the flora of the region which they traverse. Their low-water discharges are the most interesting and important as bearing upon the question under discussion, and I desire now to remark that I have and will confine my statement to *rivers*, which must be distinguished as under more widespread and prevailing natural laws than apply to springs, brooks, and creeks. Creeks and brooks are affected by every passing shower or storm-cloud, and *I will not undertake to deny that the conservation of the rain-fall in such local districts is aided by forests:* but I must distinguish between local rains and general storms, and between summer, fall, winter, and spring floods. Rivers draining five thousand square miles or upwards, so far as I know of them in the interior of the United States, are not appreciably increased in their low-water discharge by local storms. Even the disastrous cloud-burst of July 9th, 1874, which desolated Allegheny city and parts of Pittsburgh, sweeping down Butcher's Run, covering the lamp-posts in the streets, occupying the narrow defile of the water-course, washing away buildings, and drowning over two hundred people, was scarcely noticeable in the waters of the Allegheny and Ohio rivers, into which it poured. Such storms are rare, indeed, and nearly always develop upon a narrow pathway seldom exceeding a mile in width; so that when we come to consider

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*This elaborate and valuable paper, for which the Congress is indebted to Mr. Roberts, was presented at the Boston meeting, but not read on account of the absence of the author and the lack of time for its discussion. By placing it in this report the Congress does in no way indorse the views of the author, but gives opportunity to prepare—as so technical a paper demands and deserves—a discussion of his conclusions at the next meeting.

While the paper shows, at least, that the question of foreign influences, scientifically speaking, appears still an open one, the empirist has a right to his theory, based on historical and seemingly logical inferences, even if the scientist cannot explain the phenomena of cause and effect satisfactorily to himself. Meanwhile, German investigators have set to work systematically to determine by scientific methods the numerical influence of forests on temperature and rain-fall, and conclusions have been arrived at greatly at variance with the ideas advanced in this paper.

great areas drained by rivers, and construct diagrams of their annual low-water records, we need not be surprised at their comparative uniformity year after year.

A river of large drainage area is made up, to be sure, from a multitude of tributaries. Over an area of 20,000 square miles, which is the basin of the Ohio at Pittsburgh, there are, even in the seasons of the most protracted droughts, almost daily thunder storms, of limited area, perhaps, but each deluging in turn one or more of the minor tributary valleys and causing local freshets. No rain-fall may be observed at any designated station for two or more weeks at a time; nevertheless the river represents the aggregate of their effect, its low-water discharge being in reality made up of numerous miniature freshets. In other words, I argue that the low-water discharge of the Ohio river is to a very great extent maintained by a circulating series of minor freshets. A dry-weather spring yielding two gallons of water per minute, making seventy-five barrels daily, would be accounted enough even for the maintenance of a large stock farm.

The lowest stage of water ever known upon the upper Ohio was in 1838, when for several days the least discharge of the river was 552,000 gallons per minute, to maintain which it would require the united tribute of 276,000 such springs. For the average season of drought it would require more than 500,000 such springs to maintain the low-water discharge of the Ohio river.

On the other hand it would require that only ninety-seven square miles of the entire territory of 20,000 square miles be daily visited with a storm yielding for discharge a little over half an inch of rain-fall.

These figures are presented merely to set forth very briefly how great rivers may maintain their low-water discharge. I am persuaded that if absolutely no rains visited the Ohio valley for several weeks at a time during the summer, the river would literally dry up, for I have no faith that the perennial springs of the forests, supposing the region were a virgin forest, would support the loss due from evaporation in the long, wide, and shallow pools which exist in the main water-course. Therefore it matters little if the "saw-mill" man's creek has been dried up by the denudation of forests; the river will preserve its constant average. Occasionally the saw-mill creek may burst its banks, rising possibly more suddenly and higher than before its banks were denuded; the river accepts it as just one of those "ninety-seven square-mile floods" due for one day.

I myself know of many streams where saw-mills have been abandoned on account of the increasing irregularity of the seasons during which they could be operated, and I attribute the cause to the wholesale and wanton destruction of the timber; but in saying this I will not admit that such destruction of the timber has any appreciable effect upon the rain-fall or climate of the regions in question. So far as I have read the writers dwelling upon this intricate subject advance only theories, unsupported by statistics. I may be in error, through ignorance, regarding this matter, but I have thought it strange that with so many writers upon a popular subject none of them, which have fallen under my observation, excepting the German engineer, Gustav Wex, have attempted to prove *by records* that the river floods are higher and the rain-falls less and more fitful than formerly, either in this country or Europe, following the destruction of forests.

I will venture to quote from an anonymous writer, the author of a series of articles on "Forests and Forestry" recently published in "Forest and Stream:"

"The asserted influence of forest clearance in determining irregularities in river flow has long been transferred from the region of speculation to that of exact science. European nations plant forests for the express purpose of regulating river flow, with as full confidence in the result as the farmer feels when he drains a swampy meadow. The Swiss government has just made a large appropriation for this object. We have not merely the evidence that wholesale forest clearance is invariably followed by irregularity of flow in all the streams and rivers of the region, exhibiting destructive floods at one season, followed by dry beds or a sluggish flow at another season, but we have the positive evidence afforded by the reafforesting of the slopes bordering the Rhone and other European rivers, that with the growth of the forests the rivers are restored to their original regularity of flow, and the fact of the supposed connection having been thus demonstrated by experience, the mode in which forests exert their influence in this direction has been investigated and rendered familiar to all who have made the subject their study."

The writer of the above, I am inclined to think, has not consulted the official records of the German and French engineers, upon whom has devolved the care and improvement of the navigable streams of their respective countries.

Mr. Wex, the German engineer referred to, strangely enough, published tables exhibiting flood records, hereafter discussed, in support of his views that the destruction

of forests was causing lower water in summer and more destructive winter and spring floods in these rivers.

Unknown to me at the time I prepared my first paper, previously alluded to, his arguments, even from his own data, had been quite severely handled by his fellow-engineers, and I might have drawn from the highest professional authority additional data in support of my own conclusions.

Allow me to briefly state some of the conclusions I drew at the time of first reading Mr. Wex's book.*

The Rhine—Period 1770 *to* 1835.—Mr. Wex divides the sixty-six years into two periods of thirty-three years each, and finds that the mean height of floods in the second period has increased .086 of a foot, or about one inch. It is unfortunate for his theory in this instance that the individual highest flood, viz., that of 1799, when the Rhine rose to the twenty-five foot mark, was in the first period.

The Elbe—1728 *to* 1869.—As far as experience on the Elbe is concerned it appears to have been proved that the floods in this country have twice exceeded the highest waters recorded previously, viz: in 1845, nine inches, and in 1862 six inches higher than the flood of 1785. During the first half of this long period of 141 years twenty-two floods reached to or exceeded the seventeen-foot mark, and during the second half twenty-three floods reached or exceeded the same horizon. Nature's division, I thought, was remarkably even.

The Vistula—1809 *to* 1878.—In 1858, or three years after the disastrous flood of 1855 on the Vistula, Mr. Schmid, royal Prussian privy counsellor, published detail records of the fluctuations of the Vistula at Kurzebrack during a period of forty-eight years, from 1809 to 1856, inclusive, and gives the opinion 'that the apprehensions which were created in the country by the extraordinary flood of 1855, that larger quantities of water flow into the Vistula during recent than former years, are not well grounded, and that the tables rather indicate that a decrease in the quantities and stages of the water may have taken place.'

Mr. Wex then takes up the subject and supplements the tables by the records to 1878. He divides the sixty-three years into two nearly equal periods. Taking his own diagram we discover that in the first period of thirty-two years the river on nine occasions rose above the twenty-foot mark, and that once in 1829 it reached twenty-four feet. In the second period it rose also nine times above the twenty-foot mark, but at no time did it reach twenty-four feet, except during the extraordinary flood of 1855, when it rose to 28.5 feet; but, even with this unusual rise included, the mean of high water in the second period is not by one inch as high as the mean of the first period.

But Mr. Wex differs from Mr. Schmid, for he says: 'A much larger quantity of waters flow into the Vistula, and these now produce more numerous, higher, and consequently more destructive, floods than in former times.' Mr. Wex probably does not desire to be considered as an alarmist, but I think he reached this conclusion from a misapprehension of his own records.

The Danube at Vienna—1826 *to* 1874.—Mr. Wex presents the records of the Danube at Vienna from 1826 to 1874, inclusive. Dividing this into two equal periods I find that during the first, ten floods exceeded eight feet and include several produced by ice gorges. The highest rose to 9′ 3″, and the mean of the high water was 7′ 9.37″.

During the second period only six floods exceeded eight feet, but two of them were exceptionally high, one rising to 12′ 2″ and the other to eleven feet, notwithstanding which the mean height of floods for this period was over nine inches lower than for the first period.

Ice gorges are, Mr. Wex says, very frequent on the unimproved portions of the Danube above Vienna, and these exceptional floods, one of which occurred on February 5, 1862, and the other January 21, ——, were possibly augmented by them. A gorge breaks sometimes and acts like a broken dam in creating a pulsation which every gauge below will record merely as a passing flood. In searching the records of the Vienna floods, I find that of the fourteen summer floods during the 1826–42 period, when rains would have most to do with them, the highest rise was 9′ 3″, and that three of the fourteen exceeded nine feet. During the second period there were sixteen summer floods, one of them being 9′ 5″, and none of the other fifteen floods reached so much as nine feet.

Mr. Wex says: "The seven hydrotechnical experts who were invited by the Commission on the improvement of the Danube to give an opinion on this matter did not

* English translation by the late General Godfrey Weitzel, published by the Engineers' Department, U. S. A.

consider that the decrease in the annual discharge of the Danube at Vienna mentioned by me as yet a clearly-proven fact."

No one can question Mr. Wex's candor and honesty. Nevertheless he is the "lone man with his theory" among the engineers, both of this country and Europe.

The Danube at Orsova—1840 *to* 1871.—Mr. Wex's diagram of the floods of the Danube at Orsova is very unfortunate for his theories. Divided into two equal periods it is shown that in the first there were eight floods exceeding fifteen feet, two of which rose to nineteen feet. In the second period there were also eight floods exceeding fifteen feet, but none of them exceeded 17 feet 9 inches. The mean of flood-height was in the second period one foot lower than in the first period.

The Oder—1778 *to* 1835.—Lastly, Mr. Wex tabulates the record of the Oder river at Kustrin, but does not speak at length upon it. The annual records extend from 1778 to 1835, divided into two equal periods of twenty-nine years each. During the first period eleven floods exceeded ten feet rise, one of which was 13.8 feet and another 15.6 feet; but during the second period there were only six floods exceeding ten feet, and the highest individual flood rose to only 13.4 feet. Mr. Wex certainly took no mean advantage of silence, nor did he commit the "sin of omission" in this case.

The above, in brief, is the substance of Mr. Wex's patient researches, and he certainly deserves great credit for placing in convenient form extremely valuable data to refute the arguments of the essayists who so confidently assert that the floods upon the European rivers are increasing in height and frequency.

As a matter of interest, in connection with the European river record, I may be pardoned in quoting from the discussion in our Engineer's Society at Pittsburgh, the language at length of one of our most talented members, Mr. C. L. Strobel, C. E. M. E.

"The particular point of Mr. Roberts' paper seems to be this: That the cutting down of forests, which has been going on so extensively for a century or so, has not resulted in higher floods than were formerly known; his statistics show this. For a number of years our newspapers have been calling attention to the importance of maintaining our forests, a society has been formed to promote forest-culture, and Congress has taken measures in this direction. The chief argument has been that forests prevent the occurrence of very high and very low stages of water in our rivers, and that unless steps are taken to protect our trees from the rapid destruction now going on the country will periodically be affected with devastating floods and scarcely less disastrous droughts. Now, it seems to me there is nothing to prove that such will be the case, and much more to show that such results need not be expected.

"Mr. Roberts' interesting paper is a valuable contribution in this direction. Mr. Wex is, I believe, considered one of the strongest exponents of the forest theory, and I think Mr. Roberts has shown that he does not prove what he asserts. Wex's book has been severely criticized in other quarters and his own statistics used to refute the theories he advances. This has been done by a German writer named Herrich, in the proceedings of the Hungarian Society of Architects and Engineers, a resumé of which can be found in the proceedings of the Society of Architects and Engineers of Hanover for 1876, from which I have extracted the following notes:

"'Herrich shows that this subject has received much attention, in France particularly; that Wex's theories are old, but have not been generally shared by the most competent students of the subject. As regards the theory that the destruction of forests has increased the high waters of rivers, the flood records of the Seine are cited, which are authentic and very complete. They show a gradual lowering of the high-water mark much more pronounced than the cases cited by Mr. Roberts, as will be seen from the following:

	Year 1615.	1649.	1651.	1751.	1799.	1807.	1850.
	Meters.	Meters.	Meters.	Meters.	Meters.	Meters.	Meters.
High water	9.14	7.65	7.85	6.70	6.97	6.66	6.07

"This is a gradual lowering of the highest flood-marks of this river of three meters in 235 years. Mr. Roberts in his paper treats of only one of Mr. Wex's theories, viz., the effect of forests upon the high and low water stage of rivers and streams. Wex does not rest his case here. He also claims that forests induce atmospheric precipitation so as to increase the amount of rain-fall, and further, that they bring about a more equable temperature by moderating the extreme cold of the winter. Herrich shows that proof is lacking for these theories also, and that rather the reverse appears to have taken place. As regards the rain-fall Monesthier Savignat, a defender of forest-culture, and Volles, an opponent, both concur that an increase of atmospheric precipitation has taken place in France, the average for the last century being 480 to 550 millimeters and for the present century 560 to 620 millimeters, and Flanguergues states

the rain-fall at Verviers for the last century to have been 842 to 899 millimeters and for the present 926 to 1,012 millimeters. We have, therefore, here also the direct opposite of the result claimed by Mr. Wex."

FLOODS ON THE OHIO RIVER.

The great and disastrous floods on the Ohio river of 1883 and 1884, having exceeded in height all previous records, naturally attracted wide-spread attention, and we find them sometimes alluded to in support of the theory that the destruction of forests increases the height of floods.

The writer was in the service of the Government as an assistant engineer on the improvement of this river for a number of years, so that the phenomena attendant upon its floods has, since 1866, been something of a study with him. He will seek to prove that a study of the river records should excite no alarm for the future.

AT PITTSBURGH.

It will be observed from the records that the flood of 1884 was only four inches higher than that of 1832, fifty-two years previous. Between the years 1851 and 1867, inclusive (omitting two years of which records are not known to exist), there were eight floods reaching twenty-five feet or over, five of which were over the 30-foot mark. The mean high water for the sixteen years was 24.7 feet.

During the second period, viz., from 1868 to 1884, inclusive, there were but four floods reaching as high as twenty-five feet, and not until the recent great flood did the river rise to thirty feet or over. The high-water mean for the period is 23.6 feet.

The low-water mean appears from the records from 1855 to date, when divided into two equal periods, to have been the same for both, viz., eight inches. The lowest water in the Ohio river at Pittsburgh, known to have been gauged, was in 1838, when Captain John Saunders, U. S. A., in charge of works of improvement, stated it to have been 85,000 cubic feet per minute. Captain F. A. Mahan, U. S. engineer in charge of the Davis Island dam, has on various occasions gauged the low-water discharge of the Ohio in periods of drought within the past few years. The lowest he reports was during the year 1879, viz., 96,000 cubic feet per minute, but Mr. Wm. Martin, Captain Mahan's assistant, reports that in 1881 the water was evidently lower, though it was not determined that year what the least discharge was.

There seems to me to be nothing in the river records of Pittsburgh on which to establish any theory either of increase in the height of floods or for less low-water discharge due to the destruction of forests *or to any other cause.*

The Ohio at Pittsburgh receives the drainage of about 13,000 square miles from its Allegheny river branch, with about 7,000 square miles tributary from the Monongahela, the two united making about 20,000 square miles. The Monongahela has been, since 1844, improved to the Virginia State line by a system of locks and dams. The records of the Navigation Company during this period do not indicate a tendency towards a decline, year by year, of the low-water discharge, notwithstanding the fact that probably more than half of its area has been stripped of timber.

I know from reliable information that quite a number of its tributaries in Washington, Fayette, and Greene counties, highly productive agricultural regions, now, as a general rule, fail or become dry earlier in the season than formerly, and that saw-mills located upon them have been abandoned from this cause or converted to the use of steam. The highest flood on this branch of the Ohio was in 1852, and during the long interval of thirty-three years no flood has risen to within four feet of that one.

The characteristics of some of the tributaries both of this and the Allegheny rivers are somewhat anomalous and worth particularizing. Thus the West Fork of the Monongahela river, in West Virginia, draining approximately seven hundred square miles, is still heavily timbered, yet this branch becomes in season of drought a little brook that one could at places in its ripples easily step over. Its entire loss at such a period would be inappreciable in the main stream; whereas the Cheat and Youghiogheny branches are always powerful streams, yet they originate and traverse open glades for miles where no trees have ever grown. The explanation of the apparent anomaly is quite simple when we come to understand it. The West Fork river has a remarkably slight fall, abounding in long shallow pools, which in the low lying country along its course is subjected to the excessive evaporation of an almost tropical sun. On the other hand the glades of the Cheat and Youghiogheny lie in highly elevated regions favored with cool mountain breezes.

The largest tributary of the Allegheny river, the Kiskiminetas, draining 1,300 square miles, also rises in the mountains, its sinuous course lying in the deepest seclusion,

amid the shade of forests, but being extraordinarily wide at many places, its low-water discharge dwindles to less than 35,000 gallons per minute; whereas French creek, not much in excess of 1,000 square miles drainage area, at the lowest stage I have known, discharges about 250,000 gallons per minute, or fully one-half of the Allegheny river. These gaugings were made by myself in 1879. French creek originates in an elevated plateau nearly 2,000 feet above the tide water. The country about its sources was always open, and was called by early French explorers the Beef Plains (from buffalo having been found there). It has a climate greatly modified and cooled by the winds from Lake Erie. If it be urged that its discharge might be even greater with a forest, what can we say for the Kiskiminetas and the West Fork, which still possess most of their original forests and which dry up practically?

I cite these instances not to dispute or prove any theory, but merely to emphasize the importance of considering the topography, and particularly the elevation and mean temperature, of regions before empirically asserting that the equable discharge of streams originating therein may be seriously deranged by human agencies.

THE OHIO AT CINCINNATI.

The river record of Cincinnati extends only from 1858 to 1884, inclusive. During the first period, viz., from 1858 to 1870, inclusive, five floods exceeded fifty-five feet in height, the highest being in 1862, when the water reached to fifty-seven feet four inches. Mean of the period, forty-nine feet eleven inches.

During the second period, viz., 1871 to 1883, inclusive, only three floods exceeded fifty-five feet (or four with the late flood included).

The mean of high waters was forty-nine feet and nine-tenths, or, including the late flood, the mean would be fifty-one feet three inches, as compared with forty-nine feet eleven inches of the first period. Two such phenomenally high floods occurring in two successive years seriously affects the average for a period as short as seventeen years. They stand alone, however, and unless wonderful works by the hand of man in two years can be shown to have changed the face of nature in the Ohio valley I can see no propriety in introducing them as factors in this discussion. We cannot, it is true, ignore the record they make, but in the light of the thirty-five years' record preceding, I cannot see that any one would have been safe in predicting their appearance.

The mean annual and low-water depths indicate a slight decline in the last period, as compared with the first, in this respect supporting the theory of Mr. Wex: but in the low-water record the difference, two inches, is so slight that it might be offset by even one year's time of water slightly better than the average. I am not aware of the fact, if it be true, that any guagings of the actual low-water discharge of the Ohio have been made at Cincinnati.

RAINFALL AND CLIMATIC CHANGES.

What I have heretofore said and argued I believe has the solid foundation of actual records for its support, and until the accuracy of the figures is called in question, I believe I can add no more to strengthen my statements regarding floods on our great interior rivers. Freshets superinduced by the destruction of forests on small watercourses may work great injury in certain neighborhoods, and the American Forestry Congress should in its wisdom devise means, to be enforced by the law-making powers of Canada and the United States, to remedy the evil complained of.

There remains a review of some of the curious statements and arguments put forth that the rain-fall is decreasing and that our climate is changing on account of the destruction of forests, which, if granted, would show at once on our river guages.

I can, of course, grant nothing of the sort regarding at least the country east of the Mississippi, but there are important reasons for believing that human agency is possibly affecting the climate west of the 100th meridian.

Up to about 1874 all west of the 100th meridian to the Rocky Mountains, excepting narrow strips along large tributaries of the Missouri and Mississippi, were generally regarded as veritable desert lands, entirely too arid for settlement. It was about this time that settlements had advanced to, but not encroached much beyond, the magical meridional line. Beyond were to be seen the blanched bones of the California overland emigrants, with those of their horses and cattle, as they had died from hunger, thirst, and exhaustion, with here and there the graves of the brave soldiers of Donephan, Albert Sidney Johnson, and other leaders of military expeditions against Mexicans, Indians, or Mormons. Truly our geographies until recent times were entitled to designate it as the Great American Desert. Nevertheless we have lived to see this so-called desert made to smile with verdure.

In an address delivered before the Third National Agricultural Convention in 1883 Professor Wilbur stated as follows:

"I have on many occasions taken the contrary position, viz., that we have no deserts in the United States except by our permission; that the march of moisture westward from the Missouri year by year indicates that the time is not far distant when there will be no need of any irrigating ditches in Colorado. I have watched this progress of moisture and have observed its increase from the Missouri river for 150 miles west."

Clarence King, United States geologist, in a paper states:

"The cycle of moisture which has recorded itself in the increased volume of Salt Lake is also evident in many other localities and in different ways. Mono and Owen's lakes, at the east base of the Sierras, show a corresponding rise, etc. From these facts it would appear that the existing climatic oscillation began before the year 1870 and was the first of the kind for over 270 years, because the deposition of snows in the mountains is greater than since the earliest growth of the present forests. The year 1866 is about the date of the increase of Salt Lake. Mono lake shows a rise in 1864 and the destructive avalanches began about 1860."

I visited Salt Lake in 1871 and again in 1872, and observed myself that fenced-up fields, formerly plowed, had been submerged, and it has since occurred to me that there was a connection between agricultural operations and an increase of moisture from the deposit of dew, but scarcely from rain-fall. I have been an attentive observer of the progress of settlement in the far West, and I believe from the statements of friends in Montana, where I have seen irrigation practiced, that farming can in some places be conducted now without such adventitious aid where formerly it was necessary; but, for the main part, I am convinced that the eastern side of the Great Desert always was tillable. General Custer seems to have thought so in 1874.

It simply was not tried. Expeditions usually crossed the region late in the season, whereas farmers plow up the land with the first opening of spring, and the rapidly-growing grain soon shades the ground and retards the evaporation of moisture.*

Farmers in Montana, even in 1871–2, sometimes only flooded their lands once to get the crops started, averring that that was all that was necessary to secure its maturing. I do not desire to discuss this branch of the question very far, rather preferring to wait for Signal Office reports a few years hence to verify the statement of Prof. Wilbur that natural moisture or rain-fall is increasing in the West.

Many friends of forestry regulations assert quite positively, however, that the destruction of timber decreases the rain-fall. I have spoken of the far West to show there are possible compensations for this decrease in agricultural operations, which usually follow the destruction of the timber. But here again I would call upon these gentlemen for the authority for their oft-repeated assertions that the destruction of forests decreases or has one particle of effect upon the rain-fall. My figuring, so far, leads to quite the contrary conclusions. Official rain-gauge records for many stations throughout the country are not obtainable previous to 1871. To assist in arriving at the facts, I have selected thirty-seven of these stations for the decade between 1870 and 1880, and taking them by halves, the second half exhibits an increase of 1.68 inches of rainfall per annum over the first half. In making the selections of stations, I purposely took a greater percentage from the regions where lumbering operations are carried on most extensively. Every one of the Michigan and Wisconsin stations reports more rain-fall in the last than in the first half of the decade.

By combining the rain-gauge records of Pittsburgh and Cannonsburg, a town in the vicinity of Pittsburgh, (Pittsburgh records not being obtainable before 1871), I have prepared a table exhibiting the rain-fall for thirty-nine years, viz: from 1845 to 1884. Divided into two nearly equal periods, the second shows an average increase over the first of 2.67 inches rain-fall per annum. Taking the record of the city of Philadelphia, from 1810 to 1875, the average rain-fall by decades is as follows:

1810	to 1820	32.79 inches.
1820	" 1830	36.63 "
1830	" 1840	42.65 "
1840	" 1850	44.57 "
1850	" 1860	44.09 "
1860	" 1870	49.37 "
1870	" 1875	48.35 "

* As the forests, if planted, would do to a much greater extent and persistently.—F.

The above figures appear to indicate, with the settlement of the country, that the rain-fall is increasing. These tables are by no means exhaustive, and it might not be safe to venture an opinion based upon them.

The anonymous writer, whom I previously quoted from the columns of "Forest and Stream," produces what he calls figures, but which I think he desires us to consider figures of speech, on this very point They are curious and interesting at all events, and I quote them:

"A few figures will render the influence of forests in the maintenance of rain-fall over the great central region of this continent strikingly apparent.

"Supposing the rain-fall of this region dependent directly on ocean currents, amounts to a general average of twenty inches; if there were no forests nor other vegetation creating a retentive soil, the rivers would annually discharge a volume of water equal to the rain-fall; but if it were dotted with forests, the floor of which retained only one inch of the twenty, the river discharge would be reduced to nineteen inches, a saving which, if it could be maintained, would be equal to more than eight feet of water over the whole region in a century. Of the water thus retained by vegetation, a portion is employed in keeping the soil constantly moist and another portion is constantly suspended in the atmosphere, falling as rain or dew, and being continuously re-evaporated and reprecipitated. Forests may thus raise the rain-fall to double or three times the amount due to ocean currents, and, following their destruction, the whole surplus is borne into the rivers, which overflow their banks in their efforts to discharge it into the sea. Every great flood reduces the interior reservoir, thus inducing a gradually-diminishing rain-fall, with a gradual diminution in the violence of the floods, until finally the region is dependent on ocean currents only for its moisture; and it may be safely argued that when the great region lying between the Appalachian and Rocky Mountain chain shall have its rain-fall limited to the supply inborne by ocean currents it will cease to be an agricultural country."

I do not understand how moist air can be suspended over woodlands to be continuously precipitated and re-evaporated. I believe that every drop of moisture eastward, across the northern part of the continent to the Allegheny range, comes from the Pacific ocean. The average annual wind-mileage at Pittsburgh is 55,000 miles, very little of which comes from the east. East winds west of the mountains are simply the undertow, or air set in motion backwards for a short time, as an eddy under a rapidly-advancing, powerful, and high westerly or northwesterly wind.

"The east wind brings the storm," but the great rain clouds unceasingly float eastwardly. Lewis and Clarke, as early as 1803, observed, when on the Missouri river, that every cloud passed over them from the west, being undoubtedly the first recorders of the great natural phenomena. Such being the case our anonymous friend's moisture must be borne with it at the average rate of fully 125 miles per day, giving it not much time to coquet with the tree-tops in a given locality. Just how all this rain crosses the almost rainless interior, through a generally cloudless sky, is an interesting speculation. Undoubtedly it travels faster over the plains and accumulates over us more frequently to the point of saturation.

The editor of "Forest and Stream" indulges in the following, which the writer, with due respect, considers an incautious argument in a good cause:

"The forests of the National Park protect the heads of two of the most important rivers of North America, one, the Snake, flowing into the Pacific, and the other, the Yellowstone, finding its way into the Atlantic. These streams, after leaving the mountains, flow for long distances through arid regions which are only cultivable by means of irrigation, and should the forests about the head of these rivers be cleared away their volume would be so dimished that the farmers, who now and in the future will depend on them for their water-supply, whould be absolutely unable to raise crops."

The writer traveled several thousand miles during two years through the Rocky Mountain region in various directions, including a portion of the country adjacent to the National Park, and in all the distance traversed never saw a living stream after July first dependent in any degree upon rain-water for its supply. After that date their unfailing source of supply, where they exist at all, is snow, which usually lies and melts in gulches above the tree-line. Powell's and other peaks in Montana, Mts. Hood and Ranier have everlasting snows upon them above arborescent growth. Many of the mountain streams, like the Judith and the Muscleshell in Eastern Montana, actually disappear by loss from evaporation in the lower parts of their course, while strong streams difficult to ford are higher up. The Missouri, I believe, after September first until the first snow, discharges more water at Fort Benton than it does 500 miles below at its junction with the Yellowstone, its tributaries not nearly supplying the loss due to evaporation. The entire Missouri, according to Humphrey and Abbot, draining 514,000 square miles, discharges into the Mississippi only 3.7 trillion cubic

feet per annum as compared with five trillion cubic feet for the Ohio, which has only 200,000 square miles in its basin.

The diversities in the characteristics of the two streams are very great. The Missouri will in the near future afford the friends of tree-culture a field for experiment on the grandest scale to test the effect of settlement and agricultural operations over an immense treeless plain upon its natural regimen, and I would look for more pronounced results in the Missouri than appears to have rewarded the labors of observers in eastern streams in support of their favorite theory.

As it may be interesting to note the grounds on which Mr. Wex and others base their theories that the destruction of forests affects the high and low water stages of rivers, I will here introduce some paragraphs from various authorities:

Berghaus mentions in his Hydrography, heretofore cited by me, that the decrease in the discharge of the Elbe since 1782 is caused by the decrease of the rain-fall which has taken place in its basin since that time. The cause of this is stated, both by Berghaus and Malte Brun, to be in the clearing of forests, since the attraction of the latter draws electricity and water from the clouds and increases the amount of the rain-fall.

It is a common source of wonder with Germans in this country that our forests are not protected and renewed as they are in Germany; but if we can believe Berghaus and Malte Brun, the German laws on this subject cannot be universally applied throughout the empire.

"It is a fixed fact which has been proven by numerous observations that the clearing of forests dries up springs, and that when they again grow the latter flow more abundantly and regularly. * * * Boussingault says: "It is my opinion that the clearing of forests over a large area has always the effect of diminishing the annual rain-fall." The learned Coultas makes the following comparison: "The ocean winds and forests may be considered as the different parts of a great distillery. The sea is the boiler in which the steam is created by heat of the sun. The winds are the pipes which lead the steam to the forests where a lower temperature exists. For this reason the steam is condensed, and in this manner forests distill showers of rain," &c.

Observations with a rain-guage before and after the clearing of a particular forest region would have been an admirable indorsement of Boussingault's views.

Mildrum, the director of the observatory on Mauritius Island, has found that since 1852, when at least 44,155 acres had been cleared, the rain-fall, humidity, and pressure of vapor had decreased, and, on the contrary, the floods and dry periods have increased.

The clearing of less than seventy square miles producing such decided effects is remarkable. Seventy square miles represent about the one-ninth of the island, but such areas have frequently been cleared in the United States without in the least decreasing the rain-fall.

The report of Mr. Matthieu, professor of the Imperial School of Forestry, was published by the French Government, in which he shows that it is proven by experiment that the amount of aqueous vapor over a cleared field is five times as great as over ground covered with forests, which he considers equivalent to an increase in the annual rain-fall in sections of countries covered with forests. Professor H. W. Dove, one of the first authorities in the knowledge of weather, says: "Europe has worked itself into continually irregular rainy seasons by the modern cultivation of its lands, which crowds off the forests recklessly, and which causes its rivers to be nearly dry during long periods, while during others their banks can hardly retain the masses of the water which are poured into them."

Then Mr. Wex, in his summary, says:

"The existence of forests in a country increases the amount of rain-fall, because the fogs and clouds, saturated with aqueous vapor which sweep over it, are, in the first place, condensed by contact with them and fall in the shape of rain."

This short, simple assertion could have been verified in one year's time by observations on neighboring rain gauges—one in a forest and the other stationed in an open plain—but Mr. Wex quotes no one who has tried this experiment. He continues to say:

"Forests increase the amount of subterranean seepage and water in springs considerably, since the rains, being retained by the leaves of the trees, fall to the earth slowly. They are then retarded in their flow by the spongy surface, and are partly soaked in and partly sink into the deeper layers of the earth," &c.

Professor G. K. Gilbert, in Powell's Land of the Arid Regions, in a report on the water supply of the Great Salt Lake of Utah, says:

"The cutting of trees for timber and fence material and fuel has further increased the streams. By the removal of foliage that share of the rain and snow which was formerly caught by it and thence evaporated is now permitted to reach the ground, and some part of it is contributed to the streams."

Thus authorities will philosophize differently.

Again Mr. Wex says:

"A further cause of the decrease in the discharge of springs and streams of many countries in Europe during the last decades, is the emptying of lakes and ponds and the drainage of swamps and marshes."

We will let Professor Gilbert answer this. He says, quoting from the report just mentioned:

"Small springs are apt to produce bogs, from which much water is evaporated," &c.

It appears arguments can be produced from nature to support any theory. She rains not only on the just and the unjust alike, but quite possibly denies the ploughed field, which needs it most, no favors which she would give the woodlands.

Lastly, Mr. Wex says that in cultivated and thickly-settled regions much water from our rivers is withdrawn for the purposes of irrigation; he might have added for manufactures also. It is believed that scarcely a half of the water used by great cities returns to the streams from which it was originally drawn. Undoubtedly such considerations as these would have great weight in some regions, dependent upon the proportion withdrawn for these purposes as compared with the original stream. There is little irrigation practiced in the Ohio basin, and the quantity of water pumped out to supply the cities lining its banks is probably too insignificant a proportion of the whole low-water discharge to require notice.

The *Sanitary Engineer*, in a recent article, says: "The surface of the ground, when shaded by forest trees, is always covered with a spongy layer of old leaves or mosses favoring the absorption of water, while the fallen logs and underbrush obstruct the flow on the surface."

We have never had but one destructive summer or fall flood on the Ohio, and that was in November, 1810, when the Ohio basin was a virgin forest. All other high floods have occurred in the early spring, at periods when the "spongy" layers of leaves and moss must have been soaked to saturation by earlier rains and snows. It may be that changed conditions of the surface, such as the destruction of forests and cultivating and draining the soil, may have a sensible influence in increasing the height of summer freshets, which might be termed floods of intermediate height; but in February, when the great floods usually occur, the previously-saturated soil and overflowing marshes are merely like other surfaces, the same everywhere, and, therefore, can have no regulating effect on floods.

Mr. W. Milnor Roberts, in a report on the surveys of the Ohio river, referring to some views previously expressed by him in a pamphlet printed by the Franklin Institute, and combating the theories of Chas. Ellet in favor of reservoirs as a means to hold back floods on the Ohio, says: "It was proved from an examination of the records of the floods on the upper part of the Ohio, that some of the highest floods occurred when such reservoirs, had they been in existence, must have been full. Such being the case, they could not have aided in restraining those floods, and this would certainly be the case almost every year."

If Mr. Roberts could argue this way, in view of the fact that Mr. Ellet's dams across the heads of the Ohio would be, in some instances, 100 feet high, reaching from hill to hill and of enormous storage capacity, he certainly would have placed little reliance on moss, leaves, marshes, and forests as restraining reservoirs for spring freshets in the Ohio valley.

More has been done by the hand of man on the North American continent in the removal of forests during the last forty years than has probably been accomplished in Europe in a century and a half. Moreover, the proportion of mountain land in Europe is considerably greater than it is in the eastern United States. If, therefore, decrease of rain-fall, or other meteorological phenomena, are affected by such means, they would be most marked in the regions of plains, and particularly in rapidly-cleared and settled plains. In the Allegheny valley above Pittsburgh several billion feet of lumber have been cut in the last forty years, and a vastly larger quantity of timber has been recklessly destroyed by forest fires and by the process of girdling trees in opening up farms.

Preceding the great flood of 1884 in the Ohio valley its entire northeast section, embracing an area of fully 70,000 square miles, was visited with an unprecedented snow-fall, covering the country to the depth of from fourteen inches to over two feet. Following upon this came a season of over a week's continuous warm rain, which melted the snow rapidly. Even before the great snow storm the ground had been covered with snow and the rivers were moderately full before the flood commenced. Observation has shown that a river will discharge vastly more water per minute at a given high stage, if the rise to the assumed mark has been sudden, than it will at the same stage when the rise has been slow. With low water below on a stream and high water above the river's slope is increased; hence follows increase of velocity and greater discharging capacity. The great flood on the Ohio was comparatively sluggish, for, as before said, its prism was comparatively full before the flood commenced, and its slope or inclination of surface when at the maximum of its height was less than the average inclination of the river. The flood of 1883, when the Ohio was at a twenty-seven-foot stage at Pittsburgh, flowed for a while with a current of nearly eleven miles an hour, whereas the flood of 1884, when at a stage of over thirty feet, flowed at the rate of only a little more than eight miles an hour; so that I apprehend there were hours when the twenty-seven-foot flood discharged as much water as the great flood did at its maximum. It is, therefore, important to understand the precedents of a great flood in order to determine the probable effect of a given amount of rain or snow fall.

The popular opinion no doubt will long be that the destruction of forests increases the height of floods, but I am persuaded it is not a belief founded on established fact.

Table Showing Highest, Lowest, and Mean of Water at Pittsburgh, and Averages for Two Periods.

Date.	Year.	Highest.	Mean.	Lowest.	Remarks.
November 10	1810	32.			
January	1813	29.			
February	1816	33.			
February 10	1832	34.			
February 1	1840	26.9			*High Water.*
February 1	1847	26.			
September 20	1851	30.9			First period, 1847 to 1863. Average for the period is 24 feet 7 inches.
April 19	1852	31.9			
	1853	31.9			
	1855	18.0		2.10	
	1856	19.6		0.3	
	1857	21.4		0.0	
	1858	26.0		0.5	*Low Water.*
	1859	22.0		1.1	
April 12	1860	29.7		2.8	First period, 1855 to 1870. Average for the period is 8 inches.
September 29	1861	30.9½		1.10	
January 20	1862	28.7		0.3	
January 16	1863	16.0		0.1	
December 17	1864	18.6		1.0	
March 8	1865	31.4		1.4	
February 25	1866	15.4		0.4	*High Water.*
March 13	1867	22.6		0.0	
April 15	1868	20.6	5.1	0.0	Second period, 1868 to 1884. Average for the period is 23 feet 6 inches.
March 31	1869	19.6	6.2	0.7	
January 19	1870	18.0		1.3	
January 15	1871	19.0		1.2	
April 11	1872	20.6		1.6	
December 14	1873	25.6		1.6	
January 8	1874	22.4		1.1	*Low Water.*
August 3	1875	25.0	6.15	0.4	
September 19	1876	26.0	5.88	0.2	Second period, 1870 to 1884. Average for the period is 8 inches.
January 17	1877	25.0	4.95	0.7	
December 11	1878	24.6	5.20	0.0	
March 19	1879	20.0	4.30	0.1	
February 14	1880	22.0	4.70	0.3	
January 10	1881	28.0	4.96	0.6	
January 28	1882	21.9	5.11.6	0.6	
February 8	1883	27.6	5.11.3	0.1	
February 6	1884	34.4½			

Statement Showing the Highest, Lowest, and Average Stages of the Ohio River at Cincinnati each Calendar Year, from 1858 to 1883, including Floods of 1832 and 1847.

CALENDAR YEAR.	HIGHEST STAGE.		LOWEST STAGE.		AVERAGE.
	Date.	Ft. In.	Date.	Ft. In.	Ft. In.
1832	February 18	64.3			
1847	December 17	63.7			
1858	June 16	43.10	October 3	2.5	12.10
1859	February 22	55.5	September 19	3.3	17.7
1860	April 16	49.2	October 3	5.4	16.
1861	April 19	49.5	July 3	5.1	19.1
1862	January 24	57.4	October 31	2.4	17.5
1863	March 12	42.9	October 6	2.6	15.
1864	December 23	45.1	August 6	3.1	16.8
1865	March 7	56.3	October 19	5.8	21.10
1866	September 26	42.6	August 17	4.9	19.2
1867	March 14	55.8	October 19	3.0	17.
1868	March 30	48.3	July 21	5.1	18.8
1869	April 2	48.9	August 21	5.4	19.8
1870	January 19	55.3	October 4	3.10	17.10
1871	May 13	40.6	October 14	2.8	11.10
1872	April 13	41.9	October 14	3.	11.8
1873	December 18	44.5	October 12	3.8	13.5
1874	January 11	47.11	September 29	2.4	15.8
1875	August 6	55.4	September 19	4.3	18.9
1876	January 29	51.9	September 4	6.2	18.2
1877	January 20	53.9	October 9	3.3	15.
1878	December 15	41.4	October 24	4.4	16.9
1879	December 27	42.9	October 23	2.6	14.6
1880	February 17	53.2	October 28	3.9	17.
1881	February 16	50.7	September 18	1.11	16.11
1882	February 21	58.7	November 1	6.1	22.11½
1883	February 15	66.4	September 21	3.7	19.5½

Table Showing Wave of the Flood of 1884 *at Different Stations Along the Allegheny and Ohio Rivers. Records Taken on the Same Dates.*

	January 30.	January 31.	February 1.	February 2.	February 3.	February 4.	February 5.	February 6.	February 7.	February 8.	February 9.	February 10.	February 11.	February 12.	February 13.	February 14.
Oil City	2.4	5.0	5.6	5.4	.....	6.0	13.0	13.3	12.0	10.2	9.0	.....	8.	8 8	8 8	13.1
Freeport	5 8	8.0	12.2	11.6	11.6	9.3	14.2	30.0	28.6	22.2	.....	18.6	16.10	15.8	15.10	19.8
Pittsburgh	3.4	8.5	20.5	17.4	12.10	11.1	15.10	34.4¼	31.8	26.3	21.3	18.5	16.11	18.4	18 0	17.10
Wheeling	8.10	.....	20.0	.....	.....	22.0	.....	.....	.....	.....	.....	.....	30.	.....	29 6	29.0
Marietta	.....	21.6	21.6	25.6	28.4	25.3	29.0	37.8	46.3	49.6	52.0	48.3	46.1	38.0	35.0	34.0
Point Pleasant	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portsmouth	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati	18.1	31.3	38.8	46.2	49.5	49.11	52.8	59.5	61.8	62.7	63.9	64.9	66.5	68 5	69.11	71.1
Louisville	8.0	11.0	13.7	16.10	21.8	24.0	27.8	34.1	38.5	39.8	40.3	40.4	41.1	42.4	44.0	45.7
Evansville	.....	15 5	18.1	23.6	29.	32.7	35.5	37.9	40.6	42.8	44.1	44.9	45.3	45.6	46.	46.3½
Cairo	24.11	25.8	25.8	26.6	29.5	32.5	34.7	37.10	40 10	42.8	44.	45.1	46.	46.10	47.7	48.4

	February 15.	February 16.	February 17.	February 18.	February 19.	February 20.	February 21.	February 22.	February 23.	February 24.	February 25.	February 26.	February 27.	February 28.	February 29.	
Oil City	12.6	10.0	9.0	8.5	6.6	6.0	6.8	5.7	5.7	5.7	5.7	5.5	4.11	4.8		
Freeport	17.4	15.0	12.6	13.0	11.9	11.4	12.4	11.6	9.10	8.10	7.11	7.8	7.3	7.0		
Pittsburgh	20.10	17.11	14.3	15.4	13.3	12.6	12.6	11.5	10.1	9 1	8.1	7.6	7.2	6.10		
Wheeling	31.9	28.7	25.5	22.3	19.0	20.6	19.0	19 3	17.5	15.7	13.8	12.0	11.4			
Marietta	33.6	31.6	29.0	27.0	24.2	23.0	21.0	20.0	19.0	18.0	15.6	14 1	13.2	11.10	9.6	
Point Pleasant	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Portsmouth	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Cincinnati	70.1	68.4	66.0	63.5	60.3	58.10	55.5	52.0	48.5	45.2	40.10	36.10	32.11	29.8		
Louisville	46.6	46.6	45.8	44.5	42.6	41.3	39.1	36.1	32.11	29.3	24.8	21.8	17.6			
Evansville	46.10	47.3	47.6½	47.10¾	48.	48.¼	47.11¾	47.8	47.3¼	46.9	46.	45.3	44.	42.6	41.1	
Cairo	49.1	49.10	50.5	50.10	51.3	51.7	51.9	51.10	51.10	51.10	51.8	51.6	51.2	50.		

Rain-Gauge Records—Canonsburgh and Pittsburgh.

Year.	Inches.	Remarks.
1845	27.54	
1846	40.81	
1847	39.61	Canonsburgh is 20 miles southwest from Pittsburgh. The Pittsburgh record begins with 1871.
1848	31.59	
1849	32.72	
1850	31.00	
1851	23.74	
1852	39.48	There are no records for either place in 1870.
1853	25.48	
1854	20.86	
1855	41.91	
1856	25.07	
1857	43.53	
1858	31.59	Average rainfall from 1845 to 1863, inclusive, 35.01 inches.
1859	39.23	
1860	39.43	
1861	36.46	
1862	31.61	
1863	33.58	
1864	39.95	Average rainfall, 1864 to 1883, inclusive, 37.68 inches.
1865	43.90	
1866	36.51	
1867	29.77	
1868	30.61	
1869	36.60	
1870	.....	Increase of the second period over the first period is 2.67 inches.
1871	24.35	
1872	30.78	
1873	41.57	
1874	39.34	
1875	34.06	
1876	37.01	
1877	34.72	
1878	38.76	
1879	37.02	
1880	31.97	
1881	37.30	
1882	38.61	
1883	43.17	
1884	.....	

Table of Rain-fall in Philadelphia from 1810 *to* 1875.

(Report of the Commission of Engineers on the Water Supply of Philadelphia.)

Year.	Rainfall.	Average.	Year.	Rainfall.	Average.	Year.	Rainfall.	Average.	Remarks.
	Inches.	*Inches.*		*Inches.*	*Inches.*		*Inches.*	*Inches.*	
1810	32.66		1840	47.40		1870	44.11		
1811	34.97		1841	55.50		1871	47.32		
1812	39.30		1842	48.54		1872	51.12		
1813	35.63		1843	46.91		1873	58.29		
1814	43.14		1844	40.17		1874	40.91		
1815	34.67		1845	40.02					
1816	27.95		1846	44.39					
1817	36.01		1847	45.09					
1818	30.18		1848	35.00					
1819	23.35		1849	42.09					
1820	39.61		1850	54.54					
1821	32.18		1851	35.50					
1822	29.86		1852	45.75					
1823	41.85		1853	40.66					
1824	38.74		1854	40.18					
1825	29.57		1855	44.09					
1826	36.15		1856	33.93					
1827	38.50		1857	48.29					
1828	37.97		1858	39.85					
1829	41.85		1859	58.12					
1830	45.07		1860	44.09					
1831	44.94		1861	46.44					
1832	39.87		1862	45.01					
1833	48.55		1863	49.19					
1834	34.24		1864	46.00					
1835	39.30		1865	56.26					
1836	42.66		1866	45.26					
1837	39.04		1867	61.19					
1838	45.24		1868	51.40					
1839	43.74		1869	48.86					
		First Period. 32.79			Fourth Period. 44.57			Seventh Period. 48.35	
		Second Period.			Fifth Period.				
		Third Period. 42.65			Sixth Period. 49.37				

Increase or Decrease of Thirty-seven Points in the United States,

Divided into Two Periods—First, from 1871 to 1875, inclusive; Second, from 1876 to 1880, inclusive.

Place.	Average.		Increase.	Decrease.
	First Period.	Second Period.		
	Inches.	*Inches.*	*Inches.*	*Inches.*
Brookenridge, Minn	25.20	25.59	.39	
Cairo, Ill	44.47	46.36	1.89	
Chicago, Ill	33.06	35.45	2.39	
Cincinnati, O	39.06	47.03	7.97	
Cleveland, Ohio	35.19	41.61	6.42	
Detroit, Mich	28.95	40.77	11.82	
Duluth, Minn	32.68	35.61	2.93	
Escanaba, Mich	33.58	34.14	.56	
Grand Haven, Michigan	35.64	37.47	1.83	
Indianapolis, Ind	46.36	45.82		.54
Knoxville, Tenn	56.81	48.96		7.85
La Crosse, Wis	33.32	31.31		.99
Marquette, Mich	28.06	33.87	5.81	
Memphis, Tenn	50.31	58.45	8.14	
Milwaukee, Wis	30.72	37.93	7.21	
Morgantown, W. Va	47.84	45.45		2.39
Nashville, Tenn	50.90	54.00	3.10	
Pittsburgh, Pa	38.48	35.89		2.59
St. Louis, Mo	35.78	38.01	2.23	
St. Paul, Minn	32.88	29.48		3.40
Toledo, O	29.67	33.67	4.00	
Vicksburgh, Miss	58.97	60.42	1.45	
Buffalo, N. Y	34.03	40.74	6.71	
Dubuque, Ia	38.85	37.49		1.36
Erie, Pa	41.22	42.09	.87	
Fort Gibson, Ind. Ter	39.48	36.78		2.70
Galveston, Texas	52.12	51.32		.80
Indianola, Texas	38.94	38.59		.35
Keokuk, Ia	38.65	37.81		.84
Leavenworth, Kan	35.96	42.02	6.06	
Lynchburg, Va	42.35	40.88		1.47
Montgomery, Ala	58.45	52.08		6.37
Omaha, Neb	32 19	33.86	1.67	
Oswego, N. Y	31.28	40.40	9.12	
Port Huron, Mich	32.97	35.37	2.40	
Rochester, N. Y	37.61	39.15	1.54	
Yankton, Dakota	29.97	25.38		4.59
	1431.90	1494.15	97.50	35.25

NOTE.—The general average for the thirty-seven stations above mentioned is 1.68 of an increase in the second period over the first.

ANNUAL MEETING

—OF THE—

AMERICAN FORESTRY CONGRESS,

HELD IN DENVER, COLORADO,

COMMENCING TUESDAY, SEPTEMBER 14TH, 1886.

Vol. V.

FIRST DAY'S PROCEEDINGS.

Many of the members and delegates to the American Forestry Congress arrived in the city yesterday. Others are expected to-day. Owing to the fact that no business meeting has as yet been held, the names of the entire number of delegates and members has not yet been reported to the Secretary. Among those present from other States are: J. H. Hayford of New York, Hon. Martin Allen of Hayes City, Kansas; Leo Weltz of Wilmington, Ohio; G. J. Carpenter of Fairburg, Nebraska; Hon, G. W. Minier of Minier, Illinois; J. L. Johnson of Gunnison; Dr. Daniel Berri of Carmi, Illinois; J. Horner of Emporia, Kansas; Bernhard E. Fernow of New York City; Harmon Dean of Sidney, Ohio; and Mr. Esbock of Dayton, Ohio.

Among those from this State are: William W. Pardee of Denver, R. Q. Tenney of Fort Collins, B. F. Rockafellow of Canon City, Joseph Davis of Trinidad, and Blair Burwell of Durango, W. N. Byers, Posey S. Wilson, Avery Gallup, T. C. Henry and Colonel Berkey of this city, President George H. Parsons of the State Forestry Association, Professor Van Diest of the Surveyor-General's office, Colonel Edgar T. Ensign of Colorado Springs, State Forestry Commissioner and State Engineer Nettleton.

J. L. Barrett, Greeley; J. S. McClelland, Fort Collins; Samuel Wade, Paonia; Louis Dugal, Nelson Millett, Henry Lee, George Richardson and H. G. Wolff have been appointed as delegates from the Colorado State Horticultural Society.

Although the number present will not probably be as large as was first expected, the meeting bids fair to be one of great interest.

THE CONGRESS IN SESSION.

The opening session of the Congress was held last evening at the Chamber of Commerce. The hall was well filled, many of those present being ladies.

The meeting was called to order shortly after 8 o'clock by Mr. J. T. Cornforth. Besides Mr. Cornforth on the platform were seated George H. Parsons of Colorado Springs, President of the State Society, and Mr. Bernhard E. Fernow of New York city, the Corresponding Secretary of the Congress.

Mr. Cornforth apologized for the absence of Governor Eaton and President Woodbury of the Chamber of Commerce, and said that he found himself compelled to act for them. Mr. Woodbury, he said, was in New York and the Governor was detained by sickness in his family.

He then delivered the following address:

EXTENDING A GREETING.

"The members of the Chamber of Commerce and Board of Trade extend to you, gentlemen of the American Forestry Congress, a hearty welcome, and feel highly honored by your presence in our city. We feel certain that your deliberations within this chamber will be a source of information to our citizens as well as to the country at large, and will also result in great good to our people.

"Washington said, 'promote as an object of primary importance institutions for the general diffusion of knowledge. In proportion as the structure of a government gives force to public opinion it should be enlightened.'

"Now, gentlemen, we wish to learn, and after we have had the pleasure of hearing your addresses we hope to have such a fund of knowledge and information that we can enlighten our friends.

"We doubt not but that your aims are noble, and for the future welfare of our country, and full of patriotism, and that one of the prime objects of your organization is to

ask that each State have laws regulating our forests; but many interests within our State will object to too stringent a law, or say that the State should not interfere with their interests.

"Gentlemen, it was a question like this that brought forth the words of that noble son of liberty, Sir W. Jones, who said:

What constitutes a State?
Not high raised battlemets or labored mound,
Not cities proud with spires and turrets crowned,
Not bays and broad armed ports
Where, laughing at the storm, rich navies ride,
Not starr'd and spangled courts
Where low browed baseness wafts perfume of pride,
No! men, high minded men, with powers of far above,
Dull brutes endued in forest, brake or den,
As beasts excel cold rocks and brambles rude.
Men, who their duties know,
But know their rights, and knowing dare maintain,
Prevent the long-aimed blow
And crush the tyrants while they rend the chain,
These constitute a State.

"We think this Forestry Congress composed of just such men and your purposes are the greatest good for the greatest number.

NOW HOW CHANGED.

"Again we welcome you. Many years ago in our pilgrimage across the plains we traveled for 200 miles and only hand one single tree, but now how changed.

"Plantations on many sides and with each annual Arbor Day, the plains will soon be gone. The pioneers see little as it was, and the few that are spared meet to-day. This is their annual celebration. I honor the pioneers, the pilgrims; it was they that made it safe and possible for others to follow. They made the trails and prospected our mountains, laid off our cities and called for all people to come and enjoy the fullness of our land and mines. They dedicated Denver the City of the Plains. I think this Forestry Congress should ask a rededication and name it the Forest City, for we have now more trees within our corporate limits than any other city of its population in the Union.

"Some of you present remember the big timbers on the Smoky Hill Trail and the reverence in which the Indians held them. I now draw to a close by asking the question; where was the great American poet, Bryant, when he wrote his, 'God's First Temple.' He says the groves were God's first temples, ere men learned to hew the shaft. Oh, why should we in the world's riper years neglect God's ancient sanctuaries. Read it my friends and I think you will say, why, he was in Cambridge or Boston, reasoning with some learned Professors to organize an American Forestry Congress. At any rate such words as Bryant's will never die and if your organization ever erect a statue let it be Bryant's."

Secretary Fernow in reply apologized for the absence of Hon. Warren Higley, the President of the Congress, and made a short speech of thanks for the welcome which the delegates and members had received. He said: "You of the West must pardon us Easterners if we still consider you in the far West. But anyone who has made the journey from New York across the plains and then has suddenly come upon this beautiful home of an enlightened and cultured people, the distance seems as naught. His sympathies are stirred and he feels that here he is still a member of this great country. I again regret that President Higley is not present to address you."

THE PRESIDENT'S ADDRESS.

Mr. Fernow then read the address of Hon. Warren Higley of New York, President of the society, from which the following are extracts:

"*Ladies and Gentlemen*—I congratulate you on meeting here under the shadow of the rugged Rockies and on the border of the Great American Desert for the discussion of questions of vital importance to the American people, and of special interes to those of you dwelling on the border-land of this great treeless waste. It is with pride that I call your attention to some of the results that have followed our annual discussions during the short life of our Congress, and the rapid growth and spread of favorable forestry sentiment throughout the country. In a Republic like ours, where laws are expected to be the expression of the people's will, it is all important that the subject to which these laws relate should be understood by the masses interested in them, for without such popular understanding or knowledge the sovereign citizen will fail to obey or enforce them. Public discussions by intelligent, patriotic citizens, in gatherings like this, are powerful engines in the promotion of such a cause as ours.

LOOKING FOR RESULTS.

"And now what can we hope from this Denver meeting? What results can we look for as a result of careful study and long journeying? Shall your mountain forests be more respected, their protection against wicked destruction become more secure? The special object of this meeting is to bring before the people of the great West such a presentation of the questions directly arising from the peculiar conditions as will tend most surely to their intelligent consideration and eventual solution.

"You will be told with scientific assurance that by this means your cultivated fields on the eastern borders of the Rocky Mountains shall extend eastward across the desert waste until they meet the well watered fields on the Kansas and Nebraska borders. This may be but a dream of the enthusiastic forester, yet is a dream that once realized will open a now worthless territory to the incoming settlers of an extent and productiveness sufficient to support 50,000,000 of people.

"You will be told of the amount of forest product required in the working of your numerous mines; of the rapidity with which

your forest areas are being diminished, and of the increased cost of the production of your precious metals in consequence of this coming derth.

ARBOR DAY.

In 1882 only three States had officially recognized the importance of Arbor Day. Now fifteen States of the Union annually invite their citizens, through the Governor's proclamation, to do something toward repairing their wasted forests. There is no more important factor in popular education than Arbor Day celebration, and it seems to me incumbent upon this Congress to foster and encourage it in all reasonable and practical ways, until every State and Territory of the Union, and every Province of Canada, shall establish and perpetuate it throughout their borders. The enormous annual loss caused by forest fires demands our attention. In the census year ending in June, 1880, the fires destroyed, in Colorado alone, 113,820 acres of her forests, valued at $935.500; in Montana, 88,000 acres, valued at $1,128,000; in California, 356,815 acres, valued at $440,780; in New York, 149,491 acres, valued at $1,210,785, and in the whole United States, 10,274,000 acres with an estimated value of $25,482,250. In view of these alarming figures, would it not be wise for the State government to adopt adequate measures for the sure prevention of these fires, and to appropriate all money necessary to effectually carry out such measures?

IMPORTANT TO COLORADO.

"What could Colorado do under her wise forestry laws, with an appropriation of a half million toward the preservation of her valuable forests? I commend this subject to your continual attention and effort.

"It is evident that the education of our American youth should be directed with a view to their future sovereign citizenship, and instruction in those departments of American economics that most nearly touch the productive energies of the masses, should by no means be omitted in the public school curriculeun. The science of forestry, like that of agriculture, is as yet largely experimental. It is the result of one of our modern necessities. Some of the more important conclusions regarding the influence of forests are based upon historic evidence, scientific investigations and careful observation, and may be briefly summed up as follows:

1. The forests exercise an influence upon the climate of the country; they modify the extremes of temperature.

2. They have a decided influence upon the water supply of a country. Clear the forests from the valleys and headwaters of streams and rivers, and these water courses, perenial before, become dry in summer and raging torrents in spring time.

3. Forests exert a beneficial influence upon agriculture by forming a wall of protection to the growing crops when most needed.

4. Growing forests on mountain sides and steep declivities hold the loose soil and accumulating humus in place.

5. Forests in adequate areas tend to preserve the healthfulness of a country or district by their influence on the surrounding atmosphere.

6. Forest products afford the most indispensable and necessary economic element in the industries and prosperity of a nation. The total value of the forest products of the United States for 1880 exceeded $700,000,000.

A GREAT QUSTION.

The time has come for the people of America to consider most seriously this great forestry interest. And how can this best be done? What surer avenues are open for this instruction than the public school?

"When I consider the progress that has been made in America in the past few years toward the establishment of some forest policy, I feel that the consummation of our fondest hopes as to the result of our labors will yet be realized.

"I cannot close without further congratulating you and the country on having at the head of the Forestry Bureau at Washington our Secretary, the Hon. B. E. Fernon, a gentleman of eminent scientific and literary ability, a trained forester thoroughly prepared for the position which he fills."

The address was listened to with great interest and was loudly applauded.

DESTRUCTIVE FOREST FIRES.

Mr. Cornforth then called upon President Parsons, who said: "It seems fitting to make a few remarks on the importance of this subject to this State. We see in the mountains destructive forest fires. Those Eastern slopes were once entirely clothed with trees, and with the loss of the trees we have lost the natural reservoirs so necessary for the growing of crops. It was for the preservation of the Colorado forests that in 1884 the State Society was formed. A State Commissioner was appointed by act of Legislature. By the preservation of the forests the climate would be changed so as to be better for man as well as for the crops.

"We wish to make the love of trees more universal and the planting more general. We thank the members of the Congress who have come here, and as far as we can we will aid them as much as we can."

Mr. W. N. Byers was then called for, but failed to respond. Mr. T. C. Henry was called upon, but excused himself on the ground that he wished to save his ammunition for some future meeting during the week.

On motion, it was voted that ladies be invited to attend the meetings. It was then announced that the subject for this morning's papers and discussion will be, "Forestry Legislation." The meeting will be called at 9:30 a. m., when credentials will be received from delegates.

SECOND DAY'S PROCEEDINGS.

The second session of the American Forestry Congress was called to order yesterday morning by Hon. George H. Parsons of Colorado Springs. Hon. G. W. Minier of Illinois was nominated as chairman and elected. He made a short speech of thanks. Mr. A. E. Beardsley was chosen recording secretary.

The following delegates from States and societies were then announced by the Committee on Credentials:

Wyoming—Dr. J. H. Hayford, Professor N. E. Stark, Mr. E. P. Snow.

Nebraska—Professor E. E. Bessey, S. Barnard, J. H. Masters, J. G. Carpenter.

Kansas—Hon. Martin Allen (Kansas Horticultural Society), W. S. Tilton, Hon. L. D. Bailey.

Colorado—W. W. Pardee, Joseph Davis, A. E. Beardsley, J. F. Martin and Blair Burwell.

Colorado State Horticultural Society—J. L. Barrett, A. E. Gipson, J. S. McClelland, Samuel Wade, Henry Lee, Louis Dugal, Nelson Millett, George Richardson, H. G. Wolff, C. S. Faurot, and N. J. W. Hart, Secretary.

The Secretary then read an article of the constitution to the effect that all members of other like associations, etc., be made honorary members of this convention.

TREES IN NEBRASKA.

The President then called for a statement from one of the delegates from Wyoming. As a representative from that Territory was not present, the Chairman called for Professor Bessey of Nebraska.

Professor Bessey said: "It is scarcely necessary for a Nebraskan to say that we plant trees. The State which originated Arbor Day need say very little on that subject. I never have seen a great community in which more trees were planted than in Nebraska. Tree planting has from the first been a necessity, and the enterprise has been fostered. It has been fostered by the State Horticultural Society, and also by individual effort.

"Thirty years ago the man who traveled forty miles from the Missouri River reached a country which he reported to be uninhabitable. That is all changed now, and one of the influences has been the planting of trees. We feel that in our way we are solving the problem, not of reforesting, as is the case in the older States, but a similar problem, namely, the foresting of a treeless country."

Professor Martin Allen of Kansas was then called upon. He said: "In the western part of our State we have a large amount of territory with but few inhabitants, but not enough timber to supply the inhabitants. We have not done as much in the tree planting as some States, but hope to do more in the future."

Ohio was then called and was responded to by Mr. Leo Weltz, a member of the Forestry Bureau. He said that in 1880 there was 27 per cent. of woodland in the State, and now there is only 17 per cent. He said that they were now trying to get an experimental station, and hoped for generous appropriations from the Legislature.

THE COLORADO INTERESTS.

Colorado was called and was responded to by Mr. W. W. Pardee. He said: "Our State is not an agricultural State. The first men came here for mineral wealth, but later on came men who attempted the irrigation system until we have become something of an agricultural State. As to tree planting, there has been considerable along the ditches, and some tree breaks and some groves. But in our city you will see every street lined with trees. This demonstrates what can be done by energy and by water.

"Now the farmer begins to ask whether this water supply will continue. Now, these streams come from the foot-hills of the mountains and they are generated in the mountains from the melting snow. The mountain forests have now been so much stripped that these streams are beginning to diminish. The great question in Colorado now is how shall we secure the water supply? We must start forests at the head waters of the streams. It was this idea which gave rise to the State Forestry Association. Now, we come here hoping to get encouragement and aid from you gentlemen, because we feel that unless we have the perpetuity of our water supply assured, the agricultural resources of the State will diminish until this tract will again become the Great American Desert."

Secretary Fernow then announced that he had received many letters from members regretting that the distance was so great that they were unable to attend. He read a letter from the Secretary of the Pennsylvania Forestry Association, giving an account of the forestry work which has been done in that State. On motion the letter was ordered spread upon the records.

WITH GREAT RESPECT.

The Chairman, Mr. G. W. Minier of Illinois, was then called upon to speak for his State. He said: "We treat the trees with very great respect. We gather in the forests the seeds of

the various forest trees and plant them in the towns. It is true that many of our forests have been destroyed, but we will have, I am sure, in a few years more trees in the State than when Illinois was settled. We are planting belts—that is, two or three or half a dozen rows around our farms. We do not have the destructive winds which we had. We have planted evergreen trees, which act as wind-breaks to farms and vineyards.

"Always select the trees in your immediate vicinity for planting. Those are the most natural. Go to the nearest groves and select your trees. Treat foreigners with respect, but don't depend on them."

Dr. Berry of Illinois then arose and said: "I am from the southern part of the State. Our forestry interests there represent the destructive element. Along the Wabash valley they are slaughtering those forests to a terrible extent. I believe that some will live to see that white oak sold by the pound. I make these remarks to show that the conditions in the southern part of the State are different from those of the northern."

Mr. C. S. Faurot, President of the Northern Colorado Horticultural Society, was introduced and declared a delegate to the Convention.

Mr. J. S. Hayford of Wyoming then spoke a few words regarding the conditions of forestry in his State.

He said: "I do not think that the conflagrations in the forests can be stopped. The fires will destroy the timber. I do not think either that they can be replaced by planting. After a fire, the shoots will spring up very thickly, forming a better reservoir for melting snow than the original forest, but before they can grow up, they are burned down again."

Mr. Allen proposed that a committee of five be appointed to report the sense of the meeting on the efforts made by Congress to repeal the timber culture acts. Referred to the Committee on Resolutions.

PROGRESS OF THE REFORM.

The Secretary, Mr. Fernow, then read his report, from which the following are extracts:

"The progress of reforms, such as the one in which the American Forestry Congress is engaged, cannot always be measured by a definite ratio. While the development of science and art can be demonstrated from year to year, the progress of moral and economic development is not as easily recognized on the surface. Were we to guage the result of our labor by the prosperity of the Association, we might feel satisfied that our energies were not wasted. Be it understood once for all that this Congress is not composed of forestry experts, but of men who have enough of public spirit to devote their energy to an important economic problem. Be it also understood that forestry science in this country can hardly be said to exist. At the Boston meeting a New England Committee was appointed, which, in connection with a Committee of the Massachusetts Horticultural Society, defeated a uniform forestry law suited for New England conditions. The best fruit of the Congress is still to be found in Canada, where the law proposed by the Congress for abating the destruction by forest fires has been now in use for two years.

"The State of New York has fairly started upon its forestry work by appropriating $35,000 for its forest commission. The State of California has begun vigorous measures to enforce laws in regard to forest fires and the establishment of a forestry school at Los Angeles. What the tree-planting States of the West have done and are doing for their forestry interest you will hear from the delegates from those States. The General Government has continued to gather information, mostly of a statistical nature, and published it in its fourth volume of Forestry Reports. Your Secretary has been lately called to direct the work of the Forestry Division, and he hopes to commence upon the investigation of scientific forestry problems. The membership of the Congress is now forty-one life members and 105 annual members. The financial statement of the Treasurer's book gives a balance on hand of $111.35."

COMMITTEE ON RESOLUTIONS.

On motion a committee of five, consisting of Messrs. Allen (Chairman), Byers, Ensign, Weltz, Barnard and Parsons was appointed on resolutions.

Mr. W. N. Byers extended an invitation to the gentlemen present to visit and inspect the electric railway.

On motion the following Committee on Membership was appointed: G. G. Merrick, W. W. Pardee, Professor T. H. Van Diest, Nelson Millet and W. N. Byers.

Mr. Millett then arose and said: "We have in Wheat Ridge about as fine an exhibition of horticulture as can be seen anywhere, and we invite you to-morrow to come over and visit us. Conveyances will be furnished, and we also invite as many of the citizens of Denver as possible who have conveyances to join us."

The carriages will start at 8:30 this morning from the Chamber of Commerce building.

Mr. C. S. Faurot of Boulder invited the gentlemen to visit that place on their way to Fort Collins.

The President announced as Committee on Nominations Messrs. S. Buck, J. G. Masters and Leo Weltz, and as Committee on Resolutions Messrs. Byers, Ensign, Weltz, Barnard and Parsons.

Adjourned until 1:30 p. m.

The Afternoon Session.

At the afternoon session it was moved by Mr. G. J. Carpenter that a committee of six, to be composed of two from the States of Kansas, Nebraska and Colorado each, be appointed to report by resolutions the best varieties of trees to be planted in the various localities.

The following gentlemen were appointed by the President: Colorado, C. C. Pardee and Nelson Millet; Nebraska, G. J. Carpenter and J. H. Martin; Kansas, Martin Allen and Theodore Boggs.

The Secretary then read a long and interesting paper on "The State and its Relation to Forests." He reviewed the whole subject, detailing, with statistics, the dangers of allowing the forests to be destroyed. He stated that like all other subjects of a simple nature Governmental aid was almost a necessity. He said: "It may be asked how the Government is to obtain control of the land necessary for forest planting. In the case of the Federal Government the problem is very simple, as in the States where there are no public lands there are large quantities of waste land which can be purchased for a mere song. In the case of the State Government the problem is still simpler. There is in every State much land good for nothing except forest-growing."

He showed how the land would pay for itself and how the General and State Governments could best handle the question.

GREEN ASH AND COTTONWOODS.

Mr. Masters of Nebraska, then spoke a few words on the subject of the Forestry work in that State. The green ash, he said, and the cottonwoods spread over the upper ground very rapidly. He said that there were about fifty times as many trees as there were thirty years ago.

Mr. G. J. Carpenter of Nebraska, said that there were not as many fires as formerly, owing to strict legislation. He advocated forestry government stations throughout the plains country. He advocated the forestry training being introduced into the schools.

Mr. W. N. Byers said: "It is an impossibility to get any State to take hold of this question in any except a limited way. The Government is having great trouble in taking care of Yellowstone Park alone."

Mr. Fernow answered: "It is not impossible to get the States to take hold of these matters. Look at the State of New York, I don't say that they have done as much as they should, but they have appropriated $35,000 to save their 7,000 acres of woodland. I think that in time the people of Colorado will be willing to spend $50,000 to save $900,000 worth of timber."

Mr. Tilton, of Kansas, then spoke as follows: "I came to Western Kansas about eight years ago, and have been in journalism. No one can view that vast country without seeing the great crying need of Western Kansas. I have in my own mind developed some opinions regarding forest culture. The question of State interference is attended with much embarrassment. We have an amount of rainfall perfectly adequate for timber culture and agriculture, but the buffalo grass is a repellant of moisture, and where we get sixteen inches of rain we will only get the benefit of five or six inches.

"I would have two experimental stations, one on the Union Pacific road and the other on the Atchison, Topeka & Santa Fe. I would have these stations under State management. I would have them open to the public, but under certain conditions."

Mr. Horner, of Emporia, Kansas, said that he believed scientic State management was the solution of the problem.

ROCKY MOUNTAIN REGION.

Mr. William W. Pardee then read a paper on "Needed Legislation for the Rocky Mountain Country."

The following are extracts: "Legislation is needed by the General Government and by individual States for the preservation of the forests of the Rocky Mountain country; to the end that the streams may have sufficient water for irrigation. The destruction of the forest growth must be checked. Therefore, prompt and wise action should at once be taken by the General Government and by individual States within the said region of country to check the depletion of the said forest growth.

"The General Government should have full control and be largely to the expense of reforesting and preventing the destruction of the remaining forests. First, because the Government owns the greater portion of said forests; second, because the various large streams having their source in the mountains flow through other than the States or Territories in which they rise; third, because it is the province of the General Government to provide for the general good of all the States and Territories and to promote commerce.

"The soil of our plains in its native state only produces stunted grass, but with irrigation water applied it produces abundant crops. Water is to our soil what life-blood is to the human system. Hence our deep interest in protecting and promoting our forest growth, to the end that we may secure this water not only for ourselves but also for generations to come."

TARIFF ON LUMBER.

Mr. Fernow then spoke at some length on the tariff on lumber.

Mr. Merrick referred to the fact that Mr. Pardee had suggested Government aid. He thought that it was impossible to get the Government to help them. He said that Colorado had had some experience with the Government control of public lands. If the people of the State expect any success they must consider the peculiar characteristics of the State. The Government has sent timber agents from the East, but they don't know

the peculiarities of the country. The State of Colorado is better adapted to deal with the question then any general government is.

Mr. Pardee said that the gentlemen who had spoken were laboring under a mistake as to his paper. He had referred to all the arid country, and not to Colorado alone. The State cannot do anything with the forests, because they don't own any of them. If the State owned the land, that would be all right.

Colonel Ensign desired to endorse the views of Mr. Merrick. He then read a paper on the "Management of Rocky Mountain Forests."

The following are extracts: "The forests of Colorado may well stand as representative Rocky Mountain forests. The course of destruction will continue until public sentiment is aroused to the necessity of protecting the forests. Colorado alone, in this part of the country, has attempted to establish a system of forest protection. Her laws are, however, weak and inefficient in many respects.

"The larger amount of forests are still in the hands of the Government. Present efforts should be directed to the maintenance of existing forests. After this, earnest efforts should be made to plant new forests. Among the higher ranges, the snow and rains make it easy to establish new forest growths. When Colorado and other States and Territories can take care of their own forests, then they should have charge of them; but meanwhile, they should be in the hands of the Government."

Mr. Burwell said that there was one form of government which could accomplish great good, namely, the offering of rewards, or immunity from taxes.

FORESTS AND WATER.

The Chairman, Mr. Minier, read a paper on the "Relation of Forests to Water Supplies." He gave statistics showing how the planting of trees had affected the climate of the surrounding country, and told of the devastations made by fires and lumbermen in New York and Pennsylvania. He thought that 20 per cent of our lands ought to be in forests.

On motion, the paper was ordered consolidated with the others which had been read.

After further discussion of the topics, Mr. W. N. Byers read an interesting paper on, "How Best to Preserve the Rocky Mountain Forests."

He thought that more timber had been destroyed in Colorado last year than had been used for five years before. He referred to the proposed changes in the timber culture and pre-emption acts.

He showed the weak points in the proposed law and the impossibility of its being complied with as laid down.

Considerable further discussion ensued, and the meeting adjourned shortly after 5 o'clock.

Mr. Parsons announced that the Union Pacific Railroad had promised half rates on the excursions to the North, and that over twenty had already signified their intention of going.

About thirty will go on the drive to Wheat Ridge this morning leaving at 8:30.

Evening Session.

The evening session opened at 7:30.

It was decided that the papers read be made a part of the proceeding as they stand. Mr. Weltz offered a resolution to the effect that the number of vice-presidents be increased from two to five.

Referred to the Committee on Resolutions.

On motion, each delegation was requested to propose any resolutions they might have to the Committee on Resolutions.

Mr. Barnard complained that the osage orange had been taken from the list of desirable trees. He wanted to know why it had been denounced, and moved that it be the sense of this meeting that the osage orange be added to the list of desirable trees for planting on the plains.

Mr. Allen was willing to endorse all that had been said of the osage orange, but thought that this way of getting at the question was not the right one. The motion was laid on the table.

The meeting then returned to the afternoon's discussion. Mr. W. N. Byers gave some interesting facts regarding forest fires and the peculiarities of second growth.

Professor Bessey stated that he had in his own mind formulated the results of the day's discussion. He thought that the present laws should be swept out of existence. He thought the present laws were admirably adapted to the present direful condition of affairs. Then there must be an exactment permitting the cutting of timber under proper supervision. Here, he said, is where the real question will come. Then he thought that provision for the care of such young trees as came up as spontaneous growth and provision for replanting should be made.

AS TO THE LAWS.

Mr. Byers said he had been familiar with land laws most of his life and thought that the repealing law, repealing all the laws except the homestead law, was a good one.

Mr. Pardee moved that the meeting appoint a standing committee of five to be composed of men living in the arid belt, whose duty is to formulate bills having in view the protection, care and, where necessary, the reforesting of timber lands of the United States, now embraced in the arid region and covering the headwaters of the streams in the Rocky Mountain region, and to press the same on the consideration of the Congress of the United States, and also to prepare a bill for an act of Congress to provide that each pre-emptor or homesteader may also be al-

lowed to enter, in the same district, upon forty acres of timbered land at the minimum price.

The motion was carried. The Chair appointed Mr. Pardee (Chairman), Colonel Ensign, Mr. Martin Allen, Professor Stark and W. N. Byers as the members of the committee.

Secretary Fernow then spoke for Mr. Cole of Allegheny County, New York, who was unable to be present.

Mr. Cole proposes to change the character of the arid region by subterranean irrigation. Mr. Fernow stated at length the system of Mr. Cole, and told the remarkable results attained. Some of the statements were so remarkable as to draw out hoots of derision from the Congress. Mr. Fernow attested to the truth of the statements.

Governor Eaton, who was present, was then called upon and was greeted with applause. He stated that twenty-two years ago he had planted slips, which are now two and one-half feet in diameter and sixty feet high. He stated in details his experience in planting cottonwoods, and spoke of the importance of guarding the mountain forests. He regretted that he had not been able to attend the meetings before.

COLORADO CLIMATE.

Mr. George H. Parsons then read a paper on Colorado climate, describing its effect upon vegetation. The address was full of carefully compiled statistics and was listened to with great interest.

The meeting then adjourned until this afternoon.

This morning will be spent in the carriage drive to Wheat Ridge and points of interest in the city. There will be sessions this afternoon and evening. This will conclude the sessions.

To-morrow morning at 7:45 the excursion to Fort Collins, Boulder and Greeley will take place. The fare for the round trip will be $3.85. On Saturday the members and delegates will go to Colorado Springs and Manitou, and from there they will go on Monday to Leadville.

THIRD DAY'S PROCEEDINGS.

The Forestry Congress, instead of holding a session yesterday morning, adjourned at the invitation of Mr. Nelson Millett to Wheat Ridge.

Carriages had been provided, and at about 8:30, the party, numbering thirty, started from the Chamber of Commerce. The orchards and tree plantings of David Brothers and H. G. Wolf were visited. The fine trees, laden down with the large ripening fruit, called forth expressions of wonder and admiration from the visitors. The party returned to the city shortly after noon.

The Afternoon Session.

The afternoon session began at 1:30.

The Committee on Resolutions reported favorably on changing the number of vice-presidents from two to five. The amendment was adopted.

The Committee on Membership reported as follows:

Life Members—P. H. Dudley, New York; Edmund P. Martin, New York; John M. Bennett, Hebron, Nebraska; Dr. C. R. Agnew, New York; Robert B. Warder, Lafayette; P. H. Van Diest, Denver.

Members—A. P. Rose, Geneva, New York; George H. Parsons, Colorado Springs; I. H. Masters, Nebraska; Benjamin F. Eaton, Colorado; Professor J. W. Beal, Lansing, Michigan; Frank E. Brown, Redlands, California; Joseph Davis, Trinadad; A. E. Beardsley, Trinadad; Theodore Boggs, McPherson; Blair Burwell, Durango; G. Benkleman, Denver; P. O'Brien, Denver; W. N. Byers, Denver; G. J. Carpenter, Fairburg, Nebraska; David Brothers, Denver; W. S. Tilton, Winfield, Kansas, and Martin Allen, Hays City, Kansas.

These gentlemen were consequently made members of the Congress.

The following resolutions were introduced and adopted:

That the Corresponding Secretary be empowered to use his discretion in soliciting contributions during the interval between this and the next meeting, and if sufficient funds be on hand, that the two Secretaries form a Committee of Publication for the purpose of publishing the proceedings of this meeting.

That the New England committee, created at the Boston meeting, at their request, be continued for another year, and that the name of Samuel L. Boardman be substituted for that of General Charles Hamlin, resigned, on that committee.

ELECTION OF OFFICERS.

The Committee on Nominations reported as follows:

For President, G. W. Minier of Illinois; for Vice-Presidents, H. G. Joly of Quebec; Martin Allen, Kansas; G. H. Parsons, Colorado; R. H. Warder, Cincinnati; O. Abbott Kinney, California; for Recording Secretary, E. T. Ensign, Colorado; for Corresponding Secretary, B. C. Fernow, Washington; for Treasurer. Leo Weltz, Ohio.

On motion these officers were declared unanimously elected.

On motion, a committee of three on final resolutions, consisting of Messrs. Carpenter, Budd and Dean, was appointed.

On motion it was decided that the papers read at the meeting be collected and published in pamphlet form.

A paper was then read by Hon. Martin Allen of Kansas on the "Great American Desert." He spoke of the "Desert" as it was at the time that Pike, Long and the early pioneers visited it and compared that condition with the present one. He stated that there was no doubt but that as trees are planted the rainfall increases and the rain belt extends westward, and prophesied that with the energy which is now displayed by the people of the plains the desert and the treeless plains will entirely disappear.

Mr. Carpenter of Nebraska then described at length his experience in planting trees in that State and the methods used by him.

Professor Budd was then called upon to give his experience in forest culture. He described the result of his observations in Europe and Asia.

Secretary Fernow then gave a lengthy talk on the same subject. He was of the opinion that when the Americans once were aroused to the question of forestry that they would far surpass the European countries, inasmuch as the latter have many old methods which they will not drop, whereas the Americans are now ready to use the latest and most improved methods.

Messrs. Budd, Fernow and Minier entered into a discussion on the black locust tree and the damage done it by insects. It was agreed that planted with other trees it is a good tree, but planted with its own kind, it will be always surely destroyed by insects.

M. Carpenter then exhibited a number of seedlings which were planted in the spring, exhibiting the relative growth of the various varieties and recommending which ones

should be planted together. Among the varieties exhibited were black locust, black walnut, box elder and mulberry.

CONCERNING TIMBER CLAIMS.

Mr. Millett gave his experiences with a timber claim. He wanted to know whether a slow growth was advantageous, in consideration of the question of the trees living through the winter. He was assured that their slow growth was more favorable to their living through the winter.

Mr. Masters said that this country west of the Missouri had been called the Great American Desert. He then held up some handsome apples grown near Denver, and said that hereafter the plains should be called the Great American Dessert.

On motion, Mr. Isaac Horner, of Kansas, was requested to spend thirty minutes in telling the Congress his success in silk culture. He had with him a large number of beautiful specimens. His object, he said, in addressing the Congress, was to persuade them of the advantage of cultivating the mulberry tree, which is the basis of silk culture.

The Secretary then read an interesting paper on "The management of the forests in the United States," by Albert Borcherdt. He advocated withdrawing all forest lands belonging to the government from market, and establishing a competing bureau to care for them.

The meeting then adjourned until 7:30.

The Evening Session.

The evening session was opened by the reading of a paper on "Ornamental Trees for Colorado Planting and Methods of Their Culture," by Mr. James Cassidy. He said: "The first impressions of the traveler in this State cannot be said to be the most pleasing, accustomed as Eastern people usually are to associating rural life with orchards, groves and other embellishments of nature in the country. But since the conditions of pioneer life are rapidly passing away it would seem to be high time that we seek to avert the danger of becoming so accustomed to over-bleak surroundings as to forget the enhanced value of crops properly protected and the charms of trees, shrubs and flowers."

He spoke of the elm, the maple, the box elder, the birch and many other trees, giving the advantages and disadvantages of each for Colorado culture.

In conclusion he said: "The fairest adornments of nature everywhere are simply trees, shrubs and grass. What is especially needed to-day is the diffusion of information among landholders as to varieties of fruit and forest trees adapted to our State, with such methods of culture under irrigation as shall insure with proper care their permanent establishment and usefulness."

RESOLUTIONS.

The Congress then proceeded to the consideration of the various resolutions presented in the afternoon by the Committee on Resolutions. Each resolution was considered separately and several changes were made in them. The resolutions as finally adopted stand as follows:

The American Forestry Congress, in meeting assembled at Denver, Colorado, in behalf of the forestry interests of the country, resolves:

First. That the rapid destruction of the timber lands of this country is an evil which will result in incalculable damage to the present and future generations; that the denudation of mountain slopes and hillsides, by fire and axe, without proper regard for renewal, has already begun to injure agricultural interests by disturbing favorable distribution of water supply, intensifying drouths and floods, causing springs to become dry and streams to diminish their flow.

Second—That the importance of maintaining a proper amount of land in forests cannot be overestimated; and it is also apparent that only the Government, State or Nation can have an interest in such maintenance for the benefit of future generations.

Third—That the public lands, at the sources of streams, necessary for the preservation of the water supply, should be granted by the general government to the several States, to be held and kept by such States in perpetuity, for the public use, with a view to maintain and preserve a full supply of water in all rivers and streams.

Fourth—That we recommend to the General Government the creating of the office of Commissioner of Forestry, which office shall be filled by a man conversant with the interests of practical forestry, whose duty it shall be to see that the laws upon that subject are carried into effect.

Fifth—That fire is the most destructive enemy of the forest, and that most stringent regulations should be adopted by the National and State and Territorial governments to prevent its outbreak and spread in timber lands.

Sixth—That the General Government be recommended to assist the Agricultural Colleges of the various States in the formation of tree planting and culture, and that all work and experiments in that direction should be under the general supervision of the Commissioner of Forestry, in case such an office should be created; otherwise to be under the supervision of the Commissioner of Agriculture.

Seventh—That the principles of forestry and practice of tree-planting should be taught in the public schools, normal schools, and agricultural colleges of this country, and that we urgently recommend suitable legislation to that end in the several States and Territories.

Eighth—That, in our opinion, the Agricultural Colleges of the various States should give special attention to the propagation and cultivation of forest trees, and especially to the purpose of determining the most useful and robust varieties of timber for their respective States, and for the various portions thereof, and for the proper dissemination of the knowledge so obtained.

Ninth—That to encourage the planting and propagation of forest trees, States and counties should provide for and allow an abatement of taxes proportioned to the extent and success of such planting.

Tenth—That we most earnestly recommend to the Governors of the various States that they urge upon the Legislatures of their respective States the importance of the preservation of the forests where they already exist, and to urge and encourage such legislation as will promote the more general planting and cultivating of trees and forests.

Eleventh—That there should be no rigid ruling as to the varieties of timber to be planted or cultivated upon a "timber culture" claim.

Twelfth—That the Commissioner of Agriculture be authorized by Congress to apply in his discre-

tion such sum or sums as he may see fit from the appropriation for the forestry division of his department for the encouragement of National and local forestry associations.

Thirteenth—That it is the sense of this Forestry Congress that the Legislatures of the States should provide for the establishment and maintenance of experimental timber culture stations to the end that there may be secured a knowledge of the highest adaptability of different varieties of timber to the different soils, and that the taxable wealth of the State may be increased to the material lessening of the rate of taxation.

The following additional names were recommended by the Nominating Committee and were elected on the membership roll: E. S. Nettleton, Denver; F. Steinhauser, Denver, and F. J. Mott, Denver.

On motion it was decided that the Executive Committee be made a committee of Legislation to draft bills, and present them to the Congress of the United States, embodying the sentiments presented in the resolutions.

FORESTS AND CYCLONES.

Dr. Berry of Illinois was then requested to read a paper which he had prepared on the subject of the effects of forests on cyclones. The paper was long and scientific, and was listened to with great interest.

Votes of thanks were tendered to the Board of Trade, the press, the hotels, the citizens who offered the use of carriages and to the railroads for courtesies extended.

A paper by Dr. Anders of Philadelphia was then tendered to the society by Dr. P. L. McKinnie, on the subject of "Beneficial Climatic Influences of Forest Growth." The paper was not read, but was ordered added to those to be published.

On motion, it was decided to visit the electric railway to-day after returning from Fort Collins and Boulder.

On motion, the time and place of the next annual meeting of the congress was referred to the Executive Committee.

On motion, the ladies present were declared honorary members.

Meeting then adjourned until this morning at 7 o'clock at the Union Depot, when the excursion will be made to Fort Collins, Boulder and Greeley.

Vol. VI

FIRST DAY'S PROCEEDINGS.

September 1887

Promptly at 10 o'clock in the morning President George W. Minier, of Illinois, called to order the sixth annual meeting of the American Forestry congress. Considering the usual meagre attendance on the opening days of all associations, a good representation was present, delegates appearing from all the principal states of the union—from the Atlantic coast to the far west. Among those of prominence present were: B. E. Fernow, of the national department of agriculture, Washington, D. C.; Leo Weltz, commissioner Ohio state board of forestry, Wilmington, O; George W. Minier, president American Forestry congress, Minier, Ill.; Prof. J. L. Budd, of the Iowa Agricultural college, Ames, Ia.; Hon Martin Conrad, Chicago; Hon David A. Brown, Illinois statician of the national board of agriculture, Bates, Ill.; J. H. Morgan, Ontario, Canada; J. M. Osborne, Toledo, O.; S. C. Robb, Ogallah, Kas.; Jean A. Matthieu, Detroit, Mich.; Harmon Dean, Sidney, O.; Martin Allen, Hayes City, Kas.; Charles C. Bell, Booneville, Mo.: F. F. Palms, Detroit, Mich.; Benjamin Buckman, Farmingdale, Ill.; T L. Minier, Minier, Ill.

In opening the session President Minier stated briefly the objects of the congress and gave a few events of its history since the first annual meeting six years ago. Although, first an organization of the United States alone, it had been broadened to embrace in reality the whole western hemisphere and the name changed to the "American Congress of Forestry." While this action had been wise in some respects, it had had its advantages, as making the congress international in its character apparently, precluded the hope of obtaining appropriations to defray its expenses, from either the United States or any other American government.

Mr. Leo Weltz of Wilmington, Ohio, thought it important that the committee on order of business should be appointed early in the session, and on his motion the following gentlemen were appointed as that committee: Leo Weltz, Wilmington,O.; Prof. J. L. Budd, Iowa University, Iowa, and Hon. Martin Conrad, Chicago.

On motion of B. E. Fernow it was decided that the papers of certain members absent and unable to be present be read and discussed.

"Area and Economic Value of the Forests of the United States," a very able paper by H. C. Putnam of Eau Claire, Wis., was read by the secretary. Mr. Putnam, having had over thirty years' experience in the lumber and timber business, his views were considered of unusual importance by the congress. The lumber men of the north west, he said, were cutting the pine forests of that regin at the rate of 800,000,000 feet a year. Fifteen years will see the great pine forests of Wisconsin obliterated as an article of commerce. Just so with the forests of Michigan, Minnesota and the whole northwest. The importance of legislation on this subject cannot be overestimated. Care should be taken against the origination of the devastating forest fires. Officers should be appointed by the national or state governments to look to this and see that the laws already in existence are enforced. The young trees should be protected in their growth where the larger are

felled and cut up. It is easier to save a thousand young trees than to plant and nurture one. By proper care and discrimination, by proper legislation, these great forests can be preserved at their present acreage. But will the national government or the states ever move? The slaughter goes unheeded onward year after year. If these forests are destroyed, the great rivers of the northwest will in the dry season become less than babbling brooks instead of commercial waterways as they now are. History has proven this prophecy to be inevitable. As a nation we are rich in forest area. The 800 miles of coast of the Carolinas, Georgia, Florida, Alabama, Mississippi and Texas, extending inward an average of 100 miles, carries a valuable pine forest of both varieties. Just so with other portions of the country. Australia, China, Japan and the islands of the sea, on the other hand, have no timber of commercial value. Mexico has some, but at present it is almost inaccessible. Europe depends entirely upon us for many varieties of timber. Are we to be profligate of these great riches or are we to lavish and destroy? Action by congress, and laws to insure preservation of the growing timber are the only safeguards. But we must not wait too long.

DISCUSSION.

Mr. Fernow opened the discussion on this paper. He thought the incentive to forestry legislation lay rather with state legislatures than with the national congress. In Michigan a commission has already been appointed to suggest legislation in that direction. Other states should follow. In Canada the most encouragement had been received. There the proceedings of this congress were printed without the inquiry being made whether the organization were Canadian or American. There the government has conjointly with the timber men appointed "fire wardens," to look to the preservation of the forests from fires and secure enforcement of all the laws. The lumber men pay half his salary and the government the other half. This man has the power of police officers. He can make arrests and in case of emergency can summon all citizens to his aid in the suppression of fire or enforcement of the law. In Michigan, alone, on the other hand, the forest fires have done a damage of over seven million dollars. Of course the states could do nothing in regard to the mountain regions and government reservation. Congress would have to legislate on that subject. The manner in which the government forests were devastated was shameful, yet laws should not be passed without the instrument to enforce them. A national commission or board should be appointed with the necessary powers. The present trouble was that, although in most states laws already existed for the protection of forests against fires, there were no commission or officers to look after their enforcement.

Prof. J. L. Budd remarked that he had been surprised when in Riga, Russia, some years ago to find that shiploads of pine were being continually shipped from that point to the United States in large quantities. On the other hand the English have picked up nearly every black walnut log in the west and shipped it to England to be manufactured there. Speaking a little off the subject he wished to state right here for general information that in Iowa they had found that white pine was one of the best timbers to grow. Groves planted eighteen years ago were now from forty to fifty feet in height. No particular experiments had been made with red pine, but they seemed to flourish wherever planted and proved very ornamental. Observations made by the Iowa people had shown that in drouth white pine made the best growth of any tree in the state. Red pine probably

came next, and it was followed by white spruce.

"Helps and Hindrances to Kansas Forestry," by W. S. Newlon, of Oswego, Kan., was the next paper read. The author stated that the people of Kansas in years gone by had done a great deal of grove and tree planting on their farms and around their orchards, fields and homes. These benevolent efforts were now giving a rich return. All that was needed in the future was intelligent discussion and agitation to stimulate in the mind of the masses a benevolent inspiration for forestry. The hindrances to forestry in Kansas were the great drouths, fires, birds and insects, and the consumption of the timber as rapidly as it grew. In the past the prairies of Kansas were burned annually and much timber destroyed in the course. In Indian territory particularly these fires still ravaged periodically. To prevent the frequent disastrous fires from railroad sparks, the funnels of the locomotives should be netted. Much timber too is needlessly squandered in Kansas in the construction of bridges and other public structures that should be composed entirely of stone. Wire fences, too, should be built rather than plank ones. A substitute for wood in railroad ties should also be adopted by the railroads. The demand for ties probably makes a greater inroad on our forests than any other one article. The laws of Kansas fail to protect certain birds from indiscriminate slaughter because of the impression that they eat and peck fruit and perforate trees. While this to some extent is true, yet these same birds do incalculable good by preying on borers and other insects that attack the trees. A law of Kansas forbidding the growth of hedges to a height of over four and one-half feet was also an unwise act. They should be allowed full scope. The roots of trees and herbage stop the circulation of water through the ground and hold it from running off and away through the streams too rapidly. It is a well-known fact to close observers that fibrous roots hold water like a sponge and will make a swamp anywhere. This fact materially affects the rainfall of a country. Trees by consuming effete carbonic acid and giving out oxygen are valuable as preventives of malaria and other diseases. As a matter of fact birds are indispensable to forestry. Without them all trees would be destroyed by the various insects. Despite them many trees in Kansas are destroyed by the borers, caterpillars, grasshoppers, aphis and other pests. The English sparrow and other birds destroy all these insects. The birds should be appreciated and protected from injury.

DISCUSSION.

Mr. Minier said he endorsed every word of the paper—particularly all that referred to birds. They were his particular pets.

Mr. Fernow said he was astonished to see so few birds, comparatively, in the United States. The woods of North America appear lifeless compared with the woods of Europe. Singing birds particularly are scarce here.

Mr. Brown thought there were plenty of birds here, but they rather frequented the prairie groves and prairies.

Mr. Allen did not agree with the paper on the assertion that the roots of trees stored up moisture. That was, he thought, a great fallacy. He believed, on the other hand, the roots afforded an exit of moisture from the ground by sucking it up in the tree from whence it passed through the limbs and foliage to the atmosphere. Some of the birds, too, which the paper praised, he found in Western Kansas to be a great pest, sticking their bills into fruit and creating great injury.

Mr. Morgan, of Ontario, Canada, in reply to this, said there could be no roses

without their thorns. The birds paid for all their damage. He thought, however, roots were a great preservative of moisture. They act as a sponge. Go several days after a heavy rain and take a network of the roots and you can squeeze water out of them.

Mr. Osborne thought it wonderful the amount of moisture trees draw up through their roots and distribute to the atmosphere —even where the soil is apparently dry. Experiments have proven that the roots penetrate to such a depth as to obtain plenty of moisture where there has been no rain for months. In Nebraska he found the planting of forests had attracted the birds.

Mr Fernow said that experiments so far had given no direct knowledge in regard to the transpiration of water by means of the roots and branches of trees. It is certainly true that the amount of evaporation through the roots and leaves is enormous, yet it should be borne in mind that the roots, penetrating a distance often of twenty feet or more, bring up the moisture that otherwise would never be available.

Mr. Budd said that a few years ago, in the Adirondacks, he walked through a forest in dry mid-summer where the moisture actually wet his feet. Afterwards he visited the same country; the forest was cleared away, and where once was moisture was now arid desert. The point lay in the fact that evaporation from open land was much more rapid than from the earth covered with forests. Scattering trees did not do so much proportionate good in this respect as several thousand acres, as forest conditions seemed to be necessary.

Mr. Fernow stated that in Prussia, where forestry was better understood, and an annual crop of timber felled the same as any other crop, great trouble was lately experienced in disposing of the supply, timber being imported in large quantities from Gallicia and Hungary. As to the metal railroad ties suggested in the paper, Mr. Fernow would say that the Mexican railways had this year laid 60,000 of them as substitutes for wooden ones.

Mr. Budd said no climate on earth had been so greatly modified within fifty years as the climate of this part of North America. The clearing of the forests has clearly had much to do in this direction. Let us cultivate timber on our own soil, and not bring it from British America or Russia.

Mr. Fernow agreed that the clearing of forests greatly affected the climate. Experiments had proven that the temperature of forests was 15° to 20° lower than the fields in summer. In fall and winter the difference was somewhat less. The humidity of the forests was from 3 to 10 and even 13 per cent greater than in open air.

Mr. Minier stated that years ago, when surveying the Illinois Central railroad and the Illinois river, he made some observations regarding the rainfall. A single inch of rainfall on a single acre of ground amounted to 101 tons of water! He also insisted that fibrous roots, acting as sponges, absorb large quantities of water. It is also true that an enormous evaporation is constantly going on through this medium. There is considerable moisture in the atmosphere all the time—so much, indeed, that if all the water above us for forty or fifty miles could be condensed at once there would no longer be any dispute about there once having been a flood. [Laughter.] Regarding the subject of metal ties, President Blackstone, of the Chicago & Alton railroad, had informed the speaker that they proved too great an injury to the rolling stock to ever be adopted. Paper ties were the only substitute, Mr. Blackstone has asserted, and it required bass-wood or linden trees to make them. "As to the birds, there are but few of them that are not our particular friends.

In April, May and June they prey on the insects that attack the trees. In July and August they ask a little compensation for labor, and I propose to plant enough that they may come and get their pay without any trouble." [Applause.]

AFTERNOON SESSION.

At the opening of the afternoon session letters of regret at inability to be present were read from Prof. Northrup, of Connecticut; Joaquin Miller, of California, and several others.

The secretary, Mr. B. E. Fernow, made a report, stating briefly the work of the past year, which, together with the treasurer's next made, was referred to the following committee: C. C. Bell, Booneville, Mo.; Martin Allen, Kansas, and Harmon Dean, Ohio.

The report of the "New England committee" was read by the secretary. It stated that the efforts of the committee had been principally directed toward securing legislation for the prevention of forest fires. The state grange of Maine had seconded the efforts of the committee, and in that as well as other New England states the results had been encouraging. In Maine a bill had been passed establishing an "Arbor Day" for the general planting of trees.

The report of the "Arbor Day committee" was read in the shape of a letter from Prof. Northrup. In all states visited, he had met with flattering results, many of them having already passed a law creating an "arbor day."

Messrs. J. L. Budd, Leo Weltz and B. E. Fernow were appointed a committee to wait on Gov. Oglesby and escort him to the hall. On entering the meeting the governor was greeted with considerable applause, and was introduced by the president in a brief but fitting speech.

Gov. Oglesby spoke at length, avowing his great interest in the cause of forestry, and commending the zeal of a body of men who year after year labored in its advocacy without ever a hope of remuneration. Theirs was a patriotism worthy of any country. In conclusion he warmly welcomed the congress to the state and capitol city, and promised daily attendance of its sessions.

J. H. Morgan, of Ontario, Canada, responded briefly to the governor's welcome. He felt that the people of Canada and the United States on the subject of forestry were growing nearer and nearer together every day, and concluded by expressing the hope that bonds between the two people would grow closer and closer, their interests more and more identical, until in the end the long-cherished "commercial union" would become a fact of history.

The president, G. W. Minier, read the annual address, which contained a number of valuable suggestions, and was listened to with marked attention.

"Forestry in Nebraska" was the subject of a letter of the Nebraska delegates. It stated that great efforts were being made to awaken the interest of the people of that state in forestry with partial success. Already the forests at the mountain sources of the great rivers of Nebraska were being cleared off to such an extent as to endanger irrigation of Nebraska lands and, unless decisive steps were taken, in a few years the North Platte and other important streams would, in mid-summer, dwindle to feeble brooks or become entirely dry. The state agricultural and horticultural societies, too, were urging the passage of a law by the state establishing "forestry stations"—that is, the planting at certain distances apart of considerable groves to be preserved intact. The delegates were endeavoring to secure the adoption of forestry as a regular course of instruction in the schools.

Mr. Budd thought every agricultural college in the United States, particularly, should teach forestry, and Mr. Minier amended the sentiment by insisting that every common school also should give limited instruction on the subject.

Mr. Budd said that "arbor day" customs had been reasonably encouraging in Iowa. Premiums were offered for the number of trees planted, and good results achieved, although the general experience had been that arbor day was more of a sentiment than a solid reality.

Mr. Bell said that in Missouri it had been found that the best way to get trees planted was to plant them. (Laughter). In his state he simply went to the forests, secured abundant young trees and announced that on a certain day everybody could have as many as he wanted for planting. As a result, thousands of trees were planted.

Ex-Senator Gillham, of Alton, spoke at length on the necessity of forestry organization in Illinois. In his part of the state many trees had been planted, and the result had been satisfactory. He urged the adoption of resolutions by the congress requesting the various states to amend their laws and constitutions in such a way as to exempt from taxation all lands planted in forests for a given time.

From this time the discussion took a very general character on the merits and methods of treating different timber trees.

The chair appointed the following "committee on resolutions:" D. B. Gillham, W. J Beal and J. L. Budd.

"Legislation Necessary for the Encouragement of Tree Planting in Illinois," was the subject of a paper by Fred Grundy, of Illinois, which was read by the secretary. The paper was very brief, and particularly urged the passage of legislative enactments to promote forest planting. It concluded with the draft of a bill which the author thought should be presented to the next legislature of Illinois. This bill provided that land upon which a certain number of trees were planted for timber culture should be exempt for a limited time from all taxation.

Senator Gillham stated at the conclusion of the paper that abill similar to the one presented had been introduced by him in a former legislature but had failed to pass on account of its unconstitutionality, the constitution of Illinois providing nothing but school and church property shall be exempt from taxation.

On motion of Mr. Weltz the congress adjourned until 9 a. m. of next day.

From 8 to 10 last evening a reception was tendered the delegates of the congress by Gov. Oglesby at the executive mansion.

SECOND DAY'S PROCEEDINGS.

THURSDAY, SEPTEMBER 15TH, 1887.

When the American Congress of Forestry convened at 9 o'clock this morning a rather increased attendance was observed over that of the previous day. J. R. Dodge, chief of the bureau of statistics of the National Department of Agriculture, and several other gentlemen of national reputation, arrived early in the day

Letters of greeting and encouragement were read from Hon. L. D. Whiting of Tiskelwa, Ill., Mr. S. Bock of Dayton, O., from thes ecretary of the Southern Forestry congress, Huntsville, Alabama, and several other gentlemen of prominence interested in forestry.

A joint resolution was received from the general assembly of Georgia inviting the American Congress of Forestry to meet conjointly with the Southern Forestry congress at Atlanta, Georgia, in 1888. Hon. Sidney Root, of Atlanta, Ga., a delegate from the Southern Congress of Forestry, in a brief speech warmly seconded on behalf of his congress, this invitation of the state legislature. There was strength in union, and a joint convention of the two congresses next year would not only promote the cause of forestry throughout the country but cement the bond of union between the north and south.

Mr C. C. Bell, of Missouri, favored the acceptance of this invitation. Southern hospitality was proverbial, and he for one was in favor of meeting next year conjointly with the southern congress. Remarks tending in the same direction were also made by President Minier, Secretary Fernow and others. At this juncture a communication was also received from the Pennsylvania Forestry association inviting the American congress to meet in Philadelphia next year. The matter of selecting a place of meeting for next year was by general consent referred to the executive committee.

The next thing on the programme was announced by the president to be "discussion on Memorial and Bill for National Forest Administration." Mr. Fernow, spoke briefly on the attempts at forestry legislation in the various states, and read several bills on the subject—one prepared by the State Board of Forestry of California, another by Senator Miller, of New York, and another by the Forestry Commissioner of Colorado. The bill prepared by himself was then read by Mr. Fernow and discussed at length by the congress, being finally adopted for recommendation to the senate and house of representatives at Washington, as follows:

A BILL

For the protection and administration of the forests on the public domain.

Be it enacted by the senate and house of representatives of the United States of Amecria in congress assembled:

DESIGNATION OF FOREST LANDS.

Section 1. All lands now owned or controlled, or which may be hereafter owned or

controlled by the United States, and which are now, or shall hereafter be, devoted to forest uses, are, for the purposes of this act, declared to be public forest lands.

WITHDRAWAL OF FOREST LANDS FROM SALE.

Sec. 2. The unsurveyed public lands of the United States embracing natural forests, or which are less valuable for agricultural than for forest purposes, and all public lands returned by the public surveys as timber lands shall be, and the same are hereby, withdrawn from survey, sale, entry, or disposal under existing laws, and shall be disposed of only as provided in this act and as congress may hereafter prescribe.

PREVENTING ENTRIES UPON FOREST LANDS.

Sec. 3. Every person applying to make an entry or filing of public lands under any law of the United States before the classification and survey of the forest lands as provided in this act shall be made, shall file with his application an affidavit under oath, corroborated by witnesses, stating that the land applied for is not exclusively forest land, and not situated near the headwaters of any stream, and is more valuable for agricultural or mining purposes than for the timber growing thereon, and each such applicant shall state particularly his means of information and his personal knowledge of the facts to which he testifies, and upon a certificate from the commissioner of forestry the lands so entered may be disposed of under existing laws; and every person swearing falsely to any such affidavit shall be deemed guilty of perjury and liable to the penalties thereof; and all illegal entries of timber lands shall be absolutely void, and upon satisfactory proof, shall be subject to summary cancellation by the commissioner of the general land office.

INSTITUTING THE OFFICE OF COMMISSIONER OF FORESTS.

Sec. 4. There shall be in the department of the Interior a commissioner of forests, who shall be appointed by the president, by and with advice and consent of the senate, and he shall have the care, management and control of all the forest lands owned or controlled by the United States. He shall be a suitable person, versed in matters of forestry, and shall be entitled to a salary of $5,000 a year, with such allowances for assistants and expenses as will insure a proper execution of the provisions of this act and as congress may from year to year provide. He shall hold his office during good behavior, and may be removed by the president for cause, and before entering upon his duties he shall give bonds with sureties to the treasurer of the United States in the sum of $50,000, conditional, to render a true and faithful account to the treasurer, quarterly, of all moneys which shall be by him received by virtue of the said office.

APPOINTMENT OF FOUR ASSISTANT COMMISSIONERS.

Sec. 5. The commissioner of forests shall appoint to himself four assistant commissioners, one of whom shall be a resident of the state of California, or any of the territories on the Pacific slope and well acquainted with the forest conditions of the Pacific slope; another shall be from the state of Colorado or any of the territories bordering the Rocky mountains, and well acquainted with the forest conditions of the Rocky mountains, and the third shall be from one of the states east of the 100th meridian, and well acquainted with the forest conditions there prevailing. The fourth shall be an expert in the knowledge of scientific forestry. The four assistant commissioners are to act as a council to the commissioner of forests in all matters pertaining to the administration of government forest lands as constituted by this act, and each shall have special charge of one division of the public forest reserves, which he shall personally inspect at least once every year. Each of the assistant commissioners shall receive a salary of $3,000.

CLASSIFICATION OF FOREST LANDS.

Sec. 6. The forest lands on the public domain shall be arranged in three general classes, namely:

First, Lands distant from the headwaters of important streams, covered by timber of commercial value, more valuable for forest purposes than for cultivation.

Second, Lands partially or wholly covered by timber, but suitable for homesteads, and

more valuable for agricultural purposes than for timber.

Third, Mountainous and other woodlands, which, for climatic or economic or public reasons should be held permanently as forest reserves.

ESTABLISHMENT OF FOREST RESERVES.

Sec. 7. It shall be the duty of the commissioner of forests to examine and classify the forests and public timber lands of the United States, and to determine, subject to the approval of the secretary of the Interior, what portions of such forests and timber lands should be permanently retained in reservation for climatic or other economic or public reasons, and what portions may be disposed of without disadvantage to the public interests. He shall cause to be prepared connected maps or diagrams showing the approximate situation and areas of public timber lands in each state and territory, and the president shall, by proclamation, designate the permanent forest reserves as the same shall be selected and approved as herein provided; and it shall be the duty of the secretary of the Interior to cause exterior boundary lines thereof to be run and marked by durable monuments; and no further survey of any timber lands of the United States shall be made until the permanent reservations herein provided for are established.

APPRAISEMENT OF TIMBER.

Sec. 8. The lands of the first and second class shall from time to time be appraised, under the direction of the secretary of the Interior, and lists and plats thereof made; and the value of the timber shall be appraised separately from and in addition to the government price of the land.

DISPOSITION OF TIMBER

Sec. 9. The president may, from time to time, in his discretion, by proclamation, authorize the sale of such appraised timber on lands of the first class, on the stump, in aggregate quantities not exceeding twenty-five thousand acres at any one sale.

MANNER OF SALE OF TIMBER.

Sec. 10. Such sales shall be made under the supervision of the commissioner of forests and in accordance with such regulations as the secretary of the Interior may prescribe, and under the condition that the purchaser will comply with the regulations as to the cutting and removal of the timber prescribed and made known by the commissioner of forests; but no such timber shall be disposed of except to the highest bidder, upon sealed bids, by legal subdivisions of sections, at not less than the appraised price, and after due public notice as now provided by law.

RESTORING FOREST LANDS TO ENTRY.

Sec. 11. Lands of the second class, when reported to the secretary of the Interior by the commissioner of forests, with the approval of the president, shall be restored to homestead entry or sale; but a special price for the timber thereon, as appraised, shall be paid by the applicant in addition to the usual price and fees for the land.

CO-OPERATION OF OTHER OFFICERS.

Sec. 12. The commissioner of the general land office, surveyors general, registers and receivers, and other federal officers connected with the public lands, are directed to co operate with and assist to the extent of their power the commissioner of forests in the selection and classification of the public forest lands.

FURTHER DUTIES OF FOREST COMMISSIONER.

Sec. 13. The commissioner of forests shall properly subdivide and arrange into divisions and districts of proper size such forest lands as shall constitute the forest reserves and forest lands remaining under his control, and shall organize a service of and appoint inspectors and rangers for their protection and proper administration and provide a practicable system of forestry. He shall make reasonable rules and regulations for the prevention of trespass upon said lands and for their protection and the conservation of forest growth, and he shall be empowered to sell timber from the said reservations as the local demands require and a proper forestry permits. He shall designate every year the areas which may be cut over and prescribe the conditions, manner, method and time for the cutting of

the same and fix the government rate for the stumpage on such areas, and upon the application of any resident citizen desirous to obtain his supply of wood from the government forest reserves, suitable locations shall be designated to him. The commissioner of forests shall have the power to regulate pasturage and any occupancy whatever upon the forest lands. And all moneys received from the sale of timber or any other privileges he shall cover into the United States treasury.

CO-OPERATION WITH STATE BOARDS.

Sec. 14. Whenever any of the states in which public forest lands are situated shall have instituted and provided for a forest commission or other forest management of the forest lands belonging to the state, it shall be in the discretion of the commissioner of forestry, with the approval of the secretary of the Interior, to co-operate with such forest commission and to allow the same to act as agents for the United States under his direction for the purposes of this act.

PENALTIES FOR ILLEGAL CUTTING ON FOREST RESERVES

Sec. 15. If any person shall illegally cut, remove or destroy, or cause or procure to be cut, removed or destroyed, or aid, counsel or assist in cutting, removing or destroying any trees or timber upon any forest reserve of the United States, every such person shall be liable to a fine of not less than $100 and not more than $1,000 for each such offense, to imprisonment at hard labor not exceeding one year and to civil prosecution to recover the value of the property so unlawfully taken or destroyed.

PENALTIES FOR CUTTING TIMBER ON ANY FOREST LAND.

Sec. 16. It shall be unlawful to cut or remove without proper authority, or to cause or procure to be cut or removed, or to wantonly burn, injure, tap, girdle or destroy any timber on or from lands of the United States, or to export, transport, purchase or dispose of the same, or of any lumber, charcoal, pitch, turpentine, or other product manufactured therefrom; and every person violating the provisions of this section shall be guilty of a misdemeanor and shall be fined in a sum not exceeding $1,000, and imprisoned not longer than one year; and every person engaged in any such depredation upon timber or timber lands of the United States, whether as principal, agent, employe, carrier, mill owner, manufacturer, vendor or vendee, shall moreover be liable in an action of trespass for the full value of the timber or timber product at the place of delivery; but nothing contained in this section shall prevent any agriculturist or miner from taking from his claim the timber necessary for domestic purposes or the support of his improvements.

And wherever there exists a right previously established by law, to cut timber on the public lands, every person or corporation exercising such right must comply with the rules and regulations prescribed by the commissioner of forests and approved by the secretary of the Interior.

And a failure to comply with all the rules and regulations so prescribed and approved in regard to the manner of using and occupying the public forest lands shall constitute a misdemeanor punishable as provided in this section.

PENALTIES FOR OCCUPANCY OF PUBLIC LANDS.

Sec. 17. That it shall be unlawful for any person, firm, or corporation to knowingly erect, establish or maintain upon public lands of the United States without proper authority any saw-mill or manufactory of lumber or other timber products, or to engage or be employed in the manufacture of lumber, charcoal, pitch, or turpentine upon public lands, or to use at any such mill, manufactory, or works, any timber cut or removed from public lands; and any person violating this section shall be liable to a fine of not less than $500 and not more than $5,000, in addition to the penalties hereinbefore prescribed; and all mills, manufactories, and works so erected or maintained upon public lands shall be absolutely forfeited to the United States.

PENALTIES FOR TRANSPORTING AND HANDLING ILLEGALLY CUT TIMBER.

Sec. 18. That if any master, owner or consignee of any vessel, or any officer or agent of

any railroad company, shall knowingly receive for shipment any timber, lumber, or timber product taken without authority from timber lands of the United States, with intent to transport the same to any port or place within the United States, or to export the same to any foreign country, every such master, owner, consignee, officer, agent and railroad company shall be liable to the penalties prescribed in the eleventh section of this act, and the vessel on board which any such timber, lumber, or timber product shall be taken, transported or seized, shall be wholly forfeited to the United States.

PROTECTION BY MILITARY FORCE.

Sec. 19. The president is authorized to employ so much of the land and naval forces of the United States as may be necessary effectually to prevent the cutting down, removal, or other destruction of trees or timber on public forest lands, and to prevent the transportation of any such timber, and to take such other measures as may be deemed advisable for the protection of the forest lands of the United States.

RESTRICTING QUALITY OF FOREST OFFICERS.

Sec. 20. No person who is directly or indirectly engaged in the manufacture of lumber, or timber products, or conducting any business which requires a large consumption of timber or wood, shall be qualified to serve as commissioners of forests under this act, or to serve in any official capacity in connection with the public woodlands.

REPEALING CLAUSE.

Sec. 21. That the acts of June 3d, 1878, chapters 150 and 151, and the first and second sections of the act of June 15, 1880, entitled "An act relating to the public lands of the United States," and all acts and parts of acts inconsistent with this act, be, and the same are hereby, repealed.

ENACTING CLAUSE.

Sec. 22. This act shall take effect on the 1st day of July next, but the president may appoint the commissioner of forests prior to that date, with his duties and salary to commence at that date.

APPROPRIATION CLAUSE.

Sec. 23. For the purpose of carrying out the provisions of this act, for the payment of salaries, traveling and other expenses the sum of $500,000 is hereby appropriated.

A communication was received from Mayor Charles E. Hay, of Springfield, on behalf of the Lincoln Monument association, extending an invitation to the American Forestry congress to visit Lincoln monument as the guests of the association before adjournment. After some discussion it was accepted with thanks, the congress deciding to start at 4 p. m.

The committee on resolutions reported, with favorable recommendation, the following resolution, which was unanimously adopted:

WHEREAS, The osage orange has heretofore been proscribed as a timber tree by a former commissioner of the general land office at Washington; and

WHEREAS, Commissioner McFarland, in February, 1882, modified such ruling of his predecessor, reinstating the osage orange and other trees; and

WHEREAS, Under such modification the register of the land office of the western district of Kansas did recommend to patrons of the timber culture law the osage orange as one of the best they could plant on their claims; therefore, be it

Resolved, That we look upon it as not only unjust, but extremely cruel, to now subject final proofs upon claims planted under such modification and advice, simply because such advice and modification was followed.

Resolved, That up to about the 40th parallel of north latitude the osage orange is an eminent success as a forest tree, worthy of extensive planting.

"Forest Cultivation for Profit" was the subject of a well-prepared paper read by Hon. Martin Conrad, of Chicago, which is here given in full:

MR. PRESIDENT, LADIES AND GENTLEMEN:

I have accepted with much pleasure, the invitation to address you on that department of Forestry which more particularly concerns the present and

future supply of timber required for the manufacture of farm machinery and wagons, because I feel that timber culture is not ordinarily a subject of such popular attention as it deserves to be.

The few remarks I am about to make, may suggest further channels of research and experiment in this noblest of nature's domains, and it is for you, as the practical promoters of this branch of our great agricultural interests, to direct such efforts as may be awakened by my words, if you shall judge them worthy of such distinction.

It is a noteworthy result of our daily vocation, be it what it may, that we are always taking mental note of whatever may have the remotest connection with it; yet it is true that this unconscious mental action, in time quite dominates our facilities of observations. We hear the stockmen speak only of the cattle he has seen in his travels—and it is the dairyman who can locate every fine herd of "good milkers" in the country. Even Miss Flora McFlimsy, absorbed in her own delightful occupation, may have "clean forgot" the text, and all that the good pastor said—but she can minutely describe each "duck of a bonnet" that comes within her range of vision. So it comes that the lumberman is no exception to this universal rule, for, even while gazing on your favorite herd of shorthorns, his 'mind is elsewhere. He sees only the leafy grove in whose shade they are gathered, and is undoubtedly figuring how many feet of this or that grade each spreading oak would average.

Influenced in much the same way, my own observations during twenty years of experience in the wagon business have included in their scope the great problem which to-day confronts its chief ally, the lumber interest. I need hardly say that I have noted with much solicitude the wholesale destruction of our forests in all parts of the United States. I use the word "destruction," advisedly, and in its fullest sense; because the removal of timber for actual use, is but a fraction of the evil causes now at work upon our woodlands—while wantonness and rapacity are doing their worst in this war of extermination. Even the farmer, eager for quick returns, relentlessly uproots the last sapling that the ground may be sown with grain, not thinking of how he is robbing future generations of their just heritage.

In ever-widening circles does this destruction spread over the land. It is but a few years ago that Chicago drew the bulk of its whitewood supply from the state of Michigan—while to-day, that great timber state, in common with ourselves, draws upon Tennessee and other southern districts for this valuable wood. Oak, at that time, was so abundant that it could not be profitably shipped by rail to Chicago from outside a radius of a hundred miles; whereas, to-day, Arkansas and even Mississippi are represented in the oak supply of the Chicago yards. Black-walnut and live-oak are already practically extinct—but long before the culmination of this ominous result, even as far back as 1868—the Hon. T. M. Edmunds in his report to the U. S. Department of Agriculture, foresaw a complete extinction of all timber resources of the United States in about fifty years. This threatened loss alone should demand prompt measures of restraint; but the disasters that we invite, through the climatic changes that must follow our imprudence, are appalling enough to justify the gravest fears.

It is not my purpose to introduce here any lurid pictures of calamities in store for us—as better pens than mine, guided by the hands of science have already enlightened us as to the probable course of events if the present conditions are allowed to continue. The note of alarm has been sounded long ago, and the stormy floods of the Mississippi and the Ohio have re-echoed it with terrific emphasis.

In proof of the enormous climatic changes that can result from such a cause, I may mention that we have an actual demonstration of the whole process at our very doors. I refer to the northern domain of our sister republic of Mexico, a section whose former luxuriance of vegitation once proclaimed it a paradise, and whose mineral wealth marked a brilliant page in the chronicles of the sixteenth century. This region is to-day a parched and torrid desert land, treeless and waterless, in whose barren solitudes it would seem that few would have dared to venture.

Yet it is a deeply significant fact that these sunburnt valleys, not only around the city of Chihuahua, but also in many other parts of that section, should be covered with acre after acre of slag from silver oar. It must be borne in mind that in all this strange region there is not a bed of coal and that, therefore, the extensive smelting operations that are evidenced by the vast fields of slag, must have required an enormous and also convenient, supply of wood for fuel. It follows then that at some distant period of the past dense forests must have covered this land, and furnished the necessary fuel, thereby completely verifying the statement of Bernal Diaz, the soldier-historian of the Cortez expedition, that they found the region covered with luxuriant woods, verdant valleys and fertile plateaus, It was the treasure hunters then who followed these conquerors that inaugurated the destruction which has extinguished these forests and swept all vegetation from the face of the land.

With nature's sheltering mantle thus removed, the denuded earth quickly yielded to the influence of an already arid climate, and the desert promptly spread over the area thus prepared for it. The noble forests have vanished at the touch of civili-

zation, and with them also, the life-giving interchange of the clouds and the dew—the balance-wheel of nature's fertility. To-day only a few scattered ruins, here and there, in the midst of lonely wastes of desert, are left, to speak of their former beauty and grandeur. Could the explorer Cortez, and his devout historian, at this moment look upon those beautiful valleys of 350 years ago, viewing again the scenes of their adventures and discoveries, their pious catholocism might be charmed by the sight of the grand cathedral, with its stately towers, costing almost a round million of dollars, as well as the beautiful park at its doors, with its fountains, trees and luxuriance of tropical plants, maintained in this splendor, by the ever watchful, artificial care of man; but, looking beyond this little garden spot, they would search in vain for the Eden of primeval beauty that first met their wondering gaze, for their eyes would rest only upon the dreary desolation and ruin which their treasure-seeking followers left behind them.

I do not attempt to trace the exact degree of climatic changes wrought in this particular instance. It is sufficient that the connection from cause to effect is obvious; and to those who have given a thought to the science of forestry, I need not repeat the immeasurable benefits conferred by the presence of forests; how they eqalize the humidity, how they furnish shelter, create springs, control the flow of rivers, and protect the proper moisture of the ground. On the other hand, history supplies instances enough of the decay of nations whose decline may be logically traced to the imprudent destruction of their forests, and the consequent disastrous and deteriorating changes in their climate.

Fortunately, we have a prudent example before us, in the countries of Europe, in all of which the forests are under government guardianship, protecting them against fire as well as spoliation; and, however little we may profit by this (for such a system would be a physical impossibility in this country), it may at least serve to remind us that our national legislation tends to the opposite direction, and that at least indirect relief could be afforded by admitting foreign lumber free, and thereby lessening that much of the drain upon our own resources.

Without stopping to discuss this point, it is worth while to see what can be done legitimately in the right direction, and to inquire if there is not a chance of redeeming the situation by intelligent and well directed individual action, with a sufficient incentive of personal profit to warrant hopes of success. If I can show that proper efforts in tree culture will prove profitable and that it is a sure and valuable investment for any farmer and land owner, this may be the means of forestalling evil results and recovering some part of what has been so wantonly destroyed. To investigate this interesting point, I have searched many records and exhausted many tables of statistics, only to be met with a most surprising meagreness of practical information on the general subject. It seems that of late comparatively little personal knowledge of any value has been given to the world, and if there be any reason for this it will lie in the fact that the life of a matured tree far exceeds that of a man, and that consequently no one individual can possibly follow the complete growth from its germination to its natural end. All our knowledge of any given growth is, therefore, a series of tradition, so to say, for each authority can furnish but a small section of personal experience.

In my researches I have consulted a great variety of authors as well as the very latest government reports bearing on this special subject; but, as already intimated, the practical side of the information they afforded was singularly meagre and unsatisfactory. One author devotes a valuable number of pages to a continuous rhapsody over the "great ash tree" under which he played in the days of his childhood, while a still more pretentious writer in trying to cover his exhaustive subject, "Trees of America," commits the unpardonable blunder of entirely omitting all mention of the oak. That tree, which above all, from a utilitarian standpoint, has earned the right to be called the king of our forests.

It followed, therefore, as a result of my researches, that I was compelled to fall back, in a great measure, upon my early experience with the trees of the forest, together with the practical knowledge of my later years in handling lumber as a manufacture. Before I present the tabulated results of our calculations, I will give a short description of the five kinds of wood used in the construction of farm wagons, for in these five we have all the varieties that are used in implements and all outdoor machinery. I begin with the oak. (*Quercus*). Of the 150 or more varieties of this tree 82 are native to this country. Of these the white oak (*Q. alba*) is the only one in demand by wagon and carriage builders, and as it is at the same time the most serviceable for all mechanical purposes, I will describe only this species.

The white oak is indigenous to the state of Illinois and is mostly found on yellow loam of moderate fertility, although it also flourishes on our prairie soil. It matures at about an average age of 80 years, after which it gains in size, but with no further improvement in quality, its further growth being a mere accumulation of adipose, if I may use such a comparison. When fully developed the white oak is one of the largest and grandest of the entire forest tribe, and it is, of all

the deciduous trees, about the most valuable for general purposes. In a wagon it furnishes the hubs, spokes, felloes and all of the running gear except the axles and the tongue, and it takes the lead in all other branches of wood manufactures where special strength, solidity and durability are required, as in ships, car-building, cabinet ware, implements, etc., etc. The natural forests of this supremely useful tree are, however, rapidly disappearing, and, if only on the ground of utility, its preservation and culture should be our very first care.

Next in order comes the hickory (*carya*). The hickory is exclusively an American tree, of many varieties, one or more of the several species being quite common in every state of the union. None of them, however, better merits cultivation than the shellbark, for wherever special elasticity is required, as in wagon axles, carriage spokes, hammer, pick and tool handles, etc., it stands without an equal, and in its growth it is as rapid as any of its kind. The timber is heavy, hard and elastic, and is very durable, except when exposed to a foul or moist atmosphere, in which case it decays rapidly. It grows to the height of 60 or 80 feet, with a diameter of 2 feet, and while young is exceedingly graceful and ornamental, so that it might well be cultivated for its beauty alone. For fuel its wood is by far the best in America, and its fruit is the "hickory nut" of commerce.

The "thick shellbark" must not be confused with the species just described. To identify the proper nut for planting I may mention that it is of a globular shape, somewhat flattened, nearly pointless, with a thin, whitish shell, and a large kernel. The nut of the "thick shellbark" is twice as large and has a sharp point at each end, the shell is thick, hard and of a yellowish tinge, while the kernel is very inferior. The leaf of the "shellbark" always consists of five leaflets, while the "thick" shellbark leaf has seven or nine. In this way the difference can be easily distinguished —not only in the seed, but in the young trees as well. Hickory for timber should be grown uninterruptedly from the seed; but it has been asserted that the transplanted tree will bear more and better quality of fruit.

I will now pass on to the well known ash (*fraxinus*). To the manufacturer of wagons and agricultural implements this valuable timber is of high importance. It is very durable, and unites lightness, strength and elasticity to such a degree that no other wood could properly replace it for wagon tongues, fork handles and the like.

It exhibits also a highly ornamental finish when used in floors, furniture, wainscoting and interior trimming of dwellings generally. Besides all this it is of high rank simply as fuel, and for all these multifarious purposes its consumption has so largely increased, that the better grades are becoming very scarce and the price has advanced at least 25 per cent in the last 15 years. I venture to say that unless its cultivation is begun very soon, the present generation will see its last for practical uses in this country.

Indigenous to North America are the white ash, as also the "black," "blue" and "green," but of these the "white ash" is the most valuable. It bears transplanting even when quite well grown and appears to be quite free from insect foes, so that its cultivation would have at least these important points in its favor.

The next in order is the tulip tree, (*Liriodendron tulipifera*) which belongs to the family of the magnolia and although commonly known under the various names of "white wood," "yellow poplars," "tulip poplar," etc., it does not resemble the true poplar in any respect. There is but one species of this genus and it is one of the largest and finest trees of the Ameaican forests. Hough, in his "Elements of Forestry," speaks of specimens attaining a diameter of ten feet, and a height of 150 feet. It is found more or less all over the United States, but chiefly in the western forests wherever the climate is not too severe, and where the soil is deep and fertile. Its lumber, known as "white wood," is superior to pine in wagon and carriage building for several reasons. It is stronger, less liable to twist and warp, and has a dense grain,which renders it capable of taking a very higher finish without the use of any previous "filler," for which reason also its finish is much more permanent. Its clear qualities also enable its use in wide boards and the largest class of timbers. Its quality of width being a leading attraction, it requires at least 60 years before it attains a marketable size, hence its only value to the producer in the meantime is its ornamental appearance in which it has few equals. Its leaves are large, bright and glossy, its blossoms are of good size, abundant and of an agreeable odor. This tree should be cultivated from the seed and deserves an extensive propogation, for it would be hard indeed to find another kind to fill its place in the wood-working industries, especially wagon making and furniture. Its color and quality is decidedly affected by the nature of the soil on which it grows, and leads to the various names of "white," "blue" and "yellow" poplar, by which it is erroneously designated. The difference, however, is not externally manifest in the tree. The "yellow" variety is the toughest, hardest and most flexible, which leads to its extensive use in carriage panels, cylinder desks and other work where flexibility and toughness are required.

My list of wagon woods will end with the PINE (*Pinus*). This is the only coniferous tree that is

of use to the wagon-maker, and it is perhaps fortunate, because none of the conifers are of any value for wagon lumber, until at least 60 years of age, being used exclusively in the form of boards. To make the best lumber, they should be thickly grown when young, in order to produce a straight tall tree of nearly uniform diameter, and free from knots. If grown in isolated situations the tree will expend its vigor in the production of useless side branches, and the trunk will taper very rapidly from the base.

The pine is used for wagon box bottoms, in which the "hard yellow" variety is chiefly employed. Its chief recommendation is its cheapness, since ash is fully its equal in lightness and superior in durability. The fact is, if it were possible to dispense with pine entirely, the wagon would be the gainer—and the list of our wagon woods would be reduced to the four deciduous trees already described.

Here, then, we have five species of forest trees whose extinction alone, or even decline, would be a calamity of measureless extent to our entire nation. But it is a most unfortunate characteristic of our people, that, however imminent the danger, the great mass of them—in fact all but a few specialists—fail to evince the slightest personal interest in the matter. In a spasmodic manner, and to a limited extent, the timber question has received the attention of local, state and national legislation, but to the average farmer, the impending result carries but a very indistinct impression of a vaguely distant future days,—interesting him much the same as the paragraph in his almanac which tells him of the ages that remain before the extinction of the sun. To him it is a matter that concern future generations, but need not worry him; provided he credits the statement at all, which is not always. Moreover, with the great mass of people, the maxim holds good that "what is everybody's business is nobody's business," and however threatening the result,—when it comes to "sowing that others may reap," or making sacrifices from which no return may be hoped for in this life, it is asking a good deal of human nature.

To bring forth adequate results, therefore, will, as I have said, requlre the powerful stimulus of personal gain to whomsoever shall venture his means and his time in this beneficient work. I am aware that it is the unfortunate, though general impression that no profit can possibly accrue to an investment that waits for a forest to grow up from the seed, yet I propose to show that nothing could be further from the reality. I maintain that there is a profit in it, and that a well directed system of cultivation will not only repay the investment richly at an early period, but will be the means of solving the economic problem of our timber supply.

Any line of inquiry looking to the practical solution of this great problem must naturally begin with the number of trees that can be successfully grown on a given space of ground—say an acre—for a unit of calculation; but simple as the question may seem, it is vain to look for it in books. One German authority gives us 300 to 400 trees to an acre, as the results of an 80-year period of cultivation: but unless we are ready to allow a good deal for the rigorous thoroughness of the forestry systems of the old country, we may be pardoned for doubting these figures. We must reflect that a square rod to each matured tree is a small enough allowance of ground space for a large healthy growth. This gives us 160 trees to an acre, but to be still more conservative, let us knock off 50 more, leaving 110 trees to the acre for the harvest 80 years after planting the seed. This result coincides exactly with the figures given by A. R. Whitney, Esq., the veteran tree grower and proprietor of the well known Whitney nurseries at Franklin Grove, Ill.

The long practical experience of this gentleman has formulated the following method of cultivation, viz:

Starting with a planting of 2,720 young trees to the acre, set 4 feet apart, he begins by trimming out after ten years of growth every other north and south row. Five years later every alternate tree in each of the remaining rows is removed, and after another interval of five years more, cull out all imperfect growths, which will leave an average of not less than 110 trees to the acre.

To put this result in marketable form is the next step in our inquiry, that we may determine the money value of our harvest. Our leading hardwood lumbermen count an average of two trees for each 1,000 feet of lumber, and with these factors we may easily compile the following table, showing the value per acre of our 80-year crop of cultivated trees.

VALUE OF ACRE OF TIMBER OF EIGHTY YEARS' GROWTH.

Number of trees per acre	110
Number of trees to cut 1,000 feet	2
Number of feet of lumber per acre	55,000
Price per 1,000 feet	$ 18 00
Value per acre, 80 years' growth	1,100 00
Average value per acre per year	12 37½

Is not this encouraging result worthy of earnest consideration by every farmer and land-owner? A little further reflection will show him that the above result is safely within the reality, as such lumber as we speak of will be worth at least $50 per 1,000 eighty years hence, and he may also count upon the yearly trimmings of trees, which increase in value, growing from poles to trees

that will make the very best second growth spokes, and carriage stock, as well as all kinds of the most expensive ax, hammer, and pick handles. For these purposes, a tree at 30 to 40 years, is of greater value than when fully matured. Besides this, we will have timber which will be useful for fuel, fencing or charcoal, and will eventually afford a steady revenue far beyond the actual cost of supervision and labor, and in addition to all this, we must bear in mind that the timber left over after the logs are cut, including the tanbark, is very nearly as valuable as the logs themselves. But you may say that a period of eighty years—aye, forty years—is a long time to await the fruits of your labor. True: but cannot its full value be realized just as readily as any of the other permanent improvements on your lands? Your investment in the tree-plantation is not locked up, for should you sell the place at any time, it will certainly take rank with the rest of the improvements as an element of value, and will bring its full price.

No other improvement on your estate can do more than this. The soil itself is certainly not as productive as it was when you first turned the virgin sod, while neither the well-appointed farm-house nor the roomy barn nor any of the other fixtures can ever realize you a cent, except as part and parcel of the whole, and then only when it passes out of your possession by outright sale. It is the sum of all these improvements that enables you to value the property at twenty times its original cost, and not because the land will produce more than it did in the past.

Your investment in the tree plantation must therefore be ranked with the permanent improvements of the place, with the additional certainty that at whatever period of its growth a transfer of ownership may take place it will invariably yield its full value; for while all the rest are undergoing the process of natural decay and require constant labor and expense to keep them in repair, the value of the tree farm until it matures is steadily accumulating with the years, and it must therefore in its intrinsic worth prove the most valuable of all the improvements on your estate.

My subject having been limited to only such woods of natural forest growth as are in present use for the purposes referred to, I must mention that there are numerous varieties maturing at least a decade of years earlier that are possibly better adapted to our prairie soil, which might be substituted in many branches of manufacture without affecting the quality of the article. However, as I have based my estimate of profit upon the oak, which of all species requires the longest time to attain maturity, it follows without argument that with trees of an earlier maturity the average would be proportionally larger.

Having therefore clearly shown that the culture of timber implies nothing in the nature of sacrifice, but on the contrary is a valuable source of revenue, it follows that the great problem can be solved by the incentives which nature herself holds out. She asks nothing without recompense, but offers a far more substantial reward than the mere consciousness of duty performed. Had the proprietors of the Schuttler Wagon Factory planted an oak for each one they cut down for spoke timber since the establishment of their works in 1843 they might to-day make a like amount of second growth spokes from the same ground.

And before going further, let me say that this latter fact has actually been verified in a most interesting and noteworthy manner. The factory named has just finished a wagon built entirely of cultivated Illinois timber, twenty varieties of which enter into its construction,—none of them over forty year's growth from the seed. This great variety was sought, only to show what it is possible to produce on our prairie soil, and not for lack of material,—for the entire running-gear could have been made out of one honey locust log in the lot, which measured 18 inches clear in diameter. The entire assortment of woods was furnished by Mr. A. R. Whitney, of Franklin Grove,—of whom mention has already been made—and his testimony on this subject hardly needs stronger proof than this interesting collection of Illinois woods, grown by his own hands. No less praise is due to the far-sighted manufacturers, whose thorough grasp of the question has thus evolved the first wagon of the kind ever seen on the American continent.

To conclude my theme, I would therefore offer the plan of "tree culture for profit," as the only rational means that we have, not merely for recovering what we have lost, but for preventing the evil results which a few more years of our blind folly will surely bring upon us. To this end, I would not only urge upon every farmer to check by all means in his power, the indiscriminate destruction of our trees, but to preserve and foster the young growth as he finds it on his lands,—and above all, to plant at least ten acres on each quarter section of our treeless area, as a systematic step towards correction of the evil.

Having occasionally met with the assertion that the original timber area of our state had not been impaired in the last forty years, I took pains to investigate this point, and upon consulting the latest reports to the Department of Agriculture at Washington, I find that seven counties show an average increase of nine per cent., ten claim to have the same area, while a fair computation of the loss in the balance of the counties shows an absolute decrease of the entire area of the state of 52 2-10 per cent., during the stated period of time. The fur-

ther fact that both quality as well as quantity is rapidly diminishing is shown in the decrease of over 10,000,000 feet of our lumber product in a single year.

As these reports are compiled from the best and most intelligent sources obtainable in each county, the data are as nearly exact as it is possible to obtain such information.

Treating upon this subject in general terms of Southern Illinois, which was formerly covered with timber of valuable varieties, such as oak, walnut, hickory and whitewood, one of these correspondents says: "About one-half of the area has been cleared and put under cultivation. Much of the timber was burned on the ground and all that remains has been culled over and the best taken." Another speaking of Gallatin county, says, in 1857 fully 80 per cent of this county area was covered with forests. The Wabash and Ohio river bottoms and valleys are covered with a growth of large, heavy oaks, black walnut, ash and other valuable varieties. All these have long since been utilized for lumber and but little economy displayed in cutting. At present rates of destruction and consumption, in ten or twelve years no timber worth naming will be found in the county. But over 20 per cent of the entire area is now in timber of any kind, and the new growth is not of the valuable original varieties.

Increased area is only reported from counties that had very little originally. Lee county is one of this class and makes the only progressive report of the entire list. The correspondent says: "When I settled in this county, forty-nine years ago, about one-twentieth was in good timber. Most of this has been cut off, but very little of the timber land was cleared for farming uses, and as this has produced a new growth, there is now a greater area of natural growth than at the date of first settlements. Where timber has been cut away, the severity of winter and storms at other sessons of the year has been intensified.

Much tree planting has been accomplished and when this has been done on the prairies and where the natural re-invested forests have again attained size, there has been a perceptible modification of climatic conditions."

This is a very interesting report, but I am hardly prepared to admit the possibility of producing climatic changes within such narrow limits. To create any effect it requires a larger area than that of a single county in which the timbered portion is but a small fraction of the whole, but, nevertheless, we must say that Lee county is moving in the right direction. Were all to do likewise this inevitable consumption of our forests might be arrested instead of being encouraged by such statements as the one which I am herein forced to controvert, for it lulls to a dangerous indifference at a time when our vigilance should be aroused.

Let us not then, ostrich-like, bury our sight to avoid the apparation of danger nor yet believe it far away, for another generation may find itself battling with the consequences. For so surely as the forests are swept away so surely will our mighty assistants, the clouds and the sunshine, the winds and the rain, refuse their further services in calling forth and nurturing our growing crops. But released from all control they will descend upon our fields only to blight and destroy. Instead of the zephyas of spring we have called forth the black demond of the cyclone, and for the gentle and life-giving rain we have exchanged the terror of the mighty flood alternated with the hot breathe of the drought. This is what we shall have to reap for so wantonly wasting that which we should have used with prudence, and upon which future generations have a claim as well as ourselves, for it certainly was never intended that we should destroy any of the elements upon which depend the welfare of posterity.

Baron Ferdinand von Mueller, beautifully expresses the situation, when he says:

"I regard the forest as an heritage, given to us by nature, not for spoil or to devastate, but to be wisely used, reverently honored and carefully maintained. I regard the forest as a gift entrusted to us only for transient care during a short space of time, to be surrendered to posterity again as an unimpaired property with increased riches and augmented blessings, to pass as a sacred patrimony, from generation to generation."

AFTERNOON SESSION.

Immediately on convening in the afternoon the subject of printing the proceedings of the congress was taken up and it was decided to publish 1,000 pamphlets containing the three days' proceeding of this year.

The president announced the appointment of the following:

"Arbor Day Committee"—Gov. Furness, Nebraska; Leo Weltz, Ohio; Chas. F. Mills, Illinois; Prof. G. B. Northrup, Connecticut, and J. H. Morgan, Ontario, Canada.

Prof. J. F. Beal, of Lansing, Mich., submitted remarks on personal experiments in preserving the life of buried nuts, showing that acorns that had been buried below the frost for two years were healthful, living and sprouting. He said he had others

buried which would be taken up two years hence. They were also good indications that certain *larvæ* of grubs, living in the nuts, have germinated and were finding their way up through the earth at the end of two years. Prof. Beal also submitted samples of nine different kinds of wood grown from the seed by himself and pointed out the testimony they gave respecting ring growths They indicated a layer for each year. He also stated that the more valuable trees usually by their large leaves and thick foliage offered greater leaf surface to the atmosphere, thereby exerting greater climatic influence.

Prof. J. L. BUDD, of the Iowa Board of Forestry, read the following interesting paper:

POSSIBLE MODIFICATION OF OUR PRAIRIE CLIMATE.

MR. PRESIDENT:—I think it was not wise to promise a brief paper on this disputed subject, as I believe—in common with most of our early prairie settlers—that an appreciable change of climate has been wrought by the occupation and cultivation of the prairies by civilized man, and that an extended system of forestry planting in great blocks, such as is common in all parts of continental Europe, might change our present climate for the better in a brief period.

On the other hand our American physicists seem to unite in accepting the sweeping assertion of Prof. Elias Loomis, and others, that the mean temperature and rainfall for given periods does not vary sensibly from century to century, and that there is no evidence whatever that the earth's climate has changed materially in 2,000 years.

While I do not feel like combatting this general proposition from the standpoint *of periodic averages of temperature and rainfall*, we are anxious to impress the fact that successful orcharding, small-fruit growing, and crop production in field and garden, depend more on *extremes of rainfall, temperature and atmospheric humidity* than on monthly, annual or longer periodic means.

Especially is this true of great area of prairie or steppe, far removed from the breath of the ocean, such as our great western plains, and the still greater steppes of Europe and Central Asia.

In Continental Europe the methodic and general forestry system is founded and sustained on the generally accepted belief that a judicious distribution of large forest areas will modify diurnal variations of temperature and moisture of air during the growing season, and possibly will bring about a more equal distribution of rainfall if it does not actually increase it.

The general plan of the meterological observations in Europe will give, and has given during the past century, much precise information on this vitally important subject.

The learned secretary of the London Meteo rological Society gave us in 1882 the following guiding principles, observed at the meteorological stations of continental Europe:

(1.) Ordinary meteorologic tables of periodic means are not sufficiently detailed to throw light on the influence of the weather on agricultural or horticultural crops.

(2.) To be truly valuable, the observations must be frequent and accurate, and give daily and monthly *extremes* as well as *means*.

(3.) For agricultural purposes, the heat should be observed in the open sunshine, as field crops can have no protection from direct sun heat, or the heat of the lower beds of air on exposed soils.

(4.) The temperature and humidity of air during the heated portions of each day, in the growing season, and their extremes, should be recorded.

(5) We need more perfect heat measures than we now have. That the sun reached a certain temperature at a certain hour gives no correct idea of the sum total of heat during the day.

(6) We need more perfect observations on relative evaporation under the varied conditions as to exposure, color of soil, protection from wind sweep, etc. The evaporation from a tin dish on a glass plot gives no correbt idea from the evaporation from exposed dark colored soils.

Had we been favored with such accurate observations on our daily, monthly and annual extremes of temperature, humidity of air and rainfall at varied points over our prairies for the past 40 years, we would now be able to give scientific reasons why spring wheat is now a precarious crop on virgin sods, why rusts, smuts and blights are more general than in the early days, and why orchard trees, shrubs, etc., that succeeded perfectly 30 years ago, now utterly fail to endure our summers or winters.

As our relatively new country cannot give this accurate information we can only talk of *probable* causes for *known* effects.

(1) We have reason to believe that our winds from the southwest, west and nothwest are hotter and drier in summer than forty or even twenty years ago, and that our winds from the Gulf of Mexico have not materially changed as to heat or contained moisture. If well founded this would account for many of our cumulative troubles in crop production. Prof. Tyndall has remarked

that a change in the extremes of heat, cold, moisture and aridity of air, of *five per cent.* may change or materially affect the field crops of a whole country. In Europe, Asia, and in our American states at the east and south, the destruction of the native covering of timber has wrought the changes on which the statement of Tyndall was predicted.

In the prairie region we have as much timber to-day—perhaps more—than we possessed when the first settlers put up their cabins on the borders of the island groves and the stream timber borders of Indiana and Illinois. Yet it must be said that the prairie groves, and the timber of the stream bottoms and adjacent bluffs, then presented *real forestry conditions*, which alone can modify climate to any noticable extent. *Now*, our larger timber areas are broken by clearings into little patches, and our planted timber is in little patches and thin belts for arresting wind-sweep. In the way of arresting two rapid evaporation such timber planting is useful, but it cannot take the place, in climatic modification, of the scattered areas of *real* forests known to the early settlers. But the *main* cause of the cumulative increase of heat and aridity of our westerly winds in summer, is given with special clearness by our lamented Arthur Bryant on the first page of his valuable work on Forestry. In this brief paper we cannot repeat the whole story, nor is it needed in this body of clear thinkers and close observers. Forty to fifty years ago the whole prairie region, west of Lake Michigan, was literally *a sea of grass*, interspersed with island timber belts and groves, clogged drainage centers, and wet bottom lands without visible outlet. Even in the famously dry summer of 1854 the flats, drainage centers and sloughs of Illinois, in DeKalb county—which are now dry and firm—would *mire a team* in August, while the grass could be tied over your hat when sitting on a horse.

The whole country was then in condition to hold the never failing June freshets, and as Bryant states, the rank vegetation of forest, barren timber lands, and open prairie took the place of the forestry covering of the eastern and middle states to a measurable extent. Even then the rainfall was variable, ranging for instance from 74½ inches in 1851, to 23½ inches in 1854, yet it was proverbial that the dry seasons *then* gave the best crops and the fattest hogs and steers. The driest and hottest winds from the southwest were then never known to "fire" corn, to burn the leaves of trees or plants, or to prevent the deposit of copious dews at night. Forty years ago Robert Russell said that continued westerly wind could never fail to bring drouth to to the prairie region, yet the continued westerly winds of 1854 and 1855 did not come to us as now robbed of moisture, and as dry and hot as the air from the Sahara Desert.

The grassy plains and clogged sloughs and streams *gave off moisture to the passing breeze.* At this time the whole west presents a different aspect. Since Bryant wrote in 1870, the evils of which he complained have become more pronounced. Literally a great expanse of country—large enough to make several kingdoms of Enrope—in the west and northwest—have been since turned with the plow, with the accompanying drainage of sloughs, ponds and streams. Our winds from all westerly points now literally pass over *a dry heated soil* in a dry period, which drinks up with hungry avidity the moisture of the air.

For the benefit of those who may doubt that the occupation by man of a prairie country, with the consequnent exposure of an alluvial drift soil by culture, pasturage, cities, villages, roads, railway beds, drainage, opening of clogged and boggy drainage centers, and creek channels, etc., will increase the heat and aridity of the breeze passing over it, we might give many pages of proof from the chequered history of the great east plane of Europe and Asia. In the light of this experience we might reasonably expect a more radicai and positive change of climate than we now complain of.

(2). The tendency to long continued westerly winds during our dry periods has seemed to increase during the past forty years.

After careful consideration this seems quite as probable as the increase of heat and aridity of our summer air.

It may be said that we are on the plain at the foot of a mountain range. West of the Missouri river we ascend an inclined plane to Denver, where we reach an altitude nearly one mile above the bed of the Missouri or the Mississippi.

Just west of Denver we reach the apex of elevation on the summit of the Rockies. The natural movement of cool air from the mountains down the elevated plane to our relatively warm valley, was a marked peculiarity of our climate when the buffalo and Indian roamed over our prairies.

That this natural tendency would be increased by any marked increase of heat and aridity of our summer air in the Mississippi Valley, *is too evident* for words. In connection, it should be kept in mind that the inflow of air from the elevated plateau and mountains west of us is really *only a continuation* of the natural current that flows inland from the Pacific ocean to the summit of the Rockies during the heated term. When the canons, gorges and slopes of the mountains east of the summit were covered with a dense growth of conifers, that held the snows well through summer, the Pacific moisture was mainly precipitated

on the range and its foot-hills. But more recently the heating of the rocks, consequent upon the removal, in large part, of the timber covering by fire and axe, permits a greater per cent. of the Pacific moisture to pass through the gaps and over the dry plains of Colorado to the eastward. Plainly this moisture might pass eastward to the Alleghanies if it failed to meet cooler northerly currents, as it often does in the valley of the Missouri and south of the great lakes.

From this source, beyond reasonable doubt, has come the blessed showers which gave eleven inches of rainfall to the west slope of Iowa last June, while east of the divide we had, during the same period, but two inches, and that in light sprinkles.

We can only add that our idea, that we have had almost continued westerly winds during the severely dry summers of 1886 and 1887, has been disputed on the grounds that we have had winds from all directions, *often changing three or four times a day.* Our close observers need not be told that the variation of our surface winds, in connection with indications of rain, have always been followed by the steady inflow of air from the dry west.

(3) While our average rainfall of summer for a period of ten years may about equal that of the period from 1850 to 1860 it seems to be less equally distributed through the season of growth and the wet and dry seasons.

On this point Mr. Bryant says: "Extremes of wet and dry weather are more frequent and the dews condensed in dry seasons are more scanty. Instead of abundant rains in May and June dry weather at that season is more common."

As to causes we can only look to the changes wrought by man on the prairies and mountains west of us as already indicated, With the approach of cold weather each year we have a change in prevailing winds and character of storm center. The snow covered Rockies become storm breeders from which will pass eastward our usual series of storms and blizzards. In the early spring if we have our usual supply of melted snow and heavy rainfalls, filling our bottom lands of rivers and streams and making it difficult for farmers to get in their crops, the lower levels of our plain become *less heated and we may have until July* an alternating play of winds up and down our valley from the Gulf of Mexico to the polar ocean, bringing an excessive supply of the blessed rain, but facts too evident for successful refutation lead us to believe that the tendency to *extremes of drouth* will become still more manifest as the prairies become more generally occupied and cultivated unless as Bryant says, the evils we have brought about be not mitigated or perhaps wholly removed by planting a due proporition of the country with forest trees.

This brings us to the consideration of the question; in the light of the experience of the old world, as indicated by Geo. P. Marsh in his able work on "Earth as modified by human action," what course should congress have pursued in the disposition of public lands in the northwest.

During a talk with Lewis Ellsworth and Dr. John A. Kennicott, in the old Prairie Farmer office in 1857, they unitedly expressed the belief that at least thirty per cent of the whole prairie area then in the hands of government *should be reserved for timber planting in great blocks*, as practiced in Europe, and that a large share of the proceeds of sales of the remaining lands should be devoted to the systematic planting and after care of the reserved tracts, I think it will be generally agreed that this methodic disposition of our prairie lands would have been immeasureably better than frittering away the proceeds of the land in harbor improvement and abortive attempts to make mud creeks navigable.

We pass over the final attempt of congress to do something for the forestry interests, as the plan of securing a timber claim by the planting of ten acres of timber could not materially modify our climate, had each settler under this act *faithfully carried out the contract.*

Even at this late date congress could do much by withdrawing from market large tracts on the western plains, and on the headwaters of our streams in the west and northwest, with a view to systematic timber planting and the preservation of that we now have in the Rockies, *but that it will be done*, we are not more certain than was Dr. Kennicott and Mr. Ellsworth in the early days of prairie settlement. I will only add that my faith in methodic forestry planting as a complete or partial remedy for the climatic troubles we now experience, is much stronger than it was in 1881. During the summer of 1882 I was permitted to study critically the elaborate forestry system of the Russian Empire in Europe. Prior to the time of Peter the Great we have the most complete evidence that a very large part of the black soil region east of the Volga was subject to periodic extremes of rainfall, followed by long continued drouth, during which the moisture bearing winds from the west passed over the heated plains of Russia in Europe and Central Asia to the far off Altia range of mountains without precipitation, as they now pass over Western Texas and Southern California. *Now.* the planted forests on these steppes are 12,502 in number, which are under the general supervision of 762 educated directors.

The area of these individual forests ranges from 3,000 to 30,000 acres.

In company with forestry experts we passed through many of these island forests on the great plain, and found everywhere an attempt to pre-

serve *real forestry conditions* by thickness of planting, the preservation of underbrush in open parts, and the rigid exclusion of fires and stock. In all cases we found the dense sylvan shades, and the carpeting of leaves and leaf mould which keep the earth cool and moist.

As to climatic effect, the minister of public domain assured us that the meteorological records of past 150 years, and the reported crop yields on the steppes dotted with these forests, had shown a cumulative increase of rainfall from summer showers, and a decided increase in the moisture of the air during the growing season.

He was also positive in the statement that the modifying influence had extended into the eastern sections, with the completion of the forests, where formerly the lands had been utterly worthless except for thin and scanty pasturage.

In the earlier history of this region the main rainfalls were in June, but since the completion of the forestry system—now covering fully 30 per cent. of the black soil area—the summer showers during July and August permit the successful culture of the sugar beet, potatoes, Indian corn and other crops requiring rainfall later than June. When questioned for the causes for the increased summer rainfall, the invariable reply of experts was, that it resulted from the *unequal heating of the air* over the plain, brought about by the large forestry areas.

On the north plain of Europe, including North France, Belgium, Holland, North Germany, Denmark, Prussia and Poland, we found a methodic system of forestry planting and preservation, and that all classes from peasant to prince united in the belief that 33⅓ per cent. of the country must be kept in timber, yet we did not here find scientific men united in the belief that forestry planting directly increased rainfall. But they did unite in the belief that large areas of forest tend to a more equal distribution of the rainfall, and more equable conditions as to temperature and humidity of the air.

On the north plain of Europe forests have existed in more or less perfect condition during hundreds of years, hence the Russian experience in the way of extended timber planting on bare pastorial steppes, like our plains west of the Missouri to Denver, has more value for our guidance.

As nearly as we can believe any proposition of science or any established principle growing out of long experience, we may believe that the Russian plan of great island groves over our western prairies will give us a more equal rainfall and more equable conditions as to summer humidity and temperature of air.

With a despotic form of government we might hope to try the scheme in the near future, but left to the voice of the people the time of trial seems far off. Permit me to repeat the opening remark that it is up hill work to write in a satisfactory way on a subject on which I know so little or on which so little is generally known as *prairie climatology*.

It would have been far easier to talk of species and modes and methods of planting *the blessed timber* in which *I believe with an intensity bordering on perfect faith*, as our final savior and preserver from climatic ills and evils which each year are becoming more apparent.

At the conclusion of this paper the congress, in order to accept the invitation to visit Lincoln monument at 4 o'clock, adjourned until 7·30 p. m.

EVENING SESSION.

"The Influence of the Western Treeless Plains on the Atmospheric Conditions Eastward of Them," was the subject of a paper read by Dr. Dan Berry, of Currin, Ill., at the opening of the evening session. It was an elaborate production and proved the author thoroughly informed on the subject of air currents and the causes which influence their course. The fact that the once verdure-clad western plains were yearly reduced to plowed ground, the further fact that the forests of the west and southwest and of the mountains were almost obliterated, explained to his mind the increased dryness from year to year of the air currents that sweep over the Mississippi valley. These currents are now dry and arid instead of moisture-laden as formerly. Again, tiling throughout the west rapidly carries off the rainfall to the rivers, from whence it flows in freshets to the sea, without, as formerly, remaining in the ground to become a source of vapor and clouds. The planting of forests at regular intervals throughout the west is the only remedy.

The paper was discussed by Messrs. Fernow, Robertson, Allen, and others, and the author's views generally endorsed, Mr. Allen particularly urging the building of dams and fish ponds throughout the

country as receptacles for the water that escapes through the tile.

Mr. S. C. Robb, Kansas state forest commissioner, read a paper on "The Status of Artificial Forest Planting in Kansas." He stated that in Kansas in what was once called the "Great American Desert," there were now many groves of flourishing trees from six to eight years of age. The planting of these was attributable principally to the "timber culture" law passed years ago by congress. The timber planted in this way already aggregated many thousands of acres. Again, in Kansas tree planting had been practiced to such an extent that many of her towns and cities give the appearance of large forests. A law had been passed by the state under which a "state forest commissioner" had been appointed and experimental forest stations established. From all this the most flattering results were being yearly realized.

The paper was discussed at length by various members. The author having in the course of his paper incidentally mentioned the prevalent belief that the American Forestry congress was opposed to the timber culture law, Mr Fernow emphatically denied the correctness of that impression. The congress, he said, at all its sessions had invariably refused to take any action whatever on the subject—either to commend or criticise the timber culture act.

"Tree Planting On Prairies" was a paper read by Hon. David A. Brown, of Bates Ill. It cited instances where black walnut and other trees had been planted on Illinois praries with great success. He favored the planting by Illinois farmers of double rows of trees around the limits of their farms.

T. J. Burrill, of the Champaign (Ill.) Industrial university, spoke ten minutes on experimental forestry as practiced at the university. In 1871 the planting of forest trees was begun at the university. Twenty-five varieties were planted. Most of these are now in a thrifty condition, although the land on which they were planted was prairie that had been under cultivation for thirty years. Many of the faster-growing trees are now forty feet in height and two feet in circumference.

After brief discussion of Mr. Burrill's remarks, the congress adjourned until 9 a. m. to-morrow.

THIRD DAY'S PROCEEDINGS.

FRIDAY, SEPTEMBER 16TH, 1887.

The third and last day's session of the American Forestry congress opened promptly at 9 o'clock yesterday.

A valuable paper by Joaquin Miller, the eminent writer, who was unable to be present, was read by the secretary. The paper warmly urged the turning over of all government forest lands to the respective states for maintenance and cultivation. He said:

"I believe it is pretty generally conceded that our continent is being washed into the sea by way of the Mississippi and its thousands of miles of tributaries on the one hand, and at the same time swept naked of its native forests by annual fires on the other. I take it that it is this deplorable condition of things that has called into existence the American Congress of Forestry. I spent some time with the late Capt. Eads at the mouth of the Father of Waters, inspecting his jetties two years ago.

"We have begun at the wrong end," said this great man more than once to me.

One morning he threw a bucket over the side of the boat and drew up several gallons of dark mud and water.

"There," cried the great engineer, "there is a mixture of one-tenth Missouri, one-tenth Illinois, one tenth Iowa, one fraction Kentucky, and so on, through about fifteen states, with an addition of about five-tenths of pure water."

"And what would you do, Capt. Eads, to stop this washing away of states?"

"As I told you," remarked the energetic old man, as he dumped the ugly mixture back into the Gulf of Mexico, "we have begun at the wrong end. But the country is not educated up to the point of beginning. It wants the other end for wheat and corn. It only wants the mouth of the river kept open so as to be able to sell its corn for the present generation, and let the next generation look out for itself. The other end of the river has drowned out this end; state after state is going to be drowned out until some day the coral insect may again build his pretty castles where the people of Iowa are now digging wells for water. The United States is tearing out her very heart with her gang plows, and dumping it into the sea, sir."

I beg to put this statement before the country with something of the emphasis with which this great and good man uttered it there in the mouth of the great river. More than once he brought up the subject and always with an emphasis that would write every syllable in italics.

Capt. Eads was very fond of quoting poetry. Once he was saying to himself, "Leaves, leaves, nothing but leaves," when he suddenly turned to me and said: "Do you know that in leaves you can read the history of creation? My son, leaves are not only creation, but salvation." Capt. Eads explained to me that he meant if leaves and grasses were left lying on the ground at the proper time of the year, as nature, the hand of God, placed them, there would never be any damage from high water any time; that leaves would be the salvation of the republic, and that there would never be any need for Eads' jetties. He explained that he meant when he said that leaves were creation that there is no nourishment so dear to the hungry earth as a handful of leaves. He insisted that more beauty could be grown out of

a single basket of leaves than a whole load of manure.

Suppose California and all other states indeed had absolute control of all forest lands, why the state, following the liberal action of the nation, would let the counties have the lands within their lines to protect, to make parks or pleasant resorts, or to erect churches and school houses thereon. The remote border counties that have been impoverished by Indian depredations, fires and floods, and kept poor by the very conditions of savage, mountains and inaccessible forests, would thus not only be enriched but made at once the protectors of the nation's very heart and vitals. Every county officer, every constable, aye, every citizen would then have a pride and a personal interest in preserving his property. These woods would then be as secure as the archives or the courthouse of the county. The remote pioneers would no longer assist the depredator to escape punishment and laugh at the federal officers and law, but he would help to protect the property of children and the heart of the nation.

And so I say, bluntly, that commen sense and common justice demand that all the states should have the forest lands not suited to agriculture conceded absolutely and at once by the federal government.

There are few forest fires in the old world, because the poor pick up the fallen timber and the leaves are gathered to nourish the earth. But was this the case of old? I rode for a full day, from Babylon toward Jerusalem, without seeing so much as a grasshopper; not a bird, not even a blade of grass in a land that was once an Eden. We read that Alexander the Great planted every tree of Greece there in trying to restore that land, and mourned because the Greek ivy could not be made to grow on the tower of Babel.

Well let me tell you right here that if this process of fires and floods—floods that always follow fires—is permitted to go on by the help of 10,000 iron-toothed mills—gang-plows in the valleys to help along the flood that has gathered force in the burned-out higher land—why we will accomplish that same desolation just as certain as water runs. Only we will achieve by the aid of gang-plow and circular-saw implements, unknown of old, in two centuries what it took Babylon twenty to bring about.

It was my fate to spend my boyhood with Indians. They were the only true foresters I ever knew. In the spring after the leaves and grasses had served their time and season in holding back the floods and warming and nourishing the earth, then would the old squaws begin to look above for the little dry spots of headland or sunny valley. And as fast as dry spots appeared they would be burned.

In this way the fire was always under control. In this way the fire was always the servant, never the master. And by the time the floods came again there was another coat of grass and leaves, stronger and better than the one before, because of the careful and temperate fire of the careful and wise old woman. By this means the Indians always kept their forests open, pure and fruitful and conflagrations were unknown.

Let the few remaining millions of forest lands be conceded to the states, and then on down to counties, and ever smaller divisions, school districts for example. And then let the foresters of plain, hard, common sense follow the Indian's simple method of preserving his property by burning the leaves, and my word for it, neither New York, Louisiana, Michigan nor California need fear flood or fire, drought or drowning rains.

At the conclusion of Mr Miller's paper the following resolution was unanimously adopted:

Resolved, That the American Forestry congress deeply regrets that it has been deprived of the honor and pleasure of receiving Mr. Joaquin Miller as a delegate from the state of California, deploring also the cause of his absence—the death of the governor of California, his friend—and the secretary is hereby instructed to extend the thanks of the congress to the distinguished poet and essayist for his courtesy in sending his address in type, and for the lively interest which he takes in the object of this congress.

The committee on nominations made the following report of officers for the ensuing year, which was unanimously adopted:

Hon. C. R. Pringle, Atlanta, Ga., president. Hon. H. G. Joly, Quebec, Canada; Joseph S. Fay, Boston, Mass.; G. H. Parsons, Colorado, and Albert Kinney, California, vice presidents. Martin Conrad, Chicago, Ill., treasurer. B. E. Fernow, Washington, D. C., secretary. Charles C. Bell, of Booneville, Mo., recording secretary.

On behalf of the committee on nominations, Mr. Morgan, chairman, warmly thanked President Minier for his services in the past as a presiding office, and stated it had been a source of great regret to the committee that he positively declined to accept that position for the coming year.

President Minier, in response, thanked the congress for the honors conferred upon him in the past, and said his advancing age reminded him that it was time he be relegated to the position of high private for the future [laughter], and the position of president be given to a younger and more vigorous man. Still, he would continue to attend the annual sessions of the congress so long as life and health endured

On motion of Mr. Root, of Georgia, a unanimous vote of thanks was extended Mr. Minier for the impartiality, dignity intelligence and knowledge which he had ever displayed as a presiding officer.

RESOLUTIONS ADOPTED.

The committee on resolutions made the following report, which was adopted by acclamation:

Resolved, That the constitution of this congress be so amended as to make it eligible to hold the annual meetings of this organization during either August, September or October.

Resolved, That the life membership, established by the association at the Saratoga meeting at $10, shall be raised to $100.

Resolved, That the two secretaries and the treasurer shall constitute a committee on finance and publication, and that they be empowered to take such action for the collection of back dues and the provision of other funds as they see fit; and they shall also exercise the power of the congress in dropping from the list such members as are delinquent in the payment of back dues.

Resolved, That a committee be appointed to act in laying before the national congress the bill for the administration of government timber lands passed upon at this session, and in promoting its passage by the usual means.

Resolved, That the New England committee as at present composed be continued and encouraged to work further for the development of a forest policy for New England.

Resolved, That the American Forestry congress favor the proposed plan of a unification of all national societies interested in the promotion of agriculture, horticulture, forestry and kindred branchs into one large association for the purposes of holding their annual meetings in the same place, at the same time, and for other benefits that may accrue from such a unification; and the executive committee is hereby instructed to act for the congress in bringing about such a unification.

Resolved, That thanks are due to the local press for the very efficient manner of reporting the proceeding of this congress.

Resolved, That the thanks of this Forestry congress are hereby presented to his honor Mayor Hay of Springfield, for his kindness and generosity in taking this body to the tomb and monument of Abraham Lincoln.

Resolved, That the thanks of this congress are due to Hon. Joseph S. Fay, of Boston, Mass., for his repeated generosity in donating funds to this association.

Resolved, That the secretary be instructed to convey the thanks of this congress to Gov. Oglesby, Hon. Charles F. Mills and the Illinois legislature for their encouragement and many courtesies extended.

Resolved, That a committee be appointed to draft a bill to be presented to the legislative bodies of the several states providing for the appointment o state forestry commissions and giving thereto the necessary authority to enforce laws for the protection and extension of the forest area.

Resolved, That a committee be appointed to prepare a programme to be observed in each community on Arbor day, by the teachers and pupils of the public schools and all interested in natural and artificial tree culture.

WHEREAS, There exists a deplorable lack of interest in matters pertaining to forestry; and,

WHEREAS, The reckless destruction of the forests of the country demands a serious consideration of all interested in the future supply of timber; and,

WHEREAS, The attention of the public should be directed to the importance of preserving certain forests and encouraging tree planting wherever practicable; and,

WHEREAS, The information concerning the influence of forests and climatology are not generally understood; therefore be it

Resolved, That the legislature of the several states be requested to favorably consider such legislation as will tend to stimulate the care of forests and encourage tree planting.

The following was adopted as the memorial to be addressed to the congress of the United States, to accompany the bill recommended by the Congress of Forestry:

To the Senate and House of Representatives in Congress Assembled:

Your memorialists, the American Forestry congress, and citizens of the United States respectfully represent:

WHEREAS, The present laws in regard to the public lands as far as they relate to the disposal of timber lands or of the timber from the same, are entirely inadequate to the requirements of the present state of our civilization; are unreasonable, pernicious and prejudicial to the best interests of this country, and have a tendency to induce fraud, theft and perjury;

WHEREAS, Especially in the Rocky mountain and Pacific slope regions the mining interests in regard to material supplies and the agricultural interests in regard to a favorable distribution of water supply, are threatened with danger or have already been endangered by the thoughtless and unnecessary denudation of the mountain slopes and hillsides;

WHEREAS, By axe, by the teeth of cattle and by fire many millions of dollars worth of public property have been destroyed without benefit to any one, owing to the neglect on the part of the government to protect the property of the people;

WHEREAS, Favorable agricultural and climatic conditions of a country are largely dependent upon a proper amount of well distributed forest areas and especially upon the preservation of the forest cover on the mountains;

WHEREAS, Such preservation can not be had under the existing laws, nor can be expected at the hands of private individuals;

WHEREAS, By the disposal of the timbered areas now in the hands of the United States, and by their devastation, under present conditions going on unchecked, the power to insure proper forest regulation passes from the people,

Therefore, The undersigned memorialists imbued solely by a desire to further the best interests of the country at large, most respectfully and urgently pray that you will without delay give consideration to, and enact as a law the subjoined bill, which provides for the withdrawal from entry or sale, classification and proper disposal or administration of public forest lands.

A brief but instructive paper on the climatology, geography and topography of the great continental plains of North America was read by Col D. A. Robertson, of St. Paul, Minn. It demonstrated the author's intimate acquaintance with all the subjects on which he treated, and furnished manifold proofs of the influence of forests on the climate of North America

The entire programme and business of the meeting having been concluded, on motion of Mr. Weltz, the congress at 11 a. m. adjourned *sine die*.