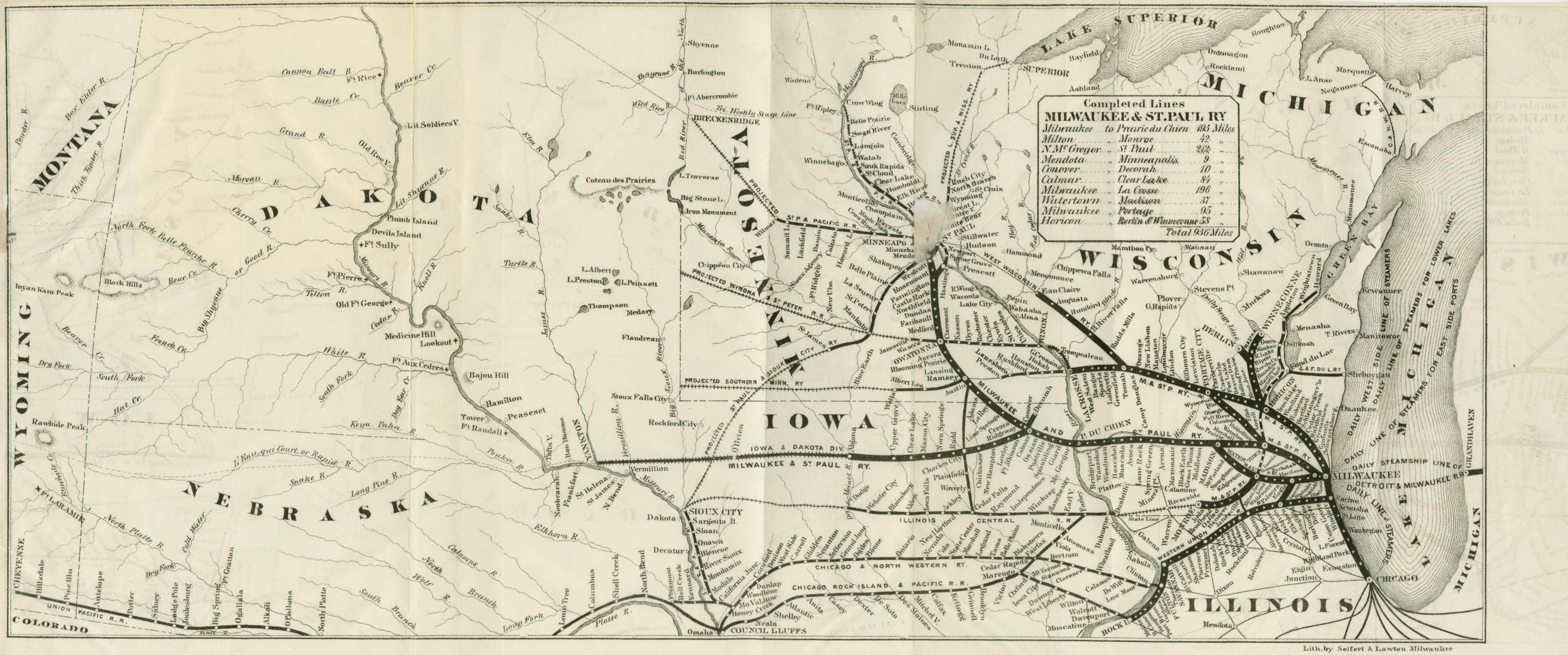

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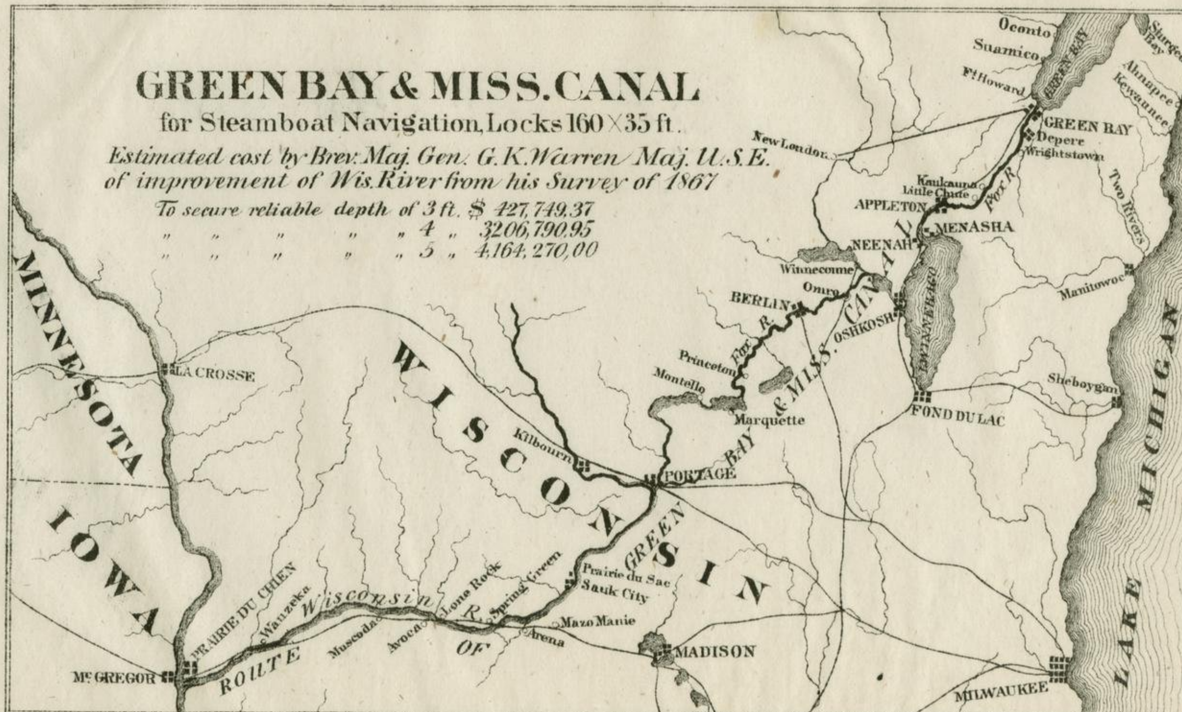

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TRANSACTIONS

OF THE

WISCONSIN STATE

AGRICULTURAL SOCIETY,

WITH THE REPORT OF THE

STATE HORTICULTURAL SOCIETY,

AND

TABULAR ABSTRACTS OF THE REPORTS OF COUNTY AGRICULTURAL SOCIETIES.

Vol. VIII, 1869.

PREPARED BY J. W. HOYT, SECRETARY.

MADISON, WIS.:
ATWOOD & CULVER, BOOK AND JOB PRINTERS, JOURNAL BLOCK.
1870.

PREFACE.

The Eighth Volume of the Transactions of the Wisconsin State Agricultural Society, now offered to its members and to the public at large, is believed to be equal, if not superior, in value to any of the series. To the industrial reader, and to all who are deeply interested in the growth and prosperity of Wisconsin, it can hardly fail to prove acceptable; for every line of it is devoted to practical matter of much importance.

The general *resume* of the condition and progress of the state in the various departments of industry to which it is devoted presents an encouraging picture, and at the same time indicates various important particulars in which improvement is needed. For the amount of space therein alloted to great internal improvements accomplished within the past year, or in progress, we make no apology. Their importance to the development of the state cannot be over-estimated, and this new placing of them before the people of Wisconsin and of the whole country must result in some public advantage.

It was the first purpose of the secretary to make the volume embrace a considerable number of original and practical articles by Wisconsin writers of acknowledged ability; but the timely appearance of the highly valuable series of the official reports of the United States Commissioners to the late Paris Universal Exposition, and of certain reports published by leading industrial associations and institutions of this country, seemed to warrant a partial substitution therefor of extracts from such of said reports as were of direct interest to the industrial public of our own state. Many of the exposition reports referred to were prepared, without regard to trouble or expense, by the ablest men the government could employ—men who are everywhere recognized as authority on the subjects discussed and yet, owing to the fact that they are chiefly for distribution to public libraries in this and foreign countries, it is only by republication in this manner that they can be made available to the great reading public.

The other miscellaneous papers embraced are also from writers of acknowledged merit and will be highly esteemed.

The report of the State Horticultural Society appears to us to contain more matter of real interest and permanent value than any of the several reports heretofore published. All in all, it makes a showing of which the fruit-growers of the state may be justly proud.

J. W. HOYT.

STATE AGRICULTURAL ROOMS,
Madison, June, 1870.

CONTENTS.

OFFICERS OF THE SOCIETY FOR 1870.

PRESIDENT:

B. R. HINKLEY........... SUMMIT.

VICE PRESIDENTS:

WM. R. TAYLOR.......... COTTAGE GROVE,
C. H. WILLIAMS.......... BARABOO,
ELI STILSON .... OSHKOSH,
SATERLEE CLARK....... HORICON,
J. G. THORP.............. EAU CLAIRE,
RUFUS CHENEY......... WHITEWATER.

SECRETARY:

J. W. HOYT.............. MADISON.

TREASURER:

DAVID ATWOOD......... MADISON.

ADDITIONAL MEMBERS EXECUTIVE COMMITTEE:

C. L. MARTIN............ JANESVILLE,
N. S. GREEN.............. MILFORD,
W. W. FIELD............. BOSCOBEL,
J. O. EATON . ... MILWAUKEE,
J. H. WARREN........... MONROE,
L. B. VILAS.............. MADISON,
NELSON DEWEY......... CASSVILLE.

CONSTITUTION.

ARTICLE I.

OF THE NAME OF THE SOCIETY.

This society shall be known as the "Wisconsin State Agricultural Society." Its object shall be to promote the advancement of agriculture, horticulture, and the mechanical and household arts.

ARTICLE II.

OF THE MEMBERSHIP.

The society shall consist of life members, who shall pay, on subscribing, twenty dollars, and of honorary and corresponding members, who shall be elected by a two-thirds vote of the members of the executive board, at any regular meeting. The presidents of county agricultural societies shall be members *ex-officio*, entitled to the same privileges as life members, and together shall be known as the general committee of the society.

ARTICLE III.

OF THE OFFICERS.

The officers of this society shall consist of a president, one vice president for each congressional district of the state, a secretary, a treasurer, and seven additional members, who shall hold their respective offices for the term of one year from the first day of January next succeeding the date of their election, and until their successors shall have been elected, and all of whom, together with the ex-president latest in office, shall constitute the executive board.

ARTICLE IV.

OF THE POWERS AND DUTIES OF OFFICERS.

The presidents and vice presidents shall perform such duties as are common to such officers in like associations, and as may be required by the executive board.

The secretary shall keep the minutes of all meetings, and have immediate charge of the books, papers, library, and collections, and other property of the society. He shall also attend to its correspondence, and prepare and superintend the publication of the annual report of the society, required by law.

The treasurer shall keep the funds of the society and disburse the same on the order of the president, or a vice-president, countersigned by the secretary, and shall make a report of all receipts and expenditures at the regular meeting of the society in November.

The executive board shall have power to make suitable by-laws to govern the action of the several members thereof. They shall have general charge of all the property and interests of the society, and make such arrangements for the holding and management of general and special exhibitions as the welfare of the society and the intrests of industry shall seem to require.

The general committee shall be charged with the interest of the society in the several counties where they respectively reside, and constitute a medium of communication between the executive board and the public at large.

ARTICLE V.

OF MEETINGS AND ELECTIONS.

The annual meeting of the society, for the transaction of general business, shall be held in its rooms in Madison, on the first Wednesday of December, at three o'clock P. M., in each year, and ten days notice thereof shall be given by the secretary, in one or more papers printed in the city of Madison.

The election of officers of the society shall be held each year during and at the general exhibition, and the exact time and place of the election shall be notified by the secretary in the official list of premiums and in all the general programmes of the exhibition.

Special meetings of the society will be called by order of the executive board, on giving twenty days' notice in at least three newspapers of general circulation in the state, of the time, place, and object of such meetings.

At any and all meetings of the society, ten members shall constitute a quorum for the transactian of business, though a less number may adjourn from time to time.

ARTICLE VI.

OF AMENDMENTS.

This constitution may be amended by a vote of two-thirds of the members attending any annual meeting; all amendments having been first submitted in writing at the previous annual meeting, recorded in the minutes of the proceedings, and read by the secretary in the next succeeding meeting for the election of officers.

LIFE MEMBERS.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Abbott, Chauncey	New York.	Bliss, C. M	Door Creek.
Adams, Jas	Janesville.	Bostwick, J. M	Janesville.
Adams, Isaac	Cottage Grove.	Bostwick, Perry	Janesville.
Adams, L. L	Stoner's Prairie.	Bostwick, R. M	Janesville.
Allen, Jas. W	Janesville.	Boyce, A. A	Vienna.
Allen, W. C	Delavan.	Boyd, R. B	Milwaukee.
Allen, H. M	Evansville.	Bowen, J. B	Madison.
Angel, R. R	Janesville.	Bowman, J. M	Madison.
Atwood, Chas. D	Madison.	Braley, A. B	Waukesha.
Atwood, David	Madison.	Brazea, Benj	Wauwatosa.
Atwood, Wm. F	Madison.	Briard, W. A	Madison.
Atwood, R. J	Madison.	Briggs, F	Madison.
Aspinwall, D. M	Farmington.	Brockway, E. P	Ripon.
Ayers, J. W	Kenosha.	Brown, Jas. J	Madison.
		Brown, B. F	Fitchburg.
		Brown, F	Madison.
Babbitt, Clinton	Beloit.	Brown, Tim	Madison.
Babbitt, D. H	Janesville.	Bruce, A. T	Madison.
Bacon, J. P	Westport.	Bryan, Jno	Cross Plains.
Bacon, W. D	Waukesha.	Bryant, D. D	Madison.
Bailey, A. P	Sun Prairie.	Bryant, G. E	Madison.
Bailey, M. T	Madison.	Bull, Stephen	Racine.
Barlass, Andrew	Emerald Grove.	Bullard, Jas	Evansville.
Barlass, David	Emerald Grove.	Bump, N. P	Janesville.
Barnes, George	Janesville.	Bunker, Geo	Madison.
Barrows, E. S	Janesville.	Burgess, J. M	Janesville.
Barry, James	Fitchburg.	Burnham, Miles	Danville.
Bates, A. C	Janesville.	Byrne, Jno. A	Madison.
Beecroft, W. G	Madison.		
Bement, E	Oregon.	Cæsar, Wm	Janesville.
Bemis, Fred	Madison.	* Campbell, C. M	Madison.
Bemis, Jarvis	Janesville.	Capron, Geo	Madison.
Benedict, J. D	Bristol.	Carlton, W. D	Sun Prairie.
Benedict, S. G		Carpenter, J. A	Waukesha.
Bennett, A. A	Grant Co.	Carpenter, J. E	Windsor.
Benson, S. W	Bloomfield.	Carpenter, J. H	Madison.
Billings, Earl	Madison.	Carpenter, S. D	Madison.
* Billings, H. M	Highland.	Carr, H. B	Madison.
Bird, I. W	Jefferson.	Carter, A. M	Johnstown.
Bird, T. E	Madison.	Carter, Gray	Janesville.
Bishop, Jno. C	Fond du Lac.	Carver, P. S	Delavan.
Blanchard, Willard	Windsor.	Case, J. I	Racine.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Chandler, J. C.....	Madison.	Dickerman, I. A..	Verona.
Chapman, C. R....	Leicester.	Dixon, J. P.....	Janesville.
Chase, Enoch.....	Milwaukee.	Dodge, J. E......	Potosi.
Chase, H..........	Milwaukee.	Doolittle, W. J...	Janesville.
Cheney, Rufus... .	Witewater.	Doris, John......	Milwaukee.
Child, Jno........	Lima Centre.	Dorn, M. M.......	Madison.
Children, E.......	Lancaster.	Doty, E. P.......	Janesville.
Chipman, A.......	Sun Prairie.	Douseman, J. B...	Milwaukee.
Church, Wm W....	Madison.	Douseman, T C...	Waterville.
Clapp, G. W......	Fitchburg.	Dow, O. P........	Palmyra.
Clark, C. M.......	Whitewater.	Drakely, S......	Madison.
Clark, Lewis......	Beloit.	Drury, E. W......	Fond du Lac.
Clark, Saterlee....	Horicon.	Dunlap, S........	Burke.
Cochrane, John....	Waupun.	Dunn, And.......	Portage City.
Cogswell, A. W....	Brookfield.	Dunn, Wm.......	Madison.
*Coit, D. R........	Madison.	Dunning, Abel....	Madison.
Colby, Charles.....	Janesville.	Durkee, Chas.....	Kenosha.
Colloday, Wm. M..	Stoughton.	Durkee, H.......	Kenosha.
Colton, S. B......	Madison.	Dwinnell, J. B....	Lodi.
Cornell, Jas.......	Beloit.		
Cornwell, H. H....	Verona.	Eaton, J. O......	Lodi.
Cory, J...........	Footeville.	Echlin, J. O......	Janesville.
*Craig, A. J	Palmyra.	Edgerton, E. W..	Summit.
Cramton, N. B.....	Verona.	Edmunds, F. W..	Madison.
Crawford, E. B....	Madison.	Elderkin, Ed.....	Elkhorn.
Crawford, J. B....	Baraboo.	Elliott, E........	Lone Rock.
Crawl, Jno...	Center.	Elliott, Jos. T....	Racine.
Crosby, J. B.......	Janesville.	Elmore, A. E.....	Mukwanago.
Cross, J. B.......	Milwaukee.	Ellis, J. A........	Madison.
Crossitt, B. F......	Janesville.	Ellsworth, O......	Milwaukee.
Culver, Caleb E....	Shopiere.	Ellsworth, W. J..	Madison.
Cummings, Wm....	Fitchburg.	Emmons, N. J....	Milwaukee.
Cnrtis, F. C.......	Rocky Run.	Enos, Elihu......	Waukesha.
Curtis, Seymour...	Fitchburg.	Esterly, Geo. W..	Whitewater.
Cutting, J. W.....	Harmony.		
		Fairbanks, E.....	St. Johnsbury Vt
Daggett, M. L.....	Madison.	Farwell, L. J.....	Madison.
*Dagget, S. S......	Milwaukee.	Fenn, G. W......	Janesville.
Dann, Obed.......	Janesville.	Ferguson, Benj...	Fox Lake.
Danks, E. P.......	Stoughton.	Fernly, Jno......	La Grange.
Daniells, W. W....	Madison.	Field, Martin.....	Mukwanago.
Darling, K. A.....	Fond du Lac.	Field, W. W.....	Boscobel.
Darwin, A. G......	Madison.	Fifield, L...	Janesville.
Davidson, Adam...	Verona.	Fifield D. E......	Janesville.
Davis, G. L.......	Milwavkee.	Fifield, E. G......	Janesville.
Davis, Jno	Milwaukee.	Finch, Lorin.....	Bradford.
Davis, N. P.......	Pierceville.	Firmin, F. H.....	Madison.
Davis, S. B........	Milwaukee.	Fisher, C. C......	Center.
Davis, W..........	Center.	Fisher, Elijah....	Newark.
Dean, E. B........	Madison.	Fisher, S. W.....	Center.
Dean, N. W.......	Madison.	Fisher, Seth.....	Center.
Dean, John S......	Madison.	Fitch, D...	Madison.
Delamatyr, W. A...	Mazomanie.	Fitch, W. F......	Madison.
Delaplaine, G. P...	Madison.	Fletcher, John....	Springfield.
Dewey, Nelson.....	Lancaster.	Folds, Geo. H....	Madison.
De Wolf, E........	Madison.	Foote, E. A......	Footville.
Devoe, A. B.......	Madison.	Foote, Sidney....	Madison.
Dexter, W. W.....	Janesville.	Fowle, Jacob.....	Bradford.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Fox, W. H.	Fitchburg.	Higbee, A. T.....	Stoughton.
Frank, A. S	Madison.	Hill, H. J........	Madison.
French, Jonathan..	Madison.	Hill, James H....	Madison.
Fuller, M. E	Madison.	Hill, J. W. P....	Windsor.
Fuller, F. D.......	Madison.	Hill, P. B........	Milwaukee.
Furlong, Thos. T...	Janesville.	Hiner, W. H.....	Fond du Lac.
		Hinkley, B. R....	Summit.
Gammons, Warren.	Middleton.	Hodge, Robt.....	Janesville.
Gates, D. W. C....	Madison.	Hodson, C. W....	Janesville.
Gaylord, Aug......	Madison.	Hœflinger, Carl...	Wausau.
Gernon, George ...	Madison.	Hogan, Gilbert...	Janesville.
Gibbs, Chas. R....	Janesville.	Hollister, R. M...	Janesville.
Gilbert, Thomas ...	Oregon.	Holt, David......	Madison.
Giles, H. H........	Stoughton.	Holton, Edward D.	Milwaukee.
Gilman, Henry	Stoughton.	* Hopkins, B. F..	Madison.
Gillette, R. E......	Tomah.	Hopkins, James...	Madison.
Goodenow, H. D...	Blooming Grove.	Hopkins, J. C....	Madison.
Goodrich, Ezra....	Milton.	Hoskins, J. W....	Milwaukee.
Goodrich, G.......	Whitesville.	Hoyt, J. W	Madison.
Gould, L. D.......	Madison.	Hughes, Wheldon.	Janesville.
Grady, F. M.......	Fitchburg.	Hume, Wm.....	Janesville.
Graham, Alex.....	Janesville.	*Hunt, J. W.....	Madison.
Grant, S. B.......	Milwaukee.	Hulbert, E.......	Oconomowoc.
Grant, Albert	Milwaukee.	Hutson, Sol......	Janesville.
Graves, R. A......	Cambria.		
Graves, S. W......	Rutland.	Ingham, A. C....	Madison.
Green, H. S.......	Milford.		
Green Samuel	Fitchburg.	Jackman, Hiram..	Janesville.
Greenman, C. H...	Milton.	Jacobs, H. C	Janesville.
Gregory, J. C......	Madison.	Jenks, S. R......	Madison.
Grinnell, J. G.....	Adams.	Jenkins, J. C....	Janesville.
Groom, John	Madison.	Jerdee, L. P......	Madison.
Grover, E.........	Madison.	Jerdee, M. P.....	Madison.
Grubb, W. S......	Madison.	Johnson, Jno., Jr.	Madison.
Guernsey, Orrin ...	Janesville.	Johnson, J. C....	Leyden.
Gurnee, J. D......	Madison.	Johnson, M. B....	Janesville.
		Jones, C. H......	Sun Prairie.
Haight, J. M......	Sacramento, Cal.	Jones, John N....	Madison.
Haight, Nicholas ..	Madison.	Juneau, Paul.....	Juneau.
Hall, Augustus	Janesville.	Janssen, E. H	Mequon.
Hallock, Youngs...	Middleton.		
Hall, H, B	Madison.	Kellogg, L. F.....	Madison.
Hanchett, A. M....	Hanchettville.	Kellogg, L. H....	Milwaukee.
Hancock, Brad	Marshall.	Keyes, E. W.....	Madison.
*Hanford A. G....	Waukesha.	Kent, A. C	Janesville.
Hammond, L. M...	Madison.	Kimball, M. G....	Madison.
Hammond, E. S....	Fond du Lac.	Kimball, John....	Janesville.
Harrington, N. M..	Delavan.	Kingsley, S. P....	Springfield.
Harris, Jas........	Janesville.	Kiser, Wm. C...	Madison.
* Harvey, L. P....	Shopiere.	Klauber, Sam'l...	Madison.
Harvey, J. W....	Madison.	Knight, E........	Sun Prairie.
Hasbrouk, W. H...	Madison.	Kneeland, Moses .	Milwaukee.
Hastings, S. D....	Madison.	Knapp, J. G......	Madison.
Hausman, Jos. ...	Madison.		
Hawes, J. F.......	Madison.	Ladd, M. L......	Sugar Creek.
Hawes, W. N......	Verona.	Lamb, F. J.......	Madison.
Helfenstein, J. A..	Milwaukee.	Lapham, I. A.....	Milwaukee.
Hicks, J. M.......	Oshkosh.	Larkin, B. F.....	Madison.
Hibbard, W. B....	Milwaukee.	Larkin, C. H.....	Madison.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Larkin, Daniel	Milwaukee.	Mosher, J. C.	Lodi.
Larkin, Wm.	Madison.	Moxley, A. R.	Madison.
Lawrence, W. A.	Janesville.	Murray, Geo.	Racine.
Lawton, J. G.	Green Bay.		
Learned, J. M.	Janesville.	Needham, J. P.	Wauwatosa.
Leitch, W. T.	Madison.	Newcomb, S. B.	Cold Spring.
Leitch, W. T. Jr.	Madison.	Newton, Ephraim	Oregon.
Leslie, Jno.	Madison.	Newton, I. S.	Middleton.
Lester, Waterman	Janesville.	Nichols, L. T.	Janesville.
Lewis, Herbert A.	Madison.	Norton, J. B.	Madison.
Lewis, Jno. L.	Madison.	Nott, B. F.	Oregon.
Little, Thos. H.	Janesville.		
Lolyd, Lewis	Cambria.	Olney, C. W.	Madison.
Lockwood, Jno.	Milwaukee.	Orr, G. H.	Verona.
Ludington, H.	Milwaukee.	Ott, Geo. V.	Madison.
Ludlow, A.	Monroe.		
Lucy, O. K.	Columbus.	Paddock, Geo.	Milwaukee.
Lyman, L. H.	Madison.	Page, H. M.	Madison.
Lynch, T. M.	Janesville.	*Paine, Geo.	Madison.
Lynde, W. P.	Milwaukee.	Palmer, H. L.	Milwaukee.
		Palmer, J. Y.	
*Mabie, E. F.	Delavan.	Palmer, O. M.	Oregon.
Main, Alex. H.	Madison.	Park, John W.	Vernon.
Mann, I. L.	Fitchburg.	Park, W. J.	Madison.
Mann, J. E.	Madison.	Parker, C. H.	Beloit.
Macy, J. B.	Fond du Lac.	Parmley, Ira	Center.
Mannering, Wm.	Black Earth.	Palmer, Henry	Oregon.
Marshall, Sam'l	Madison.	Parsons, P. B.	Madison.
Martin, A. C.	Ashton.	Partridge, J. S.	Whitewater.
Martin, C. L.	Janesville.	Patten, L. F.	Janesville.
Martin, Nath'l	Monroe.	Payne, Wm.	Janesville.
Martin, S. W.	Madison.	Peffer, G. P.	Pewaukee.
Mason, Geo. A.	Madison.	Pember, R. T.	Janesville.
Masters, E. D.	Jefferson.	Perkins, P. M.	Burlington.
Matteson, Clinton	Rosendale.	Perrine, L. W.	Janesville.
Maxson, O. F.	Prescott.	Perry, B. F.	Madison.
McBride, Alex	Madison.	Pinney, S. U.	Madison.
McCarty, F. D.	Fond du Lac.	Pinckney, B.	Fond du Lac.
McConnell, T. J.	Madison.	Plumb, J. C.	Milton.
McCormick, J. G.	Madison.	Plumb, T. D.	Madison.
McCollough, And.	Emerald Grove.	Plummer, B. G.	Wausau.
McDill A. S.	Westport.	Pond, Sam'l A.	Albany.
McDonald, A.	Alloa.	Porter, Wm. F.	Madison.
McDougall, G. W.	Madison.	Porter, Wm. H.	Madison.
McKenna, Martin	Madison.	Power, D. G.	Madison.
McKenna, David	Madison.	Powers, D. J.	Madison.
McNiel, David	Stoughton.	Powers, Wm. J.	Black Earth.
McGregor, Alex	Nepuskin.	Pratt, E. E.	Chicago, Ill.
McPherson, J. P.	Springdale.	Pres't St. Peter's Val. Farm's Club	Springfield.
Mears, Wm. A.	Madison.		
Merrill, Alf.	Madison.	Pritchard, P. M.	Fitchburg.
Miller, John	Madison.	Proudfit, And	Madison.
Mills, Simeon	Madison.		
Miltimore, Ira	Janesville,	Rawson, C. S.	Madison.
Miner, Cyrus	Janesville.	Raymond, S. O.	Geneva.
Mitchell, Alex	Milwaukee.	Reardon, Chas.	Janesville.
Morden, Ed.	Madison.	Reed, Herbert	Madison.
Morse, Sam'l	Milwaukee.	Reed, Harrison	Madison.
Moseley, G. F.	Janesville.	Resague, A. C.	Janesville.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Reynolds, M.......	Madison.	Slocum, G. A.....	Janesville.
Reynolds, Jno.....	Madison.	Smith, Adam.....	Burke.
Reynolds, Thos....	Madison.	Smith, Geo. B....	Madison.
Reynolds, Jno.....	Kenosha.	Smith, J. B.......	Milwaukee.
Rexford, S. D......	Janesville.	Smith, S. W......	Janesville.
Rice, E. M........	Whitewater.	Smith, H. L......	Janesville.
Richards, Richard..	Racine.	Smith, M. C......	Janesville.
Richardson, D.....	Middleton.	Smith, S. B.......	Vernon.
Richardson, Jas....	Madison.	Smith, J. Morris..	Janesville.
Richardson, R. J...	Janesville.	Snell, H..........	Madison.
Richardson, H.....	Janesville.	Spaulding, Wm...	Janesville.
Richmond, Amaz'h.	Whitewater.	Spaulding, Jos....	Janesville.
Riebsam, C. R.....	Madison.	Spencer, R. C.....	Milwaukee.
Rizer, J. O........	Oregon.	Squire, Thos. H...	Waterloo.
Ribbins, J.........	Vienna.	Stannard, A C....	Milton.
Robbins, J. V.....	Madison.	Stevens, J. T.....	Madison.
Roddis, R.........	Milwaukee.	Steensland, H....	Madison.
Roderman, Jno....	Madison.	Stewart, C. K.....	Danville.
Rodgers, Lawrence.	Westport.	Stewart, G. H.....	Beaver Dam.
Roe, J. P..........	Franklin.	Stilson, Eli.......	Oshkosh.
Rogers, C. H......	Milwaukee.	St. John, J. W....	Janesville.
Rogers, J. S..	Burlington.	Stockman, Jno...	Milton.
Rogers, Anson.....	Janesville.	Stone, G.........	Beloit.
Ross, Jas..........	Madison.	Storm, Wm.......	Madison.
Rowe, Richard W..	Madison.	Stowe, Lafayette..	Sun Prairie.
Rowe, W. E.......	Mazomanie.	Sullivan, Jas.....	Burke.
Rowley, N. C......	Verona.	Sutherland, C.....	Syene.
Ruble, Simon......	Beloit.	Swain, Wm. W...	Verona.
Ruggles, J. D......	Madison.		
		Tallman, W. H....	Janesville.
Sage, E. C........	New Lisbon.	Taylor, Ek........	Mukwanago.
Salisbury, R. W....	Fitchburg.	Taylor, W. R.....	Cottage Grove.
Salisbury, D. F....	Fitchburg.	Tenney, H. A.....	Madison.
Sanderson, R. B....	Poynette.	Tenney, D. K.....	Chicago, Ill.
Schutt, U.........	Janesville.	Terwilliger, Jas...	Syene.
Scollan, Frank.....	Madison.	Tierney, K.......	Madison.
Scott, S. B........	Milwaukee.	Thomas, M. J.....	Fond du Lac.
Seville, Jas.......	Merrimac.	Thompson, W. H..	Madison.
Sexton, L.........	Milwaukee.	Thompson, Dr. W.	Madison.
Simmons, C. J.....	Monroe.	Thompson, Ole....	Madison.
Sinclair, Jeff......	Milwaukee.	Thorp, J. G......	Eau Claire.
Sharp, J. W.......	Cottage Grove.	Throop, B........	Milwaukee.
Sheldon, A. H.....	Madison.	Todd, J. G.......	Janesville.
Sheperd, C........	Milwaukee.	Tolford, J. W.....	Madison.
Sheldon, D. G.....	Madison.	Torgerson, Lars...	Madison.
Sheldon, S. L......	Madison.	Townley, Jno.....	Moundville.
Sherman, Adelmar.	La Prairie.	Treat, R. B.......	Janesville.
Sherman, Amaziah.	La Prairie.	Trne, W. H.......	Fitchburg.
Sherman, Geo.....	La Prairie.	Twining, M. S....	Magnolia.
Sherman, J. M.....	Burnett.		
Sherwood, J. C....	Dartford.	Utter, Jas........	Oregon.
Shipman, S. V.....	Madison.		
Shipman, A. C.....	Sun Prairie.	Van Etta, Jacob..	Madison.
Skelley, Chas......	Janesville.	VanNorstrand, A.H	Madison.
Skinner, Geo J....	Madison.	Van Slyke, N. B..	Madison.
Skinner, E. W.....	Madison.	Vaughn, O. A.....	Lodi.
Slaughter, G. H....	Middleton.	Viall, Andrus.....	Madison.
Slaughter, W. B...	Middleton.	Vilas, Chas. H....	Madison.
Sloan, I. C........	Janesville.	Vilas Henry	Madison.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Vilas, L. B	Madison.	Willey, O. S	Madison.
Vilas, L. M	Madison.	Williams, C. L	Madison.
Vilas, Wm. F	Madison.	Williams, C. H	Baraboo.
		Williams, D	Springfield.
Wait, J. B	Waitsville.	Williams, Daniel	Madison.
Warren, J. H	Albany.	Williams, G. M	Whitewater.
Warren, W. R	Madison.	Williams, J. P	Madison.
Webster, James	Danville.	Williams, Randall	Janesville.
Webster, Martin	Fox Lake.	Williams, S. B	Madison.
* Weed, Charles	Madison.	Williams, S. G	Janesville.
Webb, James A	Janesville.	Wilson, Wm	Westport.
Welch, W	Madison.	Wilson, H. O	Milwaukee.
Werner, John	Sauk.	Wilson, Zebina	Palmyra.
West, Henry	Madison.	Wolcott, E. B	Milwaukee.
West, S. C	Milwaukee.	Wootton, Rob't	Madison.
Wheeler, Guy	La Prairie.	Worthington, B. M.	Madison.
Wheeler, W. A	Madison.	Worthington, D	Madison.
Wheelock, W. G	Janesville.	Wright, D. H	Madison.
Wheelwright, J	Middleton.	Wright, Geo	Mt. Horeb.
White, A	Verona.	Wright, J. S	Emerald Grove.
White, W. A	Madison.	Wright, Josiah T	Janesville.
Whiting, W. F	Milwaukee.	Wright, N. A	Prairie du Chien.
Whittlesey, T. T	Pheasant Branch	Wylie, Geo. W	Elkhorn.
Wightman, H	Black Earth.		
Wilcox, C. F	Janesville.		
* Willard, J. F	Janesville.	Young, J. E	Harmony.

*Deceased,

TRANSACTIONS.

ANNUAL REPORT.

To His Excellency, LUCIUS FAIRCHILD,

Governor of Wisconsin:

In submitting the report of the State Agricultural Society for the year 1869, it is gratifying to be able again to congratulate the people of Wisconsin upon the favorable circumstances which have characterized the period embraced. The public health has been almost universal; the order and peace of society have been undisturbed; a good degree of success has crowned our efforts in every department of labor; population has increased with more than usual rapidity; internal improvements have steadily advanced; and, although we have not wholly escaped the general depression and embarrassment consequent upon a heavy public debt, the unsettled condition of the national finances and the lack of a well-determined national policy, in common with our sister states, we have had immunity from those overwhelming financial disasters, which at other periods in our history, have caused an almost total stagnation of commerce and palsied the hands of our manifold industry.

The agriculture of the state suffered considerably from two or three causes worthy of mention.

In the first place, many of our farmers had not recovered from the serious effects consequent on the almost universal failure of hops,—a failure so serious that a large majority of farmers in certain counties were financially ruined by it, and hence were in no condition to add anything to the production of the state,—while, again, others had suffered loss from the decline in the market value of wool and the heavy sacrifices they were induced to make in disposing of their flocks. Both of these sources of loss might have been avoided by the exercise of a little practical wisdom on their own part, or by the acceptance of the conclusions formed by careful observers uninfluenced by the delusive hopes inspired by the unexampled gains of the preceding years.

In the second place, the season of 1869 was a remarkable one as to the climate. The first two months of the year were warm and dry; the months of March and April were both cold and dry; the succeeding four months were unusually wet; September was hot; and October and November very strangely abandoned the good old habit of giving us almost the pleasantest months in the year and went over to their new place among the months of winter. The consequence was, that the corn crop was late in getting planted, and only came out middling by virtue of the warm September; while the cereal and grass crops, though good as to yield, were harvested with difficulty and secured not without damage by rain. But on the other hand the abundance of rain, during the summer months, was favorable to the potato crop; not only inducing a large yield, but protecting it to a good degree from the ravages of the *potato bug*, so destructive in previous years: and the fruit crop was one of the finest ever produced in Wisconsin.

THE WHEAT CROP.

A third embarrassment to the farming community has resulted from an over-production of that great staple product of the northwestern states—wheat. Stimulated by the remarkable prices of preceding years, our state, in common with neighboring ones, turned an undue proportion of the large amount of labor restored to it, during the years succeeding the war, to a very poor account in the production of this particular crop. As a consequence, the price went down so rapidly that, like the holders of wool the year previous, producers of wheat were unwilling to sell, preferring to put in store, and trust to an early return to something near the previous high rates—a condition of things still further postponed by the unusually large yield in foreign countries, by the fall in gold, and by an increasing stringency in financial matters throughout the country.

Unhappily, we are without such statistical returns as would settle the question of total yield, and are therefore obliged to put up with the best estimates, which have ranged between 20,000,000 and 25,000,000.

The average yield per acre, as reported by the department of agriculture, on the basis of voluntary returns and estimates by agents of its appointment, was 13.3 bushels, being one-tenth of a bushel less than that of Maine, two-tenths less than that of Ohio, seven-tenths less than that of New York, one bushel less than that of Minnesota, one and two-tenths less than that of New Jersey, two and two-tenths less than that of Connecticut and New Hampshire, two and five-tenths less than that of Nebraska, two and seven-tenths less than that of Vermont and Massachusetts, three and two-tenths less than that of Kansas, four and seven-tenths bushels less than that of California, and larger, in a varying proportion, than that of other states not enumerated.

The average price of No. 1 wheat, at Milwaukee, which during the year 1868 declined from \$2.09¼ (the average price for April of that year) to \$1.22 (the price in December), gradually fell during 1869, until at last it reached \$0.86⅛—the lowest figure it had touched since 1862, as will appear by the following statement, gleaned from the report of the secretary of the board of trade:

TABLE, *showing the average prices of No.* 1 *spring wheat in each month of the years* 1863—1869.

MONTHS.	1863.	1864.	1865.	1866.	1867.	1868.	1869.
January	$1 15½	$1 18½	$1 59½	$1 26⅜	$2 13	$2 07¼	$1 19⅞
February	1 25	1 17¾	1 95½	1 20½	2 13½	2 01½	1 19⅛
March............	1 17	1 15¾	1 22⅛	1 35⅝	2 31	1 96½	1 13¾
April	1 18½	1 24¼	1 09¾	1 46¼	2 65	2 09¼	1 11¾
May	1 18½	1 21¾	1 69¼	1 77½	2 68	2 11¼	1 17⅛
June............	1 17	1 76¼	1 13½	1 96	2 14	1 97¼	1 20
July	1 08¼	2 14	1 16¼	1 84⅝	2 22½	1 96¼	1 36
August..........	95½	2 05	1 29½	1 92	1 87½	1 86	1 40⅝
September.........	99½	1 81	1 37¼	1 97½	1 83¾	1 63	1 24½
October..........	1 10	1 61¾	1 40½	2 09	1 92½	1 39¾	1 05¼
November.........	1 08⅛	1 84½	1 40⅛	2 10½	1 84½	1 26¾	92⅞
December.........	1 14⅛	1 69⅝	1 26½	2 08	1 90½	1 22	86⅛

According to the Milwaukee rules of inspection, the quality of the wheat crop of 1869 was also much below the standard, as will appear by the following figures taken from the reports of the grain inspector for that and the preceding four years:

Crop of	Per cent. of whole graded as No. 1.	Per cent. of whole graded as No. 2.	Per cent. of whole graded as No. 3.	Per cent. rejected.
1865	77	15.6		7.4
1866	10.8	50.7	28.8	9.7
1867	60.2	34.3	4.8	0.7
1868	37.3	57.7	3.9	1.1
1869	38.5	54.9	6	0.6

Of the new varieties introduced during the year, the Tappahannock, as a winter wheat, has given good satisfaction, in general. It appears to be better adapted to more southern latitudes however, and can hardly be said to have established its adaptedness to Wisconsin, even in localities where winter wheat ordinarily succeeds. The Arnautka wheat, a spring variety, imported by the agricultural department from Russia, and distributed through the medium of this office, promises well; making in a majority of cases, where the circumstances were favorable, a bountiful yield. It is a bearded wheat, with remarkably large heads; the berry is also very large and handsome. It is the opinion of some who have tried it, that upon new lands, to which especially adapted, the yield may reach forty to fifty bushels per acre.

There has been no change in the current opinion among agriculturists, that occasional change in variety is important to the success of wheat-growing, and neither the national department of agriculture nor the agricultural societies can be too pains-taking in the matter of seeking for and introducing such new varieties as promise adaptation to our climate and soils. For if we are to devote ourselves, in the northwest, chiefly, and many of us almost exclusively, to wheat-growing, this question of varieties is one of very great importance.

The misfortune seems to be that no variety has yet been discovered that will flourish independent of all conditions of soil; since it has not only become the general practice, but seems to be the fixed purpose, of our farmers to ignore the question of soil, as not entering into the problem of success!

But on this head remonstrance is vain. In traveling about the state, one is less frequently offended than formerly by the sight of burning straw-stacks, and the laborious moving of barns to escape the nuisance of manure-heaps; but the practice of taking active measures for the reinforcement of the soil, by the careful return to it of the necessary elements of which it has been deprived by successive years of reckless robbery, is still very exceptional. The long-practiced and selfish policy of *creaming* our lands for our own present advantage, and leaving our successors to take care of themselves, continues, and is likely to continue until the wave of westward-moving population shall have swept over our entire vast area of virgin lands, and reached at length that pericd, sure to come, wherein American agriculturists shall be forced to give earnest heed to those inexorable laws of nature, obedience to which is an absolute condition of permanent, or even of the highest present, success.

THE BARLEY CROP

Was only fair in yield and quality. The agricultural department reports the increase upon the aggregate crop of 1868, at 10 per cent.; average yield per acre, 25.9 bushels, against 24 bushels in 1868. The prices at Milwaukee ranged considerably lower throughout the year than during the corresponding months of 1868, as will appear by the following figures taken from the secretary's report to the chamber of commerce:

Price of barley at Milwaukee in 1868 *and* 1869.

Months.	Prices in 1868.	Prices in 1869.
January	$1.70@2.15	$1.55@1.75
February	1.95@2.30	1.70@2.00
March	1.95@2.30	1.65@2.05
April	2.35@2.55	1.55@2.10
May	2.10@2.65	1.60@1.85
June	1.50@2.10	1.25@1.55
July	1.28@1.50	1.10@1.55
August	1.38@1.81	1.15@1.35
September	1.38@1.80	1.10@1.45
October	1.15@1.95	95@1.27
November	1.20@1.85	85@1.15
December	1.25@1.80	85@1.15

Several new varieties were sent out from this office during the winter, but the returns made by those to whom they were distributed have been so few and meager as to warrant no general conclusions as to their value.

THE OAT CROP

Of 1869 was considerably larger than usual—the agricultural 1
department says 25 per cent. larger than in 1868, with an average yield of 36.2 bushels per acre—and the price has been correspondingly lower; the average for the year, at Milwaukee, being 51 cents per bushel. During the past two or three years, several new varieties have been introduced from foreign countries. Of these, the Swedish, the English Excelsior, the Norway, and the Saxony oats are favorably reported upon by those who have experimented with them.

THE RYE CROP

2
Of Wisconsin, though less in yield, per acre, than in 1868—the proportion being as 15 bushels to 18.6—was probably almost the same in the aggregate, and of a better quality than in most of the northwestern states. The average price of rye at Milwaukee during the year was about $1.00; the price at the beginning of the year being $1.10; the highest price reached, $1.15; and the price at the close of the year having declined to $0.71 to $0.74.

CORN.

3
Owing to the cool and wet weather during those months in which the corn crop requires attention, it was but poorly cultivated; besides which the weather had a directly injurious effect in preventing a proper development and maturity of the crop. Accordingly, notwithstanding the more favorable conditions of September, a large portion of it was found at the end of the season less than fully ripe—a fact which not only seriously affected its value for home consumption and its price in the market, but which is likely to result unfavorably to the succeeding crop by leading to the use of seed that will not germinate. This is especially true of the dent varieties, which, in this climate, require a combination of favorable circumstances to insure their maturing.

The average yield is believed to have been about 26 or 27 bushels per acre; that of 1868 having been over 30.

THE POTATO CROP

Of 1869 was one of, if not the, largest crop ever produced in this state. It suffered in some sections from the *rot*, but, in the main, the product was of a most excellent quality. The same was true of many of the other western states; the reported yield of potatoes of the very best quality having been, in numerous cases, from 300 to 500 bushels per acre. The price, therefore, in all the western markets was unprecedentedly low in the early fall—ranging from 25 to 35 cents per bushel. But, unhappily, many of our farmers were so tardy in the work of harvesting that the snow and frost of the last week in October, cut short their labors, while full one-half, or even a yet larger proportion, of the crop was still in the ground. Several varieties of recent introduction have been found valuable acquisitions. For although many of those cultivated have given excellent satisfaction—a remark especially true of the pink-eye, mercer, carter and peach-blow—a variety that would mature earlier, and yet be equal in quality, and less liable to rot, has always been in demand.

It appears to be the opinion of a large majority of those farmers who have tried the early rose—a variety introduced in this state some two years since—that it entirely fulfills these conditions, being excellent for domestic use, and maturing some two weeks earlier than the other varieties already in cultivation. At the last general exhibition of this society, a new hybrid, produced with very great care, by Hon. M. K. Young, of Glen Haven, Grant county, and shown by him in considerable quantity, attracted much attention, and received the award of a silver medal. Mr. Young entertains a high opinion of it, and we are informed that other parties who have tested its value, deem it a valuable addition to our list of superior varieties.

The *rot* is still the occasion of much embarrassment in the cultivation of the potato. Its cause is still a mystery, and none of the multitude of remedies proposed has established itself in the public confidence.

There are precautionary measures recommended, however, the reasonableness of which should commend them to the attention of farmers and secure a fair trial. Of these, the selection of well drained soil; the choice of healthy, and occasionally *new* seed; early and thorough planting; and early digging, are the most prominent. Some authorities also recommend liming the seed in the hill, when planting, and the sprinkling of slacked lime upon the heap when storing, as being important.

It can hardly be presumed that a kind of food so universally in great demand, and apparently so well adapted to the necessities of mankind, should be the prey of an incurable disease; and there is but little doubt that the means of prevention are simple and efficacious, if we only knew the causes by which it is produced. There is some reason to question whether this or any other plant is of such universal adaptability that it will flourish, and continue to do so, from one century to another, irrespective of climate and soil; and it is by no means improbable that there must occasionally be a renewal from the seed proper, and even a going back to the original source.

THE HAY CROP

Was unusually heavy, as a natural result of the rainy weather during the season of growth. But, on the other hand, the showers continued so persistently during the period of making and securing, that much of it was damaged before it could be got into stack or under cover.

A yearly improvement is perceptible in the matter of cultivating the tame grasses where previously the natural meadows —marsh and prairie—had been the sole reliance. There is much room for improvement in this direction, however, and the importance of giving more attention to this branch of husbandry is in no danger of being too often urged or too strongly impressed upon the farmers of Wisconsin. Farmers have been too often discouraged by clover failures, and have made this an excuse for the general slackness in the cultivation of the grasses.

Some soils are naturally adapted to grass crops; and such, with occasional fertilization, will often produce successive crops without much deterioration for many years. Others, with the greatest care, cannot be kept in grass more than a few years, without breaking up and re-seeding. It should also be borne in mind that clover belongs, by nature, to a system of *rotation of crops*, and should not be expected to flourish for a term of years without renewal. Treated in a proper manner, even clover may be successfully grown upon almost any soil capable of producing the ordinary grasses and the whole class of plants to which it more properly belongs. Scarcely any other plant so well fulfills the two-fold office of yielding a valuable crop for farm use, and of actually enriching the soil, and giving it, moreover, an admirable mechanical preparation for other crops.

Our farmers are likewise either slow in learning the important art of hay-*making*, or very slow in putting in practice the knowledge they already possess. So true is this that only a small proportion of the hay that finds its way to market, or is consumed on the farm, is of prime quality. Often it is cut quite too late; in which case the sweet juices have been dried up and an undue proportion of the nutritious elements has been concentrated in the seed, which also, in turn, is lost to the hay, as finally put away in mow or stack, by shelling out, in the rough process of gathering in. Often, when cut at the proper time, it is allowed to lie in the field for a period twice as long as necessary, and successively exposed to dew and rain, and scorching sun, until all the life and aroma have gone out of it. And, again, when cut at the right time and got into stack or barn in good condition it is practically ruined at last, for want of a few pounds of salt, requisite protection from the storms of autumn and winter, or needed ventilation.

In no branch of farming is that careless, helter-skelter, hurried, slip-shod way of doing business, which so distinguishes and disgraces our western farmers, more observable than in their manner of harvesting and curing their grass and grain crops. The exercise of a little common sense, and a good degree of thrift and thoroughness in these matters would add millions of dollars per annum to the results of their labor.

SORGHUM AND IMPHEE

Have settled down upon the basis predicted in our last report. The farmers are few in number who still expect to see them become a staple production in this latitude. And yet there are many who, having learned the art of their cultivation, who being also possessed of the requisite machinery for the manufacture of the syrup, and who having more fully conquered their first prejudices against its peculiar flavor, continue their cultivation for domestic use, notwithstanding the decline in price of the southern and imported sugars and syrups. During the year there was even prospect of a revival of this interest; but we are no less confident, on this account, that the true habitat of this kind of plants is in a lower latitude, and that sorghum can never become a staple crop in Wisconsin. It rendered the north an important service in a time of need, and there is but little doubt that for latitudes well adapted to its cultivation, it will yet prove a valuable and permanent addition to the list of staple crops of the United States.

THE SUGAR BEET, AND BEET-SUGAR.

Resolute in their purpose to find some source of supply that should make them independent, in a measure at least, of their southern neighbors and of the world, the northern states are now undertaking the cultivation, as an experiment, of another sugar-producing plant—the sugar beet. It is by no means an original experiment, however; only a test as to its adaptability to the soils and climate of this country. In Europe the cultivation of it for sugar has been practiced for more than a half century; and, as was remarked in my last report, there seems so little reason to doubt its equal success in the United States that American agriculturists and capitalists are fairly warranted in giving the matter a thorough and patient trial.

There is also good ground for the opinion that, if successful at all in the United States, it will be found well adapted to Wisconsin, where the beet has already succeeded remarkably well, and where the experiment made, within the past year or two, at Fond du Lac, has been less than an entire success because of a want of practical knowledge and the requisite capital to conduct the operations upon an economical scale.

In view of all the facts, I deem the subject one of sufficient importance to warrant a pretty full account* of the rise and development of this comparatively recent branch of industry; drawing from such sources of information as are reliable.

Parties not hitherto engaged in the business, residing in Wisconsin, are making careful preparations to test the practicability of producing beets of good quality for the manufacture of sugar, in this section of the country, with the view of entering into the business in 1871, should the results of their experiments prove satisfactory. This is a prudent way of initiating a new enterprise, and one that may be commended to all who feel an interest in this and similar matters. When the beets are once grown, a competent chemist will be able to decide whether they are of a quality to warrant the next step—the erection of expensive establishments for the manufacture of the sugar.

In a recent monthly report of the department of agriculture, these statements are made:

"Foreign statistics represent the consumption of sugar of all kinds, in the last nine months of the year 1869, in France, to amount to 294,000 tons, against 252,000 tons in the same period of 1868, in the following proportions:

	1869.	1868.
	Tons.	*Tons.*
Home	137,000	129,000
Colonial	67,000	49,000
Foreign	94,000	73,000

*** See an article in a subsequent portion of this volume, by H. F. Q. D'Aligny.**

"The exportation of refined sugar for the same period in 1869 was 71,000 tons, against 57,000 tons in 1868, showing an increase of 14,000 tons; and the import from the colonies and foreign countries:

	1869.	1868.
	Tons.	*Tons.*
Colonial	66,000	80,000
Other countries	93,000	90,000

"The stocks of beet and cane on the 25th of December were:

	1869.	1868.	1867.
	Tons.	*Tons.*	*Tons.*
Beet	44,000	42,720	34,000
Cane	9,110	15,115	2,800

"Thus nearly one-half the sugar consumed in France is made of beets. The quality of this season's manufacture is unusually good, and the beet has yielded an increased percentage of sugar, the improvement in some places reaching two per cent. Not less than 40,000 tons have been made in crystals and fine sugar above number twenty, Dutch standard, against 24,000 tons last year. It is estimated that 200,000 tons have already been manufactured, and the entire product of the season will be 250,000. The price at the close of the year was 61 francs for 88 per cent., or 5*s.* 6*d.* There will be less than usual of the brown graining sorts this season.

"A review of the beet-sugar industry in Europe appears to indicate an increase of 100,000 in the annual production, which is placed at 725,000 tons, against 625,000 tons last year (1869). A million tons will, ere many years, in all probability, be reached. The product already exceeds that of Cuban cane sugar.

"The number of manufactories reported is as follows: In France, 475; Belgium, 120; the Zollverein, 297; Austria,

200. There are also thousands of spirit distilleries and alkali works, collateral branches of this industry. The consumption of beet sugar is extending on the continent and in Great Britain, where the industry as yet scarcely has a foot-hold. One manufactory and one distillery are in operation in England. The prejudice of English refineries against it is rapidly giving away.

"In a recent letter, in reference to the beet-sugar enterprise, commenced several years since at Chatsworth, Illinois, by the Gennert Brothers, Mr. M. L. Dunlap states that the operations of these gentlemen having come to a stand-still through want of capital, and more from want of practical knowledge of the business, Messrs. Bunn, Reynolds, and others took hold of the business with the purpose of redeeming the enterprise and to test thoroughly the practicability of making sugar from the beet in competition with the sugar-cane. They secured the services of William Wiferling, a native of Saxony, who has had twenty years' experience as a sugar-maker in the best factories of Europe. He at once remodeled the works and successfully made up the crop of 1868, amounting to six hundred barrels of granulated sugar. The beets, having been badly grown, yielded only about four per cent. of pure sugar. This year, one thousand two hundred acres were planted to beets, but the season was an unfortunate one for the experiment; the deluging rains sweeping away the plants and ruining the crop. Only two hundred and fifty tons of beets, or about the ordinary yield of twenty-five acres, were saved. Not discouraged by this failure, wholly due to an unpropitious season, the company is making preparations for further experiments. During the fall one thousand six hundred acres have been plowed; but whether the land will be planted to beets or to farm crops may depend somewhat on the results of certain new processes in separating the nitrates from the beet juice, now undergoing trial in some of the German factories. An excess of nitrates in the prairie soils of the West is complained of, and it is thought that, in the absence of these, it would be only necessary to wash the beets, reduce them to pulp, press out the juice, and boil it down to the point of crystalization. Mr. Wiferling is quite sanguine that this result will be reached. Thus far, however, the experiment has not resulted in establishing any practical facts, yet this failure has proved nothing against the enterprise. The beets are rich in sugar, but, as in all new soils, contain an excess of the nitrates. All that is needed to insure success is some cheap and certain mode of separating the nitrates; that obtained, the other difficulties will soon be overcome. At present the process is an expensive one, and requires great skill in the manipulation.

"The enterprise at Fond du Lac, Wisconsin, appears to have been more successful. Mr. A. Otto, a practical German sugar-maker, last year planted four acres of beets, near Fond du Lac, and fitted up cheap and simple apparatus for manufacturing. The crop turned out well and proved rich in saccharine matter, yielding a good quality of sugar. This year eighty acres were planted, and, notwithstanding the unfavorable season, the peculiar fitness of the soil secured a good crop of beets. More machinery was obtained, and the manufacture is now being successfully prosecuted; about one thousand pounds of a good quality of coffee sugar being turned out every twenty-four hours, with improving results as the work progresses. The crop of beets is sufficient to occupy the works for at least four and a half months, which will give an aggregate of one hundred and twenty-five thousand to one hundred and thirty-five thousand pounds of sugar. The process of manufacture is similar to that followed at Chatsworth, Illinois. The locality of Fond du Lac is said to embrace all the requisites to make the manufacture of sugar a prominent feature there."

From the same report, I further quote an account of a meeting lately held at Fond du Lac for the discussion of the subject of beet-sugar manufacture, and the practicability of making it successful in Wisconsin:

"Mr. Wiferling, superintendent of the works at Chatsworth, Illinois, gave the following statement, based on experience at

Chatsworth, of the daily cost of running a factory capable of using fifty tons of beets per day:

Beets, fifty tons	$200 00
Coal, twenty tons	80 00
Labor of one hundred	100 00
Grease, tallow, &c	4 00
Lights	2 00
Shovels, brooms, &c	1 55
Lime	8 00
Acids	9 00
Loss on bone-black, 250 pounds	10 00
Belting	2 00
Filtering-cloths	3 00
Rubber, lead, hemp, &c., for packing	1 25
Changing, repairing, &c	10 00
Stationery, &c., in office	2 00
Coke	1 00
Sinking fund for wear, &c	66 60
Interest on capital	66 00
Salaries	20 00
Insurance	20 00
Barrels	20 00
Incidentals	25 00
	652 00

"Fifty tons of beets will yield at least ten per cent. of boiled juice and the product will be as follows:

Coffee-sugar (A,) 4,000 pounds, at 15 cents	$600 00
Coffee-sugar (C,) 1,000 pounds, at 13 cents	130 00
Yellow sugar, 500 pounds, at 11 cents	55 00
Molasses, 3,000 pounds, at 2 cents	60 00
Pulp for feeding	15 00
Total income	860 00
Expenses	625 00
Net profit daily	208 00

"Mr. Wiferling stated that tests had proved the soil of Fond du Lac to be free from the salts, &c., which have prevented the granulation of sugar at other points.

"At a subsequent meeting, S. D. Carpenter gave the following estimate of the cost of establishing a factory capable of working up over seventy-five tons, or one hundred and fifty thousand pounds of beets every twenty-four hours.

Building	$5,000 00
Pulping and power department	6,100 00
Scum department	400 00
Defection department	1,100 00
Carbonation department	2,425 00
Evaporation department	9,300 00
Filtration department	2,725 00
Bone-black department	1,000 00
Crystalization department	3,725 00
Piping, vats, tools, &c	3,400 00
Total cost of factory	$35,175 00
Add for 30,000 pounds of bone-black	1,500 00
Total	$37,675 00

"Mr. Carpenter estimated the annual expenses, including ten per cent. interest on outlay, at $48,967 50, to which he added twenty per cent. for insurance and incidentals, making a total of $58,761. He also gave the following as a fair estimate of the probable yearly income:

Sugar, 1,200,000 pounds, at 12 cents	$144,000 00
Pulp for feeding cattle, 2,700,000 pounds	2,700 00
Molasses, 5,000 gallons, at 35 cents	1,750 00
Residues, as fertilizers	1,000 00
Total	149,450 00

CULTIVATION OF RAPE.

Few persons outside of Fond du Lac county are aware of the extent to which the cultivation of the rape has been carried in that section. Indeed it is said that there are but two or three localities in the United States where it is cultivated at all.

In Belgium, France, and Germany, it is grown extensively; and in view of its easy cultivation, the convenience and economy of its cultivation, and the value of the product, it is surprising that it has received so little attention in this country.

It was introduced at Fond du Lac as early as 1857, by Gen. C. S. Hamilton, to whom I am indebted for the principal facts here presented. As a result of the experiments he had caused to be made, the General was enabled, in 1860, to procure about 3,000 bushels of the seed for working up into oil. He had been engaged in the manufacture of linseed oil since 1853; and as the process of manufacture in the case of rape-seed oil is almost exactly the same, so far as the crushing of the seed and the expression of the oil are concerned, no difficulty was found in working it up in the mills already in operation.

At first the manufacture was confined to the crude oil. But the General invented a process by which he was enabled to prepare a very excellent refined oil equal to any in the market. The war interrupted the further progress of the business by calling the chief operator into the military service; and it was not until after its close that the enterprise was again pushed forward. Arrangements are made for a crop of the seed in 1870 that, with anything like a favorable season, will fall scarcely short of 25,000 bushels.

The advantages of the rape as a farm crop are several:

1. The time of seeding—June 10th to 25th—is the most convenient the farmer could ask for; since it comes when there is but little in the way of farm work to interfere with it.

2. Great economy of ground is often possible by making the rape follow upon the heels of a failing crop. For example: if a crop of wheat or other grain should fail, or give promise of being so near a failure that it could hardly pay, the whole may be turned under, at the right time, and seeded with rape, the failure of which, *in clean soil*, is hardly a contingency.

3. The seed costs almost nothing. Two quarts, the value of which may be reckoned at 15 to 20 cents, will sow an acre.

4. It is not troubled by any of those diseases and insect enemies which are so apt to cause the failure of many other crops.

5. Owing to the peculiar character of the plant—its leaves are broad and numerous—it shades the soil; thus stifling any

weeds that may spring up after it gets fairly established, and inducing that peculiar fermentation and lightening of soil which are found so favorable to succeeding crops. No other crop is so good a preparer of the soil for winter wheat, the yield of which is several bushels per acre more after it, other things being equal, than otherwise.

6. It succeeds admirably upon sod and is its best possible preparer for other crops. The sod upon which it has been grown is so rotted by the fermentation induced as to crumble into mould under the process of preparing for any succeeding crop.

7. It requires no labor during the period of growth, and is easily harvested. It may be cut with a cradle, scythe or mower, thrown together in little heaps after curing, and when dry enough to thresh, gathered in a tight wagon bed, or an ordinary wagon or rack, spread over with strong sheets or a piece of canvass.

8. It is harvested at a most convenient time—during the first half of September—after the cereal harvests are all out of the way, and before the corn and potato harvests begin.

9. It is easily prepared for market. When properly cured, it shells with such facility that one team of horses will tread it out as fast as another can haul it in. It may be screened in an ordinary fanning mill, and is then ready for market.

10. The crop is a profitable one. The average amount per acre is equal to, or rather greater than, that of wheat, and the price is usually much higher, though determined by the price of the oil. In 1865 the price was $2.25 to $2.75 per bushel. Last year it was about $2.00. One bushel of seed yields about two gallons of oil, the market value of which is equal to that of the best lard or sperm oil. The *real* value is greater, for the reason that it is not only a first class illuminating oil, but also a lubricator of much value, not simply on account of its lubricating properties, but also because it requires an intense degree of cold to solidify it.

There are but two circumstances that militate against the entire success of the rape as a general farm crop:

1. *It will not succeed on foul land. The land must be clean*, else it will be choked out by the weeds, in its early growth, and amount to nothing.

2. It requires to be harvested when the crop is ready. If allowed to get ripe before being cut, much of the seed will shell out and be lost, in spite of all that can be done. The time to cut is *while it is yet green*, with the under pods just changing to yellow.

The first of these objections ought really to be enumerated as an eleventh advantage. For if anything will compel our farmers to keep their lands clean, that's what we want. And as for the second objection, it is one that may also be urged against wheat, or grass, or almost any other summer crop.

The Fond du Lac mills have a capacity sufficient to work up 100,000 bushels of the seed, and there is little doubt but that the cultivation of rape will rapidly extend as its advantages become better known—not alone in that section of the state, but in others.

Moist, rich lands are the best for it, but it will flourish on almost any of our prairie and clay lands.

General Hamilton deserves the thanks of the farming public for his efforts to introduce so desirable a plant into the agriculture of Wisconsin; and, if its cultivation should become general, he will have even more reason to be proud of his achievements in the field of industry than of his many successes on the field of arms.

STOCK BREEDING, ETC.

There is nothing of a very remarkable character to report under this head—unless it be the almost entire immunity all classes of Wisconsin stock have had, during the year, from the various diseases, which have been so destructive in some other portions of the country. In this particular, our state has for many years, been highly favored. Indeed it has never been visited by any of those sweeping epidemics, like the hog-cholera, murrain, pleuro-pneumonia, abortion in cows, the

Texas cattle disease, from which many of the other states have more or less suffered.

The conviction is yearly becoming more general among our farmers that there are definite principles of breeding, which it is necessary to understand and observe, in order to the best results; and the number correspondingly increases of such as are willing to make large expenditures and sacrifices, in order to insure to their flocks and herds the best conditions of success. So that, not only in fine-wool sheep—in which we have, for some time, held rank among the foremost of the wool producing states—but also in the quality of our horses and cattle, we are quite rapidly approaching the time, when the Wisconsin farmers will be able to show stock with even the foremost breeders in the older states. Our fairs, state and county, are doing much to advance this interest, by bringing the best animals to the notice of many communities, by encouraging the owners of valuable stock bred in the neighboring states to bring it among us, and by stimulating many spirited breeders to import even from foreign countries.

THE WOOL CLIP OF 1869

Was scarcely less than 40 per cent. short of the clip of 1868. Wisconsin was fast becoming a great wool-producing state; but, under the depressing influence of low prices, she has suddenly dropped to an ordinary position among the states not particularly distinguished in this branch of husbandry. This sudden revulsion is not wholly due, by any means, to the moderate prices of wool during the years 1868 and 1869—which at no time fell entirely below paying rates—but rather to the *extraordinary difference* between those prices and the prices of the few previous years. To have received the extravagant price of a dollar and more per pound, and to have been indulged in such enormous profits until his ideas, expenditures and investments had all become adjusted to it, and then be brought rapidly down to the old rates common before the war—this was more than the farmer was prepared for. He was first surprised, then provoked, and finally so disgusted that the first impulse was to sell off, or slaughter, his sheep and go out of the business. It is safe to predict that, after a time, when it comes to be realized that gold is no longer at 200 but only 115, and that everything is gradually adjusting itself to this change in values, a majority of those who have hastily abandoned wool-growing will return to it and again join their efforts with the more steady and consistent endeavors of others to develop the wool-producing resources of the state.

Whatever can be done by the law-making power to aid in this important work should be done. It is safe to say that better laws than those now in force for the protection of flocks from the ravages of dogs are capable of being framed and put in operation; and the opinion is becoming quite prevalent among substantial farmers largely engaged in the business, that a little show of statesmanship in this and other matters looking to the development of the state, should be exchanged for the narrow views, gross ignorance and silly trifling which too often manifest themselves on all occasions, when this important subject is brought to the attention of the legislature.

In 1868 Wisconsin had nearly 2,000,000 sheep, worth, at a low valuation, over $4,000,000—the seventh state in the union; Ohio, New York, Michigan, Pennsylvania, Indiana, Illinois and Iowa, alone out-ranking her. And it is certainly a matter of much moment that all measures calculated to promote this interest should receive the respectful and thoughtful consideration of every citizen placed by the popular vote in a position where it is so easy to retard or advance the prosperity of the commonwealth.

THE DAIRY BUSINESS

Has had a remarkable development during the past year, in consequence of the great interest awakened in the matter of establishing factories for the manufacture of cheese.

It is but recently that this system of cheese-making was first introduced. New York took the initiative, and there are now in that state alone between 700 and 800 large establishments engaged in the business—some of them consuming the milk of 1,000 cows. Many of the factories are owned and managed by one or a few individuals; others are managed by joint-stock companies; and still others are conducted on the mutual benefit or co-operative system—several farmers of a neighborhood sharing in the expense of establishing and conducting the factory.

This system of collecting the milk of a neighborhood and making up the cheese under the supervision and by the labor of comparatively few persons is not only vastly more economical than the individual method, but a much better quality is also the result. For, in such cases, great pains are taken to procure the most skillful and every way competent superintendents, as well as the best available operatives—a disposition constantly strengthened by the competition and emulation that naturally springs up between the various manufacturing establishments of the same county, district and state, and the ever-increasing importance to each of them of making its particular brand popular in the markets.

In view of the many advantages attaching to the factory system, it is rather surprising that it should not have been introduced long ago. It is only very recently that it has been introduced in Wisconsin; and yet there are already in operation scarcely less than 50 factories; many of them consuming the milk of 200 to 400, and at least one, (the Rosendale factory,) of 600 cows. Moreover, the number of such factories is constantly increasing, though not faster, either here or elsewhere in the country, it is believed by those best acquainted with the constantly growing demand for cheese of a good quality, than is consistent with the future profits of the business.

Hitherto, for some reason, but little attention has been given by these cheese-making companies to the manufacture of butter—an article certainly no less susceptible of successful and profitable manufacture under the co-operative or general factory system than cheese, and one the necessity for improvement in the quality of which is universally felt.

On this general subject of dairy products, and on the several branches of it, so much has been written and published of late, by men thoroughly acquainted with it from observation, study and actual experience, that I deem it better to quote them *verbatim* than to occupy space with a theoretical discussion of it from my own individual stand-point. Accordingly, in view of the great practical importance of the subject to our farmers and makers, I shall introduce, in their proper place in this volume, a considerable amount of matter thereon, drawing from the addresses and essays of men who are deemed high authority on the particular branches whereof they treat.

Strangely enough it has not been possible to gain accurate knowledge of the amount of cheese manufactured in Wisconsin during the year 1869, or even the total of receipts and shipments at our principal market, Milwaukee. Nor do I find any reliable estimate of the average product, per cow, of the several factories.

The increase in the amount of butter manufactured in the state may be gathered from the following figures, taken from the late report of the secretary of the chamber of commerce of Milwaukee:

Total receipts and shipments of butter, annually, for the past ten years.

Years.	Receipts.	Shipments.	Years.	Receipts.	Shipments.
1860......	889,025	814,316	1865......	1,200,381	1,263,740
1861......	484,358	637,700	1866......	1,711,217	1,318,318
1862......	1,106,966	1,238,406	1867......	623,589	371,717
1863......	852,596	986,826	1868......	1,408,153	623,882
1864......	1,386,317	1,749,755	1869......	2,554,454	1,928,971

Portions of Wisconsin are admirably adapted to the dairy business, and it is a matter of pride that a branch of husbandry so profitable should be making so good progress.

There seems but one objection to the present popular system, namely that it does not encourage the breeding of cows remarkable for the *quality* of their milk. For where the milk is paid for at so much the gallon, and the product of a whole neighborhood is brought together, *quantity* will be the chief consideration with those who sell.

This objection has less weight where cheese alone is considered; and when butter manufacture comes to assume the same importance in a co-operative way, some just means will doubtless be devised whereby quality may also be made a consideration.

So far as I have been able to learn, the question of *breed* has not yet received sufficient attention. It may therefore be again urged upon those who make it an important part of their operations to produce milk, whether special attention should not be given to the breeding with direct reference to the milk-producing qualities of their herds.

It has long been almost, if not universally, conceded that the Ayrshires are the best milkers of any; and yet I hardly know of a half-dozen animals of this breed in Wisconsin. If one wants milk, the main question is milk, not the amount of beef the cow will make when age renders her less fit for the dairy. The question is wholly one of profit. And if a cow remarkable for the quantity and quality of her milk will yield to the owner a larger total profit on the milk produced during her prime than an ordinary milker will yield him on both milk and beef, it is a clear case that the *milker* is the more profitable animal, all in all.

FRUIT GROWING.

Horticulture is still making good progress. New local societies for its encouragement are springing up all over the state. Their influence is no less marked upon the general advancement of fruit-growing than upon the localities where they exist. Whatsoever can be done by the state to encourage the formation of such societies, and to help them to a yet greater efficiency, ought by all means to be done—not doubtingly and grudgingly, but with assurance and a wise liberality.

The report of the State Horticultural Society, herewith included, deals so fully with this subject that I may properly confine my own remarks on behalf of the State Agricultural Society, within very narrow limits.

The relation between the two organizations continues to be of the most cordial character; and it is believed that, as they are devoted to interests indivisible, so they will each be actuated by a natural desire to perpetuate the harmony and good will by which their action has been governed in the past.

It is not unusual, in these days of a higher appreciation of the value of such organizations to the industry of the country, for the state governments to extend a helping hand to them in the form of moderate annual appropriations. And if such a policy be a wise one anywhere, surely it is so in a state and climate like ours, not only less than the most favorable to the success of horticulture, but really involving almost annual discouragements and failures.

THE MINING INTEREST.

But little that is new and peculiar to the past year can be said of the mining interest, except that the iron mines of Dodge county have received much additional attention, and are in the way of being developed to an extent not heretofore attempted.

But this exception, is one of great significance to the state, involving, as it does, three important facts, namely: (1) The discovery that the deposits of this ore are much more extensive than has been heretofore supposed; (2) that the ore itself is more valuable than was at first believed, indeed a very valuable ore; and (3) the fact that the requisite energy and capital so recently invested in the iron manufacturing industry, at Milwaukee, are beginning to make themselves felt in a marked degree upon the development of the mining interest.

The Dodge and Washington county ore—"Iron Ridge ore"—is known by most of our citizens as being what is called "seed" or "bog" ore, and as occurring in small flattened nodules, cemented together, but easily crumbling into an earthy condition on exposure and handling; which circumstance adds greatly to the facility with which it is taken from the mines.

Its mineralogical and chemical constitution is as follows, according to an analysis by Prof. Cassels:

Peroxide of iron, being—		
Iron	53.72	
Oxygen	23.00	
		76.76
Silica		10
Clay		4
Sesquioxide of manganese		1.05
Water		6.00
Loss		2.21
		100.00

From this, it appears, not only that the ore is rich in iron, but that it is to a remarkable degree wanting in that large proportion of silex which characterizes many other ores, and which makes the smelting of them so much more laborious and expensive. The ore in question requires on this account no other flux than the clay with which it is found mixed in the bed.

Owing to the peculiarities of composition, and the hardness of the iron it produced, the Dodge ore has been, until very lately, considered unavailable for some uses, and therefore limited in demand. Experiments with it, in connection with Lake Superior iron, have shown, however, that it is possessed of great value, both for the manufacture of steel—of which it produces an excellent quality in the proportion of one to two—and for the working into rails.

In the manufacture of iron rail for railways, experiment has shown that, by using the Superior iron for the body of the rail and the Dodge iron for the top, there is secured by this means, not only the requisite strength and toughness, but a surface that does not laminate and sliver up, as much of the railway iron does, but, on the contrary wears smooth and hard, like steel. This quality cannot fail to create a very great demand for this iron, when the manufacture of railway iron becomes a common thing in the west. Not only so, it will also create for it a demand, because of its availability for a multitude of other uses. Thus not only the Superior, but much of the Missouri, iron is too soft for either rails, merchant bar, or nails. By a proper mixture of that of Iron Ridge with them, it is possible to secure any degree of hardness desired. This quality is beginning to be appreciated even in Missouri, from which state there is already something of a demand for the Wisconsin ore, with prospect of a rapid increase.

The lead interest remains *in statu quo.* No new developments, and no new enterprises of great magnitude in process of inauguration.

The same is also true of zinc and copper.

There is a strong desire felt throughout the lead region, embracing the southeastern counties of the state, for a more thorough exploration of that section by a commission competent to throw additional light upon several questions bearing upon the future prospects of the mining interest. The reasons urged are weighty in character, and the state cannot properly much longer defer a full and fair cnsideration and just settlement of the question, whether it should do anything to encourage enterprise in this direction?*

MANUFACTURES

Have made rapid progress during the past year. The large establishments reported in the last volume of transactions have not only held their own but advanced by enlargement of their operations and the introduction of improved methods and machinery.

A few branches of this general industry demand special comment on these grounds.

The manufacture of lumber is believed by those who have given special attention to the growth of this business, to have been much greater during 1869 than reported by us in 1868, so much greater that an addition of 40 to 50 per cent. to the figures found in said report would still be under the true

* Since the foregoing was written, the State has authorized a topographicat, practical and statistical survey of the lead region. See law published in this volume.

estimate. Effort has been made by me to procure reliable statistics of this important branch of industry, for publication, but up to the hour of going to press all promises have failed.

WOOLEN FACTORIES IN WISCONSIN.

Woolen mills have multiplied until they now number over fifty. They are steadily improving also in the quality of their work. So true is this last remark that much of the cloth and other textile fabrics manufactured by them are coming into use where but lately only goods of foreign manufacture were worn. Shawls, afghans, &c., also, of most excellent quality, and of beauty unsurpassed by foreign-made articles of the same general class, are being made by some of our factories. The mills at Baraboo and Racine have been especially successful in this last-named branch of the business.

The Racine factory finds a steady demand, from a single house in Chicago, for all the shawls it can manufacture. They are fine in quality, of Turkish pattern, and unsurpassed for the beauty and richness of their coloring. Other factories may be engaged in this particular branch, but I have no absolute knowledge of the fact.

It is claimed by merchants who deal in goods of foreign manufacture, that the colors in home-made goods are not fast —a charge too well substantiated, I am sorry to say, in many cases, by the experience of those whose interest in home industry has encouraged them to put them on actual trial. Whether it be true of them in general I will not assume to say. But this I will say: Wisconsin manufacturers will find, in the end, that pains-taking in all matters pertaining to their business will alone enable them to establish themselves thoroughly in the confidence of the public. If they do not understand the art of dyeing, let them import dyers from the Old World.

The following list, kindly furnished by Mr. James W. Hutchinson, of Appleton, secretary of the Wisconsin Woolen Manufacturers' Association, contains the names and location of a large majority of them. The names of the remainder have not yet been furnished:

List of woolen factories and roll-carding machines in Wisconsin.

Location.	Name and discription of factory.	Proprietors.	No. sets of cards.
Appleton	Apppleton Woolen Fac.	Hutchman, Fay&Ballad.	2
Barraboo	Island Woolen Mills	Drown & Co	2
Barraboo	Manchester..do	John Dean & Co	1
Beaver Dam	Farmers'.....do	Chandler, Condon & Co	2
Beaver Dam		J. McFetridge & Co	1
Beloit		Aldridge & Knowls	1
Broomfield	Roll Cards	Nathan Hamron	..
Brandon	...do	Seunows & Jackson	..
Burlington	Burlington W. Mills	Lawton & Perkins	1
Cambria		D. H. Roberts	1
Cambridge		Geo. Dow & Sons	1
Cedar Creek	Roll Card	August Palser	..
Cedarburg		Hilgon & Willenbury	2
Dartford		E. Quick	1
Delton	Roll Card	J. Adams	..
Durand	...do	W. W. Darwin	..
Fond du Lac	Empire Woolen Mills	G.W. Carpenter & Sons	1
Fond du Lac	Roll Card	Thos. Flood	..
Geneva	Geneva Woolen Co		1
Harrisville		C. F. & A. W. Fuller	..
Janesville		Kayne, Hastings & Co	2
Janesville		F. A. Wheeler & Sons	1
Jefferson	Jefferson W. Man. Co		1
La Crosse	Roll Card	F. Blaschick	..
Madison		Thornton, Griffiin & Co	1
Manitowoc		J. Vilas & Co	1
Manitowoc Rapids	Roll Cards	Vierce & Pliny	..
Menasha		Chapman & Co	1
Milwaukee		Maas & Rice	1
Milwaukee		Esche & Co	1
Monticello	Monticello Manufac. Co		1
Neosho	Roll Cards		..
Neshkora		Wells & Scobie	1
Platteville	Roll Cards	J. M. Smith	..
Platteville		Bass & Nye	1
Plymouth	Roll Card	H. Jones	..
Poysippi		R. D. Moon	..
Prattsville	Roll Card	H. D. Nye	..
Racine	Racine Woolen Mills	Blake & Co	2
Richland Center	Roll Card	Dr. Brisner	..
Sheboygan Falls		Buckner & Heald	1
Sheboygan Falls		Hills & Clark	1
Sparta	Sparta Woolen Mills	Tylor & Co	1
Towerville		F. W. Tower	1
Watertown		D. Jones & Co	1
Waukesha	Waukesha Manufac. Co		1
Waupaca		Dayton, Dewey & Co	1

I am informed by Mr. Hutchinson that the woolen mills of the state will average about 400 spindles each—some 24,000 spindles in all—and 25 operatives, half male and half female.

Another noticable feature, in the progress of our manufacturing industry, is

THE MANUFACTURE OF ZINC OXIDE.

This branch of industry has been carried on for some time at Bellevue, near mineral Point. For a time metallic zinc or spelter was also manufactured there, but this branch of the business has been wholly transferred within the year, to La Salle, Illinois, at which point it has been carried on upon a considerable scale for some years.

The Bellevue works are owned and managed by the New York Zinc Manufacturing Company. The white oxide or "zinc white," as it is sometimes called, has steadily improved in quality, until it is now believed to equal the best in the market.

When it is considered that the ore from which is made this beautiful product, so useful in the arts, was for a long time thrown out of the lead mines of the Mineral Point region as useless, and kicked about as so much rubbish, or at the best used for filling mud-holes on the highway, the importance of the Bellevue enterprise will be the better appreciated. I have not been able to secure reliable statistics as to the actual amount of the oxide manufactured done, but have judged from observation of the works in the absence of the superintendent, the number of men employed, and the quantities of ore and oxide in and about there, that the company is doing a quite large and successful business.

But the most remarkable advance made by any branch of our manufacturing industry has been in the department of metallurgy. Reference is especially made to the development of the iron-manufacturing interest, under the energetic management of

THE MILWAUKEE IRON COMPANY,

To whose initiatory movements allusion was made in my last report. In laying before you and the people of the state a fuller account of this company's operations, I can hardly do better than to quote, at some length, the following from a carefully prepared article by the editor of the *Bureau*, of Chicago, a journal devoted to the commercial and manufacturing interests of the northwest:

"The Milwaukee Iron Company was chartered by the legislature of Wisconsin in January, 1866, and was organized shortly after; the plans for the works being made by the engineer of the company, Mr. Wm. F. Durfee, and Mr. O. W. Potter, superintendent of the Chicago rolling mills. * *

"The site was chosen at Bay View, 114 acres of land purchased, and work commenced in June of the same year. It progressed slowly the first twelve months, owing to the burning of the Chicago rolling mill, which had to be immediately re-built, and not until March 1868 were the mills completed. The reasons for selecting this location, were: its cheapness (having been purchased for a trifle over $100 per acre); its contiguity to water navigation; the Milwaukee and Chicago railroad running through it, dividing it into nearly equal portions; the fact that here could be made homes for the men, keeping them close about the managers; and that the site outside the city limits would avoid the excessive city taxes. The portion east of the railroad was divided into streets and lots, the latter being 50 x 150 feet. These are sold to the men at low rates and on long time, the object not being to speculate in real estate, but to induce good and skilled men to settle here. In June, 1866, there was but one house on the whole location. There are now 43 comfortable cottages belonging to the company, and 25 houses of various kinds, belonging to the workmen, who have bought lots and built. Many of these are neat, and display much taste. Amid the group, there is a beautiful little church, worth $4,000, and a brick school-house, capable of accommodating 180 scholars; also, two stores. There is but *one* restriction placed upon the sale of the lots—in that there shall be no intoxicating liquor of any kind made or sold on the premises.

"In 1866, a fine pier was built into Milwukee bay, where all the coal for the works is landed. The rolling mill is one of the very best in the United States, all the latest and valuable improvements in such things having been introduced. This building is 180x211 feet, covered with an arched self-supporting roof. The main engine for driving the 'rail train' is 44x44 inches in steam cylinder, and was built by the Corliss Steam Engine Company, of Providence, R. I. There are seven other engines in the mill, for various purposes. Steam for all these is supplied by nine boilers, placed immediately in the rear of the furnaces, which are fired by the waste heat, after doing its duty on the iron. This mill is capable of making 25,000 tons (250 miles) of finished rails per annum.

"The first bar of iron ever rolled in Wisconsin, was in this mill, March 8th, 1868. When it began business, it was to be confined to 're-rolling' old rails—that is, making new rails out of old ones, with the addition of a certain percentage of new iron. The old rails are cut into four feet lengths, piled, heated and rolled into bars 8x1 inches. These bars are again cut into four feet lengths, piled, heated and rolled into rails. On the top of the 'rail pile,' however, is placed a slab of new puddled iron, one and a half inches thick. When rolled, this slab comes on the *head* of the rail and presents a very hard and durable wearing surface. This head piece is made of four-fifth Iron Ridge and one-fifth Lake Superior iron. The Iron Ridge iron is rather too hard, and the Lake Superior iron is altogether too soft and lead-like for use alone. By mixing the two as above, a very hard, homogeneous and *close* iron is the result, and for the wearing surface of rails is unequaled by any iron known in the country. One of the greatest advantages of the Iron Ridge iron is its *easy weldability*. It will stand a high heat, without injury to the iron, being *cold short*, and can be perfectly welded. Perhaps the greatest reason why so many poor iron rails are made, is to be found in the fact that they are made from *red short* iron, which, when heated, will drop to pieces before becoming hot enough to weld. Especially is this the case with cheap English and *all* the Welsh iron. Thousands of miles of American roads are laid with the cheap, cindry, red short iron made 'for sale,' and merely stuck together, but by no means welded. Such rails are not used on English roads, but sold to us because they are *cheap.* It is by such rubbish as this, that iron rails as a class are judged, by those who would make us believe that solid steel or steel-headed rails are alone worth using. In 1868, some cheap English rails were laid in the St. Paul track, and in three months some of them were in the mill to be re-rolled, while rails from the Milwaukee mill, after one and a half years' wear in the same place, are now as perfect, to all appearance, as on the day when they were put down. This is the difference between good and bad iron rails.

"The business of re-rolling is, of course, limited by the supply of old rails, and it would be some years before the supply would be sufficient to give the works enough to do. As the peculiar and valuable qualities of the Iron Ridge ore became known, and its extent and importance appreciated, it was thought that pig iron from it and the Lake Superior ore could be made in Milwaukee cheap enough to work it up into *rails* and pay a fair profit. If this could be done, a business of vast extent could be built up. The first step was, of course, the purchase of the property of the Swedes Iron Company, known as Iron Ridge. This was done in June, 1869, jointly with the Chicago and Wyandotte mills, by E. B. Ward, of Detroit. * * * The stock of this company was increased from $350,000 to $800,000, and work commenced at once. To use the ore, blast furnaces must be built. Arrangements were soon concluded with Mr. John Player (Mr. P. is the inventor of Player's hot-blast stove, and the builder of many of the best furnaces in England and on the continent), to design and construct two furnaces in Milwaukee, capable of making 40 tons of pig iron daily, each. The work has been carried on very rapidly, and in March, 1870, one of them will be ready for use. The second one will be finished during the coming summer. These furnaces are larger than any at present in blast in the country, and will be, it is confidently believed, second to none in the world, as regards convenience, rapidity, good work, and economy of fuel. Few people, not intimately acquainted with such things, know the herculean task it is to build one. A few dimensions may give a better idea. The furnace, where the smelting is done, is 17 feet in diameter at the boshes, and 66 feet high, containing over 9,600 cubic feet. When running, this will be kept constantly full of ore and coal. The engine for blowing air into this mass of materials is of the size of that of a large steamship. The steam is made with six boilers, 60 feet long each, which are fired with the waste gases from the furnace, thus caught and utilized. The smoke-stack is 140 feet high, 24 feet square at the base outside, and 8 feet in internal diameter all the way up. The hoist for taking up coal, ore, etc., is worked by a separate engine of forty-horse power. The weight of air blown into the furnace daily, is greater than that of all other materials. The blowing engine, of course blows cold air, which by the hot-blast stove is heated to at least 1,000 degrees before going into the furnace, thus saving at least one and a half tons of coal per ton of iron, over the old way. The blowing engine is making by Robinson, Rae & Co., of Pittsburgh; the cast iron work aside from engine, by E. P. Allis & Co., of Milwaukee. This work would do credit to the oldest shop in the country. The sheet iron and boiler work by R. Davis, of Milwaukee; the iron roofs by F. Letz & Son, of Chicago. Much of the work is done in the shops of the company at Bay View. To use the pig iron to be made next year, a much larger puddle mill will be necessary, the walls of which are now up. This building is 166x82 feet, and will contain sixteen new puddling furnaces and will be entirely fire proof. The company have a machine shop, where all repairs to machinery and roll turning are done. Over this is the carpenter and pattern shop, containing wood-working machinery, patterns, etc. In rear of this, on the first floor, is the blacksmith shop, supplied with one of Morrison's steam hammers. All machinery in this building is driven by a twenty-horse power engine, built by the Bay State Manufacturing Company of Milwaukee.

"When the furnaces now commenced are completed, the money actually laid out on the original purchase of 114 acres will reach fully one million of dollars. This is so much *richness* added to the soil. * * * * * *

"This is what the company is doing for itself. What is it doing for others? The farms adjoining the property could not have been sold for $100 per acre in 1866. Within a radius of one-half mile from the mills, land was worth on an average $80 per acre. Now the same land sells readily at from $250 to $300 per acre. The company have paid out since May 1st, 1869, fully $22,000 per month for labor alone. This money is spent by the workmen for land, houses, rent, provisions, clothing, etc. A good deal is deposited in savings and other banks, thus adding largely to the local capital of this section. Every branch of business is benefited by this outlay.

"Of the 300 men in the employ of this company, there are but 22 Americans. The balance are English, Welsh, Germans, and a few Irish. A large share of those skilled in the iron business are English and Welsh; many of them middle aged men who have spent their lives in iron works in England. * * * * * * * *

"The advantages of Milwaukee for the manufacture of iron are several:

"1. Cheap iron ore. The ore of Iron Ridge can be delivered here cheaper than at any other point. Cheaper indeed than ore can be put down at any furnace in the country. The ore of Lake Superior can be delivered here *via* Escanaba, at a lower rate of freight than it can at any other point. By mixing these ores in various proportions, iron suitable for any purpose can be made.

"2. The bituminous coals of Pennsylvania and Ohio can be delivered here at a cost for freight of $1.25 per ton the season through. The anthracite coal so largely sold in Buffalo, at 50 cents per ton freight from Buffalo, and vessels are often willing to bring it freight free, wanting it for ballast. As heating and puddling furnaces for using inferior bituminous coal become improved, there is no doubt but the coal found in Illinois in such vast quantities can be very extensively used; that can be delivered here at a price not exceeding 75 cents per ton above its cost in Chicago. Looking the subject of fuel all over therefore, it is easy to see that in her cheap iron ore Milwaukee possesses advantages which will more than doubly offset her disadvantages in the item of fuel.

"3. From the ores so cheaply obtained at Milwaukee, iron suitable for any purpose can be made. Pure Lake Superior iron, it is well known, although exceedingly tough and fibrous, is far too soft and lead-like for many purposes. Especially is this the case for the heads, or wearing surfaces, of *rails*. For *nails*, also, pure Lake Superior cannot be used—they have not sufficient stiffness to drive in hard wood. By mixing the two ores in proper proportions, iron suitable for rails, merchant bar, nails, or any other purpose, can be made. It is well known to iron men that the Missouri ores make a *red short* iron—that is, an iron which will not stand sufficient heat to weld perfectly, or to roll into thin sections; such as angle iron, T iron, etc. It has been proven that the best iron yet discovered to render the Missouri iron neutral and weldable, and to make it stand a high degree of heat without injury, is the Iron Ridge iron. Messrs. Schoton, Harrison and Valle, are now buying all the Iron Ridge pig iron they can get for this purpose. The only trouble is, enough is not yet made. As the iron interests of Missouri are developed, this must make a large market for the Iron Ridge iron.

"4. As a distributing point for the product of the furnace and rolling mill, Milwaukee has no superior. A glance at the map will satisfy any person of this. In this respect she possesses an advantage of from five to seven dollars per ton over Johnstown, Brady's Bend, or any of the eastern mills which look to the west for a market.

"5. Land is cheap and abundant. Food is cheap as any point in the land. A more healthful place cannot be found. Here, consequently, the mechanic and laboring man can easily get *homes*, and achieve that independence which is difficult in many of the eastern cities, and next to impossible in England. By these means the company find it easy to get the most skillful, sober and industrious men. * * * *

"Will steel rails soon drive iron rails out of the market? This is a question in which manufacturers are vitally interested. There is not a doubt that steel, as a wearing surface for rails, is the best material known. It is also an undeniable fact, that good iron rails of a section proportioned to the heavy locomotives and heavy traffic of to-day, never *break in cold weather*, and in this respect are very much safer than steel. The St. Paul road procured 200 tons of Bessemer steel rails, from England, in 1868. Some of them were laid in their yard where the work is very severe, but where the trains run slowly; and they answer exceedingly well. Some of them were laid in the main track, a few miles from Milwaukee. At each end of the steel-laid track, the word '*slow*' is displayed, to warn engineers of danger. Why is this? Some of them have *broken*, and they dare not run fast over them. Some of these rails are exceedingly tough and bend readily, while others will snap off like glass before bending enough for a track of 350 feet radius. Of the 56,000 rails furnished the St Paul road, by the Milwaukee Iron Company, *not one* has broken in the track, and only *nine* have been returned to the mills as defective. Good iron rails can now be furnished at Milwaukee for $83 per ton, currency. Their average life in Wisconsin is not less than ten years. The solid steel rails have not, as yet, been put down there for $100 per ton, gold. There is much doubt if their production can be very much cheapened, even in this country. The Bessemer process demands iron entirely free from sulphur and phosphorus. Very little iron, and that of the highest price, is suitable for Bessemer steel. Besides this fact, the cost for plant is enormous, the waste very great, and the product very uncertain in quality. In addition to this, it is well known that Mr. Bessemer is about the only one who has, as yet, made much money out of the Bessemer process. We will, however, call the price of

Bessemer steel rails in Milwaukee, $110 in currency. Computing compound interest on this amount for ten years, at 8 per cent. per annum, a ton of Bessemer rails would cost $237.38. A ton of iron rails, the first cost of which is $83, would cost in the same time $179.11, a difference at the end of ten years of $58.27 per ton. This is more than sufficient to re-roll and re-lay the iron rails at the end of ten years. Indeed, this difference of interest would re-roll the iron rails every seven years.

"In view of these facts, are the western roads soon to throw away their iron rails and adopt steel? It does not need a sage to answer. The iron rails in the states of Indiana, Illinois, Wisconsin, Iowa and Minnesota, are worth not less than $60,000,000. This sum is being largely increased yearly, by the building of new roads. The cost of building roads, as cheaply as they can be built, is so very great that it is difficult to raise money to build them. Double the price of *rails* and the task would be next to impossible. The day when solid steel rails shall be largely used in the west, is *not yet.* The man who shall discover how to make an iron rail with a steel head perfectly welded thereon, will solve one of the most important problems known to metallurgy. The difficulty hitherto has been, that the steel and iron requiring different degrees of heat to weld properly, cannot be heated in the same furnace without either overheating the steel or underheating the iron, so that a perfect weld is impossible. Progress in this problem is no doubt being made, both in this country and Europe, and we believe in its final successful solution. When the time comes for making steel-headed rails, this company will be ready for the task.

"Present success, however, lies in making *good iron* rails and for these the railroads should be willing to pay a fair price. With soft and very malleable iron in the heads, good and durable rails cannot be made. Much of the iron in use in England, Wales, and elsewhere, as we have stated, is of this character. And we would re-affirm, as our opinion, that the discovery of the ore at Iron Ridge commences a new era in the manufacture of railroad iron. We know not the iron anywhere that is its equal for this purpose. For the reasons given in the present and previous discussions of this subject in our columns, it is our belief also, that better and more economical rails for general use than those of steel manufacture ever, can be, yes, are being made, by The Iron Rolling Mill Company of Milwaukee."

THE COMMERCIAL DEVELOPMENT OF THE STATE

Has been very considerable during the year past, owing to the large increase in the number and capacity of the manufacturing establishments, of various kinds, the improvement of harbors, and the important additions, made and initiated, to our facilities for transportation.

Perhaps it can hardly be said that Wisconsin had, until very recently, been backward and wanting in sagacity and foresight in providing for this great interest; indeed I do not think she had, in view of her recent organization and actual accomplishment. But during the past year or two, there has been so profound and universal an awakening upon the subject of internal improvements, so much actual accomplishment of very important results, and so much work in the way of planning and inaugurating new enterprises looking to the future greatness and power of the state, that one, for the moment, thinks of the past as slow and improvident.

It was my desire to be able to present, in this report, a full showing of the actual amount of general commercial business done during the year 1869, not only by the lake ports, but by the larger inland towns. Up to this moment, however, my urgent applications to the proper authorities, have not secured the required information. Of all the ports, Milwaukee has alone responded.

But Milwaukee is so metropolitan to the other cities and towns of the state, and does so large a proportion of its general commercial business, that statistics of, and bearing upon, its commerce convey a just idea of the commercial prosperity of the whole state. That she is not the universally recognized heart of our whole arterial and venous system of trade—is a reproach to that spirit of local selfishness, jealousy, and ill-founded pride, by which so many of the relations of association with her have been characterized in the past.

To our mind, the question of adopting such a policy as shall tend to make Milwaukee a great and powerful commercial centre is by no means a narrow and local one, looking to the aggrandizement of Milwaukee, and of her alone, at the expense of all other localities, as many seem to suppose. On the contrary, it is a question of whether Wisconsin, with her vast and various resources—her fertile lands, forests, mines, water powers, and almost unequaled natural advantages for a vast commercial industry—shall be a province, a mere satrapy, paying tribute to other powers, or a great and independent state. It is a question, therefore, in the affirmative decision of which, not only every locality, but every individual citizen has an interest—a question in the discussion of which all partial views, local prejudices, and that blind selfishness which always ultimately defeats itself, must give place, and at an early day, to a broad and enlightened statesmanship.

In reporting details of the commercial condition and progress of Milwaukee, I shall draw freely from the valuable report of the secretary of the chamber of commerce; many of the facts presented in which are of sufficient importance to warrant their incorporation.

COMMERCE OF MILWAUKEE.

"The records of the commerce of Milwaukee, for the year 1869, as far as accessible to the public, show a large increase in the general volume of business, compared with preceding years, and while this is to be accounted for by the rapid development of the country west of us, the continual extension of our railroad communications, and the bounteous yield of our staple productions, there is no disguising the fact that the past year has been a season of unusual depression in commercial circles, and that here, as elsewhere throughout the country, the mercantile and commercial classes have experienced serious reverses. The general stringency in financial affairs, was greatly aggravated in the producing regions by the great depreciation in breadstuffs, without any corresponding reduction in the cost of production, and, next to the tillers of the soil, this was most seriously felt by the wholesale merchants, whose country customers were obliged to curtail their business, and in many instances, unable to meet their obligations in consequence of the unwillingness of the farmers to sell their product at the extremely low prices prevailing.

"It is suggestive to contemplate the enormous extent of the commerce of our city, even during a period of such general commercial prostration as the past year has been; one is bewildered in attempting to estimate to what demensions the commerce and general business of this city may grow in future years when the resources of the vast fertile regions west and north of us shall be more fully developed. * * *

"The total receipts of grain at Milwaukee, in 1869, were 19,407,054 bushels, of which 17,745,238 bushels were wheat. The receipts of flour were 807,763 barrels, and the amount manufactured in the city, 481,511 barrels; total 1,289,274 barrels. The shipments of wheat from this city to Eastern and Canadian markets, during the year, amounted to 14,272,-799 bushels, and of flour, to 1,220,058 barrels.

"As there is a general impression that Chicago handled more wheat than Milwaukee, in 1870, the following comparison, from official sources, will settle that quesion:

	RECEIPTS WHEAT.	SHIPMENTS WHEAT.
	Bushels.	Bushels.
Milwaukee	17,742,238	14,272,799
Chicago	16,876,760	13,244,249
	868,478	1,028,550

"It will therefore be seen that Milwaukee received 868,478 bushels more, and shipped 1,028,550 bushels more wheat than Chicago, in 1869. But the amount claimed as receipts at Chicago, includes 312,515 bushels shipped from this city by rail in the early part of the year, to eastern points via Chicago. If we deduct this from the receipts at Chicago, it will be seen that Milwaukee is 1,180,993 bushels ahead on receipts.

"The total number of hogs packed at this city, during the season just closed, was 175,000 against 133,244 the previous season. For receipts and shipments of cattle, provisions, hides, lumber, wool and other productions, we refer to the appropriate tables.

"The total quantity of eastern and foreign merchandise carried to Milwaukee, in 1869, by railroads and lake steamers, exclusive of railroad iron, pig iron, salt, plaster and other articles of course freight, was 111,256 tons, against 94,468 tons in 1868.

"In extent of marine commerce, Milwaukee ranks as the fourth city in the Union. The number of entries at the custom house during the year, was 4,878, with a total tonnage of 1,974,119 tons, and clearances 4,877, representing an aggregate tonnage of 1,938,414 tons."

INCREASE OF COMMERCIAL FACILITIES—HARBOR IMPROVEMENTS AT MILWAUKEE.

"Accompanying this report, in connection with a map of our railroad system, will be found a diagram of the harbor of Milwaukee, showing the slips, canals and dock extensions now in progress, and known as the Menomonee and Kinnickinick improvements, and constituting what is admitted by all authorities to be the best and most commodious inland harbor on the continent.

"The 'straight cut' entrance shown in the diagram, 260 feet wide, 1,376 feet long, with a depth of 13 to 17 feet of water, and constructed by the city at an expense of $380,000, has proved to be all that its projectors claimed for it, an improvement of permanent character, affording ingress to the harbor at all times with perfect safety, either by sail or steam, and effectually preventing the formation of ice during the winter months in the Milwaukee river for a distance of a half a mile from its mouth. To protect the channel of the 'straight cut from the formation of sand bars, the two piers have recently been extended 250 feet beyond the light house. The fact that scarcely a day has passed during the present winter that there have not been arrivals and departures of steamers plying between this port and Grand Haven, illustrates very strongly the accessible character of the harbor of Milwaukee.

"Adjacent to the entrance of the harbor, southward, extends the magnificent Kinnickinick basin, a sheet of water upwards of a mile in length, and varying from a quarter to three-quarters of a mile wide. The depth of water in this basin varies from four to fourteen feet, and its bottom is composed of soft black mud or muck, easily dredged or excavated. Efforts were made some years ago, to induce the government to appropriate this basin for a naval depot, and although these efforts were not successful, it is pretty certain that in case the interests of the nation require the establishment of a naval depot upon the lakes, here will be its location. But in any event, it is of the first importance to the interests of commerce that this splendid basin should ever be preserved for the purpose for which nature so admirably designed it, that of a harbor of refuge. A good share of this basin is platted off upon the city map in lots that are owned by individuals or corporations, but it can not very well be of any practical use, except for the purposes of navigation, and should congress make any provision for its improvement in the interests of navigation and commerce, there is little doubt but that the city, and other parties interested, would willingly relinquish any titles or claims they may have upon it as private property.

"The Milwaukee Iron Company have recently purchased the strip of land on the east side of the basin, from the point indicated as the mouth of the old harbor, southward along the lake shore to the rolling mill and blast furnaces, and are engaged in dredging a deep channel from the old river bed to their new property, where they propose to construct a thousand feet of dock line for shipping purposes, and connect the same by rail with their works at Bay View.

"The Wisconsin Leather Company are also constructing extensive dock lines east of the railroad track, and the city is dredging the channel of Kinnickinick creek to a sufficient depth to make it safely navigable.

"The Menomonee marsh, hitherto an almost totally useless and unsightly waste, in the heart of the city, is undergoing a wonderful transformation under the magic influence of commerce, and where only two years ago nothing was to be seen but the sluggish water and tall grass of the swamp, are now broad and deep canals extending in all directions, with spacious docks intersecting each other, and in connection with the other dock extensions in progress, forming a grand system of interior wharfage unsurpassed by that of any other port upon the lakes or the sea. Many of these improvements extend beyond the limits of our diagram, as, for instance, the bayou above Cherry street bridge, which has been dredged and docked on both sides a distance of several thousand feet; also the canals extending westward through the Menomonee marsh beyond the slaughter houses. The extent of new docks actually constructed during the past season, was in the neighborhood of ten thousand feet, and together with those now under way will give our city before the close of 1870, something like *eight miles* of dock line.

"The following letter from Col. J. B. Wheeler, U. S. engineer and superintendent of harbor improvements, gives an accurate description of the 'straight cut,' and what the goverment has done and is doing to improve the same:

"MILWAUKEE, Wis., Feb. 3d, 1870.

"Mr. WM. J. LANGSON,
"*Sec. Chamber of Commerce, Milwaukee, Wis.*

"DEAR SIR—I have received your letter of Feb. 1st, and in reply to it, state the following facts:

"The length of the north 'straight cut' pier is...............	1,374 feet.
"The length of the south pier is...............................	1,376 "
"The width between the piers is...............................	260 "

"The foregoing lengths include the 403 feet of pier-work built during 1868 and 1869, under my superintendence.

"From a survey made on the 7th of Dec., 1869, under my direction, the least depth of water in the channel over the outer bar, was 13 feet. You can safely rely on a greater depth in the spring.

"The government has appropriated and assigned to the improvement of this harbor, since 1866, the sum of eighty-four thousand and two hundred and eighty-three dollars and fifty-one cents, of which there remains unexpended, something over twenty thousand (20,000) dollars.

"I have asked for the additional sum of $54,000. This amount added to that on hand, will enable me to add 200 feet more of pier, carrying the extremities of each pier beyond the outer bar, and to make such repairs on the old work as may become necessary.

"The light-house was built before I assumed charge, and I am therefore unable to give you the cost or amount appropriated. This particular information you can obtain from my predecessor, Gen. W. F. Reynolds, L. H. Engineer, Detroit, Michigan.

"The area of the Kinnickinick basin covered with water east of railroad bridge, including the old river, is about 145 acres in extent. A cut from 8 to 10 feet deep, and about 200 feet wide has been made leading to the bridge. Outside of this cut the water is about four feet deep.

"The area west of the bridge is about 125 acres in extent and the same depth of water. A cut has been made on this side, but its dimensions, etc., I do not know. That portion of the basin east of the railroad bridge, forms an important element in the harbor facilities and privileges of this city, and I feel surprised at the delay on the part of the city in not improving it. Certainly, past experience has shown the advantages belonging to Milwaukee as a harbor of refuge, and the entire blocking up of the straight cut by vessels running in here seeking shelter. As commerce increases, the imperative necessity of the improvement of this basin will be evident, and it is only a question of time concerning its improvement.

"I am sir, very respectfully, your very obedient servant,

J. B. WHEELER,
Major of Engineers and B't Col."

THE NEW STOCK YARDS AT MILWAUKEE.

"A much needed improvement has been made during the past year by the Milwaukee and St. Paul Railway Company, in constructing new and very complete stock yards at a point accessible to all the railroads entering the city. The new yards are located upon the south side of the Menomonee flats, about one mile west of the union depot, a point where all the railroads entering the city from the west unite. The facilities for receiving, shipping and yarding stock here are very good, and will be increased from time to time to any extent required, as the railroad company own a large tract of land adjoining the present yards. Already it is found that more room is wanted, and important extensions of the pens will be made the coming spring. The present area covered by that portion of the yards that is completed is between four and five acres. The pens (completed and under way) will hold two thousand head of cattle or about twenty thousand hogs. Fourteen cars can be unloaded or loaded at the same time. At the old yards but one car at a time could unload. Two wide passages or streets extend the whole length of the yards, intersected by shorter avenues, dividing the pens into sections which are designated as 'Section A,' 'Section B,' and so on. The pens, of which sixty-two are now in use, are numbered in regular order and the number of each conspicuously inscribed upon its entrance. The arrangements for weighing, watering and feeding stock are very complete. The yards are supplied with an abundance of pure water from a large reservoir on an adjacent eminence, which is fed from the Menomonee river by means of a pump worked by a wind-mill.

"One of the canals in process of being dug out through the Menomonee bottom reaches these yards so that stock can be shipped either by rail or water with equal convenience. The company are constructing a broad planked avenue parallel with the line of the railroad track leading from the yards to the slaughter houses, about half a mile distant. These yards, so perfect in all of their arrangements, have been constructed with great economy, the whole of the expense of the work thus far done amounting to only about $28,000.

"By an arrangement between the railway companies, live stock may now be shipped from any point on the lines of the Chicago and Northwestern Railway to this market, and if not sold here may be re-shipped to Chicago without any additional expense. Parties shipping live stock from any points west or north of this city to Chicago have the privilege of unloading, feeding and resting here with no additional expense except for fodder consumed.

"This liberal and judicious arrangement on the part of the Milwaukee and St. Paul Railway Company will not only prove a great convenience to shippers of live stock, but also a decided advantage to the packers and stock dealers of this city.

"Mr. E. W. Edgerton, superintendent of the new stock yards, reports receipts from the date the yards were opened, October 26th to the 31st of December, of 4,125 head of cattle, 47,981 hogs and 1,677 sheep."

Nor have the plans of Milwaukee, at length fairly aroused to the importance of more vigorous measures for insuring to herself the full amount of trade that naturally belongs to her, been confined to the extensive and valuable improvements above-named. Railroad enterprises of great magnitude and far-reaching in their influence upon her own destiny and the future of the whole state, have been inaugurated and pushed with commendable vigor. The most important of these I deem it proper to recite, drawing again for accurate information from the report of the chamber of commerce:

RAILROAD IMPROVEMENTS LOOKING TO A FURTHER CENTRALIZATION OF COMMERCIAL INFLUENCE AT MILWAUKEE.

"*The Milwaukee and St. Paul Railway Company.*—This great corporation, of which our distinguished fellow citizen, Alexander Mitchell is president, now owns and operates 936 miles of railway extending westward from the city of Milwaukee, and known as the Milwaukee and St. Paul Railway. The enterprising spirit that has characterized the company since its first organization, has at no time been more conspicuously illustrated than in the character of the improvements and extensions made upon its lines during the past year. And while these improvements and extensions have been liberal, involving an out-lay of $1,255,000, they were eminently judicious, and will certainly contribute materially to the future prosperity of the company. In a little more than a year they have added 111 miles of new road to their lines, the greater portion of which was upon the extension of their Dakota division, through the great wheat district of norterh Iowa. The company are pushing this line forward without interruption, and by next harvest expect to have it completed to Algona, fifty miles beyond its present terminus, and 160 miles west of Prairie du Chien, and before the close of 1871 to Yankton, on the Missouri river, 493 miles west of Milwaukee. This will undoubtedly be the first railroad line to reach the borders of Dakota, and from its location, will necessarily become the main channel of travel and traffic between that state and the east. Every mile of this road penetrates a region of unsurpassed fertility, the resourccs of which are yet comparatively untouched.

"The Milwaukee and St. Paul Company have also built two connecting links at this end of their roads, of great importance in facilitating the transportation of both freight and passengers. The one from Sun Prairie to Madison, twelve miles, shortens the distance fifteen miles and gives them an almost air line from Milwaukee to Prairie du Chien. The other connecting branch just outside the city limits, between the northern and Prairie du Chien divisions, by which the cartage of freight from the northern division through the city is avoided, and all passenger trains enabled to depart from, and arrive at a common depot. The unnecessary expense of a separate depot for the northern division is also saved by the building of this connecting piece of road, five miles in length. Any of the company's grain elevators may be reached by all of these roads, and the stock yards are made equally accessible as the union depot, while through eastern freight, from any point within range of these lines can go forward *via.* Chicago without breaking bulk. The company are also building a branch road from Eagle, thirty-six miles west of Milwaukee, to Elkhorn, a distance of fourteen miles, by which they will secure an unbroken connection over the Western Union Railroad with Savanna, Fulton and Rock Island.

"The various lines owned by the Milwaukee and St. Paul Railroad Company, and now in operation, are as follows:

	Miles.
Milwaukee to St. Paul via Prairie du Chien	405
Milwaukee to La Crosse via Watertown	196
Milwaukee to Portage via Horicon	95
Horicon to Berlin and Winneconne	58
Watertown to Madison	37
Milton to Monroe	42
Calmer to Clear Lake	84
Conover to Decorah	10
Mendota to Minneapolis	9
Grand Total	936

"In addition to these roads owned by the Milwaukee and St. Paul Company, there are in the state of Minnesota 700 miles of completed railway directly tributary to their lines, which is constantly and rapidly extending. The St. Paul and Pacific, completed 247 miles; the Lake Superior and Mississippi, 77 miles; the St. Paul and Sioux City, 107 miles; the Hastings and Dakota, 30 miles; St. Paul and Chicago, 20 miles, and 50 miles of the Southern Minnesota, are feeders of the main line of the Milwaukee and St. Paul Railway. It is understood that arrangements have been made to complete the eastern connection of the Winona and St. Peter Railroad to La Crosse during the present year, which will be equivalent to adding 150 miles to the La Crosse division of the Milwaukee and St. Paul Railway. The West Wisconsin Railroad, in operation between Tomah and Augusta, 66 miles, is also an important feeder to this line. Also 50 miles of the Southern Minnesota Railroad, in operation between La Crescent, opposite La Crosse and Lanesboro. The gap between the two sections of this road from Lanesboro to Ramsey, three miles west of Austin, where it intersects the main line of the Milwaukee and St. Paul Railway, a distance of about 40 miles, will be built the present year, thus opening an unbroken line of 130 miles of road, extending westward from La Crescent.

"One of the most needed improvements made by the Milwaukee and St. Paul Railway Company during the past year, was the construction of new and capacious stock yards in this city, accessible to all railroads entering the city, with sufficient grounds adjoining to enlarge them to any possibly required extent. Upon this work the company expended $28,000.

"Among the early and necessary improvements contemplated by the company is the erection of a large union passenger depot in this city. It is a fact that would hardly be credited by people unused to visiting our city, that Milwaukee, the terminus of nearly two thousand miles of railway, is absolutely without a single depot building for passenger trains. This, however, is not on account of any lack of means on the part of the railroads, but solely owing to the unsettled state of our railroad affairs in years past, and the difficulties of uniting separate interests upon any feasible plan for a union depot. These obstacles no longer stand in the way, and hence there is now a fair prospect of this long delayed work being accomplished at an early day. It is understood that the Milwaukee and St. Paul Company have decided upon the location, and purchased the grounds for the erection of this building.

"The total earnings of the Milwaukee and St. Paul Railway for 1869, were $7,250,668 68, and the operating expenses $4,229,882 11, leaving the sum of $3,020,786 57 as net earnings. The interest on the mortgage debt was $1,246,582; which, deducting from the net earnings, leaves a balance of $1,774,204 57 applicable to dividends, or something over ten per cent. upon the total amount of the company's stock, common and preferred.

"The company expended during the year for renewal of track, new bridges, new fences, new cars, new tools and machinery, $677,626, and in building new lines, $577,853. The five miles of connecting track from the northern division to the track of the Prairie du Chien division at the head of Spring street in this city, cost $95,496. Thirteen new locomotives were added to the rolling stock, at an expense of $172,562."

"*The West Wisconsin Railway.*—This new railroad extends from Tomah, on the La Crosse division of the Milwaukee and St. Paul Railway, through the counties of Monroe, Jackson Eau Claire, Dunn, Pierce, Buffalo and St. Croix, to Hudson and St. Paul, a distance of 172 miles. Sixty-six miles of the road are completed and in operation, its present terminus being the village of Augusta, 25 miles from Eau Claire and 90 miles from Hudson, on the St. Croix river. The construction of the road from Augusta towards St. Paul, is being vigorously pushed forward. It is to be completed to Eau Claire by the first of July next, and to St. Paul within a year from that date. The region through which the road passes abounds in all the essential elements that contribute to the prosperity of a railroad, in a new country—rich soil, extensive water powers, abundance of timber; and at Black River Falls, 30 miles from Tomah, is one of the most valuable beds of iron ore to be found in the state. A stock company was recently organized and sufficient capital subscribed to erect a blast furnace at Black River Falls, for the manufacture of pig iron from this ore. The construction of the road is developing the great resources of the northwestern part of the state, and thriving villages and cities are springing up all along the route.

"In addition to the advantages of opening to our city a valuable section of the state, hitherto almost inaccessible to us, the construction of the West Wisconsin Railroad is important to Milwaukee in establishing the shortest possible route betwen St. Paul and Lake Michigan, via the Milwaukee and St. Paul Railway from Tomah to Milwaukee. The distances are:

	Miles.
St. Paul to Tomah	172
Tomah to Milwaukee	153
Total distance from St. Paul to Milwaukee	325

"This is claimed to be about 50 miles shorter than the line of the river road, and 81 miles shorter than the Prairie du Chien route. The energy displayed by the managers of the West Wisconsin Railroad, in its construction thus far, furnishes the best assurance that the enterprise will be carried through to a successful termination. The company received from congress, in 1864, a grant of ten sections of land per mile, over a million acres in all, of valuable agricultural and timber lands, which is yet untouched; and from each of the counties through which it passes, a donation of fifty thousand dollars.

"A committee appointed by the president of the chamber of commerce, passed over the road on the occasion of the opening of the second division to Augusta, and in connection with a very flattering report of the progress and prospects of the road, offered the following resolutions, which were adopted by the chamber: * * * * *

"The West Wisconsin Railroad is operated by the Milwaukee and St. Paul Railway Company. The local business of the road, thus far, has exceeded the most sanguine expectations of its friends and furnishes the best assurance of its future prosperity, when, in addition to its local traffic, it shall have secured a connection with the grand net-work of roads extending from St. Paul."

"*The Western Union Railroad.*—The Western Union Railroad, extending from Racine to Savanna on the Mississippi river, thence to Fulton and Rock Island, 197 miles, was purchased in July last by Alexander Mitchell, Esq., of this city, and a new company organized, composed of Mr. Mitchell as president, S. S. Merrill as vice president, and other capitalists interested in the Milwaukee and St. Paul Railway. Since the acquisition of the road by the new company its business has steadily increased, and its condition greatly improved. A connecting link of road, fourteen miles in length, is now in process of construction from Elkhorn, on the Western Union Railroad, to Eagle, on the southern division of the Milwaukee and St. Paul Railway, thirty-six miles from Milwaukee, thus establishing an unbroken line of road, under one management, from Milwaukee to Rock Island, and at the same time making the Western Union an important trunk line of railroad—a position which it could never gain or hold with Racine as its eastern terminus. The Milwaukee and St. Paul road will also be benefited to the extent of the increase traffic over its line from Eagle to Milwaukee. This connection will be completed early in the present season, when through trains will run daily between Milwaukee and Rock Island, making close connections with the tributaries of the Union Pacific Railroad at Fulton and Rock Island.

"The distance from Milwaukee to Rock Island by this route will be 207 miles (fifteen miles shorter than the route via Racine,) and to Omaha 518 miles, only twenty-five miles more than the distance from Omaha to Chicago.

"The region traversed by the Western Union Railroad, embracing the counties of Racine, Walworth and Rock, in Wisconsin, and Winnebago, Stephenson, Carroll, Whiteside and Rock Island in Illinois, is unsurpassed anywhere in the west as regards the fertility of its soil, high cultivation, diversity of resources, and general thrift of its inhabitants. It has been truly said that this road penetrates the garden of the two states, and we may add that Milwaukee proposes hereafter to have a share of the fruit.

"A movement is on foot to extend the line from Sabula, opposite Savanna, westward about 150 miles through some of the richest portion of Iowa. It is understood that the ompany propose to iron and operate the road if the parties interested along the road will grade and tie it. Sabula and other towns on the route are taking active measures to accomplish this object."

"*Milwaukee and Northern Railway.*—By a recent act of the legislature, the Milwaukee and Northern Railroad Company was incorporated with power to build a railroad from the city of Milwaukee upon such line as they may select between lake Michigan and lake Winnebago to the Fox river of the north, and thence to lake Superior. The incorporators include some of our most enterprising capitalists and business men, whose names in connection with the project are an assurance that this long deferred and important enterprise will now be carried forward without further unnecessary delay. The charter is one of the most liberal that the legislature has ever granted to any corporation. One of its provisions authorizes the cities, towns and counties on the line of the road to give it such aid as they may deem necessary to secure its construction, and as the people of the eastern part of the state are thoroughly aroused to the importance of the road to them, and its unquestionable value as a great channel of commerce, and have repeatedly expressed in the most emphatic manner their desire to aid it with their influence and money, there is no doubt the road can be built without any material foreign assistance. It is the intention to organize the company and commence work as soon as the necessary preliminaries can be accomplished.

"This road will be a most important addition to the great net-work of railroads radiating from Milwaukee, extending, as it does, through a productive and populous region, almost totally unsupplied with railroad facilities, and forming a much shorter line to the Fox river and lake Superior than any other route, existing or prospective. It will shorten the distance between Chicago and Green Bay eighty to ninety miles compared with the Northwestern."

"*Milwaukee and Northern Illinois Railroad.*—The subject of a southwestern railroad has long been a favorite project with our citizens, and while the acquisition of the Western Union Railroad and its connection with the old Prairie du Chien road, by the construction of a track from Eikhorn to Eagle, will, within a few months open a new line of railroad from Milwaukee through the productive counties of southern Wisconsin and northern Illinois to Savanna and Rock Island, our attention is now called to an equally important line of communication in a more easterly direction. An energetic effort has been made to awaken sufficient interest in the matter, to secure the construction of the Milwaukee and Northern Illinois Railroad, upon the grading of which, about one hundred thousand dollars were expended some years ago; and in view of the additional importance which the project has acquired by the growth of our manufacturing establishments and the concentration of extensive iron interests here, there is good reason to hope that its successful completion will not be much longer delayed. This road extends from the fifth ward in a southwesterly direction, through the villages of Waterford, Rochester and Burlington, to Richmond, just south of the state line, 44 miles from Milwaukee. From Richmond, extending 35 miles further in the same direction there is a road already built, leading to Elgin, and from that point to the coal fields south of Ottawa, 78 miles, a road is now in process of construction, under contract to be completed by the first of September. The parties interested in the Vermillion coal fields build 68 miles of this road, and the owners of the Elgin and Richmond road 10 miles, with the probable intention of consolidating, and ultimately establishing a trunk line of railway through the Fox river valley to Milwaukee, intersecting and connecting with the Kenosha and Rockford railroad at the state line, and the Western Union at Burlington. The Elgin and Richmond and Kenosha and Rockford roads are at present considered very poor railroad property, but there can be no doubt that the completion of the Milwaukee and Northern Illinois railroad and its consolidation with the other roads extending through the Fox river valley to the Ottawa coal fields, will make the Elgin and Richmond road a first class railroad, and also greatly enhance the value of the Kenosha and Rockford, and the Rockford, Rock Island and St. Louis road."

Measures have also been taken for strengthening and increasing the commercial relations between Milwaukee and other ports on Lake Michigan:

"*Englemann Transportation Company.*—This company, organized by Nathan Englemann, Esq., has contributed, in no small degree, to the commercial facilities of our city during the past year, in affording regular and reliable communication between this port and those on the eastern shore of Lake Michigan. The line will be strengthened the coming season by the addition of the splendid screw steamer, *Lac La Belle'* 1,150 tons,' custom house measurement, now being supplied with a new cabin and fitted out in palatial style to take the place of the steamship *Detroit*, in the Detroit and Milwaukee Railway Line, in connection with the fine steamer *Ironsides*. Both of these are fast steamers, capable of making 15 to 18 miles an hour, and accomplishing the transit of the lake in 4 1-2 to 5 1-5 hours, according to the state of the weather. The other boats belonging to the company, the *Manistee*, *Messenger*, *Bertschy* and *Barber*, will ply between this city and the east shore ports north of Grand Haven, Muskegon, Whitehall, Pentwater, Ludington, Manistee, Glen Arbor and Traverse City.

" The following will show the tonnage (new measurement) of each of the steamers now composing the lines of the Englemann Transportation Company :

Lac La Belle,	tonnage	1,150
Manistee	do	561
Bertschy	do	467
Ironsides	do	1,124
Messenger	do	444
Barber	do	302

PUBLIC IMPROVEMENTS CENTERING AT GREEN BAY.

Every careful observer of the geographical features of Wisconsin must have been struck with the nearness of approach, at the city of Portage, of the Wisconsin and Fox rivers, which, with the most trifling help of man, form an uninterrupted line of water communication between lake Michigan and the Mississippi river. The Don and Volga present the nearest resemblance to this peculiarity; but those two great rivers are not only a considerable distance apart at the place of nearest approach, but are separated by a mountain range, the piercing of which would be a most herculean task.

There is, in fact, no parallel in the geography of the globe to these two rivers of Wisconsin, each of which sweeps far out of its course that it may join hands with its fellow, and so unite the great waters of the east and the west.

It is not strange, in view of this remarkable provision of nature, that, very early in the history of the state, the attention of far-seeing men should have been called to the feasibility of so far improving the navigability of these rivers as to make them a channel of commerce between the north-western states and the Atlantic seaboard--not strange that as long ago as in 1838 such improvement was strongly recommended by Mr. Poinsett, secretary of war, "for the purpose of facilitating the transportation of troops and munitions of war, destined for the western frontier of the United States," and a preliminary survey made under his direction by Col. Cram, of the topographical engineers, with the view of determining the character and cost of the required improvements. Nor is it strange that, in pursuance of repeated favorable reports and high official recommendations, grants of land in aid of the work were made in 1846, 1854 and 1855, so that, under the direction of the Fox River Improvement Company, the Fox has been so far improved as to become a very important outlet for the products of a large section of the state, as well as inlet for such imports as have annually sought entrance at Green Bay; nor that the importance of an enlargement of said improvement and its completion through to Prairie du Chien has been declared by a great number of commercial and other conventions held in the leading cities of the northwest—including Chicago, Dubuque, St. Louis and even Louisville—within the past few years.

On the other hand, it is hardly surprising, that in the early history of the west, and even down to these last years, the government of the United States, still somewhat unsettled in its policy as to improvements of this class, should have failed to take the work in hand and vigorously push it to a conclusion.

But, within the past ten years, the improvement of the northwest has been so rapid, and the demand for cheap transportation has become so imperative that further delay must result in immense loss to the public and private interests. In proof of this assertion, I quote, at some length from a memorial to congress, adopted by the canal conventions held at Prairie du Chien in 1868, and at Portage City in 1869. The statistics are understood to have been collected and compiled by Breese J. Stevens, Esq., chairman of the committee of the convention, the carefulness and thoroughness of whose investigation of the whole subject are a sufficient warranty of their correctness:

PRESENT NECESSITY FOR THE IMPROVEMENT.

"The commerce of thirteen states and four territories in greater or less degree stands in present need of this water channel as its eastern outlet.

"It is impracticable to present in this paper a statement of the nature and extent of the productions of the thirteen states and territories, or even of the entire production of a single state.

"The states of Illinois, Missouri, Iowa, Wisconsin and Minnesota, known as the five most productive of the famous eight 'food producing states,' are more deeply and immediately in need of this outlet. The following statement of the increase and extent of the grain crop of these states will furnish a fair sample of the increase and extent of the entire productions of each and all of the states and territories referred to:

TABLE No. 1.

STATEMENT showing the increase and extent of the grain crop of five of the "food-producing" states for the years 1849–50, 1859–60, 1865–66.

[The figures for 1850 and 1860 were obtained from the U. S. census, and for 1866 were obtained in part from the reports of the commissioner of agriculture, the state census of several of the states and the estimates of officials and prominent men residing in the several states. It is thought that the estimates for 1866 are considerably less than the actual yield.]

STATES.	POPULATION.			WHEAT—BUSHELS.			CORN—BUSHELS			TOTAL GRAIN—INCLUDING WHEAT, CORN, RYE, &C.—BUSHELS.		
	1849–50.	1859–60.	1865–66.	1849–50.	1859–60.	1865–66.	1849–50.	1859–60.	1865–66.	1849–50.	1859–60.	1865–66.
Illinois	851,470	1,711,951	2,151,007	9,414,575	44,159,500	28,551,421	57,646,984	115,296,779	155,844,850	77,527,563	157,294,393	216,427,359
Missouri........	682,044	1,182,012	1,500,000	2,981,652	4,227,586	3,544,036	36,214,537	72,892,157	46,819,543	44,551,808	81,504,669	54,262,288
Iowa	192,214	673,918	902,040	1,530.581	8,433,205	15,753,323	8,656,799	41,116,994	52,288,184	11,800,550	56,276,547	89,400,236
Wisconsin.......	305,391	775,881	1,000,000	4,286,131	15.812,625	20,307,920	1,988,979	7,565,290	9,414,583	10,060,605	30,172,333	48,752,829
Minnesota	6,077	172,123	430,000	1,401	2,195,812	18,000,000	16,725	2,987,570	9,000,000	50,564	7,662,498	30,779,743
Total of 5 states.	2,037,196	4,516,885	5,983,047	18,214,340	54,828,728	85,156,700	104,524,024	240,858,790	273,366,660	143,400,000	332,610,440	439,662,455

1865–66.	POPULATION.	WHEAT—BUSHELS.	CORN—BUSHELS.	GRAIN, INCLUDING WHEAT, CORN, RYE &C.—BUSHELS.
Total of all the United States..	* 36,000,000	† 151,999,906	867,946,295	1,343,027,878
Proportion crop of 1866—five states to United States...........................	Less than one-sixth	More than one-half	About one-third.	About one-third.
Value of grain crop of U. S., 1865–66—estimated by commissioner of agriculture	....	....	....	$1,118,904,376
Value of crop of five states........................	....	....	About one-third.	$391,596,000

* Estimate of commissioner, General Land Office.

† Less than the actual yield.

"From this statement (table No. 1) it appears that a population of little more than two millions in 1850, has increased to four and half millions in 1860 and nearly six millions in 1865; that the product of wheat, eighteen million bushels in 1850, has increased to nearly fifty-five millions in 1860, and to eighty-five millions in 1865, and that the product of grain, including wheat, etc., one hundred and fifty-three million bushels in 1850, has increased to three hundred and thirty-two and a half millions in 1860, and to four hundred and thirty-nine and a half millions in 1865.

"It also appears that less than one-sixth part of the population of the United States has raised more than one-half of the wheat, about one-third of the corn, about one-third of the grain, including wheat and corn, which, in the year 1865, was produced in all the states and territories of the United States.

"The total value of the grain crop of the United States for the year referred to was, by the commissioner of agriculture, estimated at $1,118,904,376, in which estimate the crop of the five states referred to was put down at nearly one-third of the whole—$391,596,000.

"The actual yield is, possibly, greater than the amount claimed in the statement (table No. 1). The governor of Iowa estimates the wheat crop of that state for 1867 at twenty million bushels, and for 1868 at twenty-five million bushels. The census returns made to the secretary of state of Wisconsin indicate that the wheat crop of Wisconsin in 1860 was over twenty seven million bushels, while the secretary of the State Agricultural Society estimates the crop of 1861 at twenty to twenty-five million, and of 1863 at twenty-five to thirty million bushels.

"In the main, however, it is thought that the statement is substantially correct. In order to test it, the following tables have been prepared with reference, more especially to the wheat crop, designed to show, first, the quantity for export or shipment east, and, second, the quantity actually shipped.

"It is estimated by the 'Mark Lane Express,' that in England the average consumption of wheat is six bushels to the inhabitant, while in this country, where corn is substituted in part, it is estimated that the average is about five bushels to the inhabitant.

TABLE No. 2.

STATEMENT designed to show the amount of wheat for shipment east.

Total yield of wheat and flour for 1865, as per table No. 1 (bushels)		85,156,700
Deduct seed, 1 1-2 bushels per acre. Total No. acres in wheat (5,854,991) as per report of commissioner of agriculture, 1866	8,732,486	
Deduct consumption, 5 bushels to each inhabitant. No. of inhabitants, 5,083,047, as per table No. 1	29,915,235	
		38,697,721
		46,453,979
Deduct for shipment south and west, say 15 per cent		6,968,846
Quantity for shipment east		39,490,133

TABLE No. 3.

STATEMENT designed to show the actual shipments of grain from lake Michigan ports.

(The following table in the main has been compiled from the reports of the boards of trade of Milwaukee and Chicago.)

	Wheat, Bushels.	Flour, Barrels.	Wheat and flour reduced to bush.	Corn, Bushels.	Total grain including wheat, flour &c. Bush.	Total shipments. Bus.	Shipments by Lake. Bushels.	Shipm'ts by R. R. & Ill. canal east and west Bushels.	Shipm'ts by R. R. east. Bushels.	Proportion shipm'ts by R.R. east to total ship'ts east. Bus.	Shipments by Lake in tons.	Total shipments by Lake, R.R. and Canal. Tons.
1862.												
Chicago	18,806,808	1,739,849	....	29,452,610	56,484,110	....	*..........	*..........	†..........	....	....	....
Milwaukee	14,915,680	711,405	....	9,489	18,832,489	....	....	....	....	....	....	....
Other ports (estimated)	1,800,000	245,000	43,505,848	1,000	2,551,000	77,767,599	74,487,674	3,279,925	....	....	....	....
				29,463,099								
1863.												
Chicago	10,889,881	1,536,690	....	24,906,930	54,741,839	....	*..........	*..........	†..........	....	....	....
Milwaukee	12,887,020	603,526	....	88,989	16,993,335	....	....	....	....	....	....	....
Other ports (estimated)	1,789,489	176,029	36,597,715	10,000	2,729,634	74,464,808	68,042,456	6,422,352	....	....	....	....
				25,005,919								
1864.												
Chicago	10,949,880	1,287,545	....	12,740,543	47,124,494	....	....	....	....	....	....	....
Milwaukee	8,992,479	414,833	....	146,786	12,084,070	....	....	....	....	....	....	....
Other ports (estimated)	1,500,000	200,000	39,253,699	200,000	2,700,000	61,909,073	54,848,179	7,060,894	4,909,489	8 p. cent.	*1,441,076	*1,589,065
				13,687,329								
1865.												
Chicago	8,098,968	1,523,876	....	25,228,526	53,212,224	....	....	....	....	....	....	....
Milwaukee	10,479,777	567,576	....	371,130	18,803,359	....	....	....	....	....	....	....
Other ports (estimated)	1,548,997	100,671	31,082,47,	89,050	2,327,139	69,842,722	59,123,060	10,219,662	7,156,717	10 p. cent.	*1,620,851	*1,892,974
				25,688,706								
1866.												
Chicago	10,341,549	2.197,787	....	32,953,530	60,786,660	....	....	....	....	....	....	....
Milwaukee	11,634,749	720,365	....	480,408	17,627,994	....	....	....	....	....	....	....
Other ports (estimated)	1,128,428	114,747	38,269,216	591,125	3,057,007	87,421,681	67,071,010	19,750,671	15,474,456	18½ p. ct.	*1,869,239	*2,421,001
				34,025,063								

* Approximate. † Could not be conveniently ascertained.

"From table No. 2, it appears that the quantity of wheat and flour for shipment east in 1866, was about 39,000,000 bushels, while from table No. 3, it appears that the quantity actually shipped from the ports upon lake Michigan, was as follows:

	Wheat and flour.	*Grain, including wheat and flour.*
In 1862	43,505,848 bushels.	77,767,599 bushels.
In 1863	36,597,715 ...do...	74,464,808 ...do...
In 1864	30,253,699 ...do..	61,909,073 ...do...
In 1865	31,082,357 . .do...	69,342,752 ...do...
In 1866	38,269,316 ...do..	87,421,681 ...do...

"It is submitted that these tables verify substantially the accuracy of the statements in table No. 1.

"While it is true that a quantity of grain is raised upon the immediate shore of lake Michigan and does not require transportation across the state, it is equally true that a quantity of the grain crop of the five states referred to, is shipped to the west and south, and another quantity to the east by channels other than the ports of lake Michigan. With water channels opened and freights reduced, thereby stimulating shipments, it is thought the yearly crop is now, and possibly as far back as 1866 was, sufficiently large to make the shipments eastward from points west of lake Michigan not less than 50,000,000 bushels of wheat, and of grain including wheat, not less than 100,000,000.

"This quantity in weight, estimating for the different kinds of grain, is about 2,500,000 tons. The average distance from the Mississippi river to lake Michigan by rail, 170 miles, and by the Wisconsin and Fox rivers, 278 miles. To the distance by rail must be added the average distance to the head of lake Michigan, opposite Green Bay, estimated at 150 miles. The charges for transportation over 170 miles of railway, at thirty mills per ton per mile, and over 150 miles of lake at three mills per ton per mile, amount to $5.55 per ton, and with the cost of transhipment at the Mississippi added, to $6.21 per ton; while the charges over 278 miles of river, at seven mills per ton per mile, amount to $1.95 per ton. The saving of $4.26 per ton, upon the whole quantity for shipment, would amount to $10,650,000—a sum more than twice the estimated cost of the proposed work, to be saved upon the movement eastward of a single grain crop.

"It may be said that this great product would not go all by water—be that as it may—whether moved by rail or water, it must go at approximate water rates. The saving to the public is equally certain, whether effected by light tolls or light rail rates.

"It is, however, by no means certain that water routes can not successfully compete with railways. It appears, (table No. 3,) that from the ports of lake Michigan, the shipments were nearly all to the east, and were made by water, excepting that in 1864 eight per cent., and in 1864 eleven per cent., and in 1866 eighteen and a half per cent., were made by rail. The following statement is designed to show what proportion of the shipments by rail to the east were carried in the five winter months:

TABLE No. 4.

STATEMENT designed to show the proportion of shipments east by rail in the winter months.

(Compiled from the board of trade reports of Chicago, for the years 1865, 1866 and 1867. Shipments by railroad from Milwaukee not given, because included in the Chicago shipments).

Railroads and years.		Shipments of wheat, flour, (reduced to bushels) corn and oats, in the 7 months of Apr., May, June, July, Aug., Sept. and Oct. Bushels.	Shipments of wheat, flour, (reduced to bushels) corn and oats in the 5 months of Nov., Dec., Jan., Feb. and March. Bushels.	Propt'n of ship-m'ts in 5 w. mos. to tot. sh. of y'r.
Pittsburgh, Fort Wayne & Chicago. Mich. Southern & N. Indi'a. Michg'n Cor tral. Chicago & Great Eastern.	1864	2,002,949	2,830,040	58½
	1865	3,534,170	3,303,020	......
	1864-'5	5,537,110	6,133.060	52½
	1866	9,591,082	5,314,498	......
	1864-'5-'6	15,128,192	11,447,558	43

"From this it appears that of the shipments east by rail there were carried, in the five winter months of the year 1864, fifty-eight and a half per centum, of the years 1864 and 1865, fifty-two and a half per centum, and of the years 1864, 1865, and 1866, forty-three per centum. Deducting from the shipments carried in the summer months the quantity discharged at points not reached by water, and it follows that during the seven months of navigation while the water channel was open and in competition with the four great lines of railway leading from Chicago to the east, there were shipped by rail not much over *five* per centum of the gross shipments east.

"The opening of a water route will stimulate the export of corn. From tables Nos. 1 and 3 it appears that from a product of 273,000,000 bushels in 1865, only 25,000,000 bushels were exported—less than one bushel in ten. These tables show, says the commissioner of agriculture, in his report for 1865, p. 62, 'how excessive charges for transportation are eating out the substance of the west, reducing home prices and farmers' profits, and consigning corn to the grate or furnace. It should teach the west to diversify its industry, and divert labor from wheat-growing to industries which make light products.'

"Having spoken so freely of the grain crop, it is impracticable to do more than refer to the other varied and great productions of the territory tributary to this route, seeking an eastern route by water. It is thought that the western freights will approximate to the eastern freights. The opening of this route will furnish a western market for the great lumber districts of Michigan and eastern Wisconsin, for the coal and salt districts of the east, for lake Superior iron and for general merchandise.

"The following is a statement of the lumber trade of the two ports of Milwaukee and Chicago:

TABLE NO. 5.

STATEMENT of receipts and shipments of lumber, &c., at the two ports of Milwaukee and Chicago.

LOCALITY.	1860.	IN THE YEAR 1866.					
	Total rep'ts Lumber, feet.	Total rep'ts. Lumber, feet.	Receipts by lake. Lumber, feet.	Receipts by R.R. canal, etc. Lumber, feet.	Ship. by R. R. and canal. Lumber, feet.	Estimated product of lumber, feet.	Total rep'ts. Coal, tons.
Milwaukee.	30,124,000	*58,808,000	56,846,000	1,962,000	21,906,156	....	66,617
Chicago ...	225,372,340	730,057,168	687,851,000	42,206,168	422,087,266	....	496,193
Totals ...	255,496,340	788,865,168	744,697,000	44,168,168	443,993,422	....	562,810
Wisconsin.	....	....	....	....	....	†800,000,000	......
Michigan..	....	....	....	....	....	‡1,125,000.000	......
Total	....	....	....	....	....	1,925,000,000	......

"To move by rail the quantity actually received (788,865,168 feet), allowing for each car seven thousand feet, and for each train fifteen cars, will require 7,513 trains of cars, or one for every hour, day, and night in the year, Sundays excepted, and to move the quantity actually shipped (443,993,422 feet), will require 4,228 trains, or about fourteen trains for every day in the year, Sundays excepted.

"Should the western freights amount to not more than one-half of the eastern freights, they would swell the aggregate of the saving to $15,975,000 per annum."

RAPID GROWTH OF THIS NECESSITY FOR THE IMPROVEMENT.

Under this head the memorial properly recites:

"However great in quantity and value the productions of the five states referred to now are, under the stimulus of cheap transportation, they will grow into quantities and values vast and immeasurable. However great may be the development indicated by the miles of completed railway therein, it has not reached nor approached its limit.

"The following statement is designed to show the number of miles of railway completed in these states, and the number of acres of improved land as compared with the total area:

* Not estimating lath, shingles, posts, ties, bolts, cord wood, etc.
† Estimate Secretary Wisconsin State Agricultural Society's Report, in press, gathered from reports of Boards of Trade.
‡ Estimate of Commissioner General Land Office, report of 1867.

TABLE No. 6.

STATEMENT designed to show the number of miles of completed railway in the five states referred to, and the number of acres of improved land, as compared with total area.

[Compiled from the reports of the commissioner of agriculture, the report for 1867 of the commissioner of the general land office, &c., &.]

STATES.	LANDS, (ACRES.)								RAILROADS. (MILES COMPLETED.)			
	FARMS, 1849-50.		FARMS, 1859-60.		Not in farms 1860.	Total acres in farms and out.	Proportion improved lands to whole in 1360.	Lands unsold title in United States in 1867.	1849-50.	1859-60.	1866.	Amou't in con-str'ct'n 1868.
	Improved.	Unimprov'd	Improved.	Unimprov'd								
Illinois.................. ..	5,039,545	6,997,867	13,096,374	7,815,615	14,547,211	35,462,400	....	2,000	110	2,868	3,160	812
Missouri........................	2,938,425	6,794,245	6,246,871	13,737,939	23,188,390	41,824,000	....	1,835,898	....	817	950	A large amount
Iowa........................	824,682	1,911,382	3,792,792	6,277,115	25,158,893	35,228,800	....	3,113,464	....	680	1,400	...do...
Wisconsin	1,045,499	1,931,159	2,746,167	4,147,420	29,617,773	34,511,360	....	10,016,701	20	923	1,730	...do...
Minnesota	5,035	23,486	556,250	2,155,718	50,728,032	53,459,820	....	36,776,171	....	....	400	...do...
Totals	....	....	27,438,454	....	....	200,486,400	*13½ per ct. about one acre in 8.	....	130	5,288	7,641	....
"United States"..									8,590	30,794	36.000	....
Proportion—five states to United States..........................									....	....	over 1-5	....
Six New England States....................................									....	....	3,819	....
Six middle states, including New York and Pennsylvania..............									....	....	8,882	....

* Until the next census it will be impossible to ascertain the amount of improved land in 1867.

"It appears from this statement that in 1850, in the states referred to, there were 130 miles of completed continuous railway, while in 1866, only sixteen years later, there were 7,641 miles and more in process of construction. The total number of miles of completed and continuous railway in the United States was 8,950, in 1850, and 36,000 in 1866. These five newly-created states contained in that year nearly as many miles as the six older 'middle states,' nearly twice as many as the six 'New England states,' more than one-fifth as many as the United States, and more than one-fifth as many as all the the rest of the world. They contained in 1866 nearly as many miles as the United States in 1850.

"It also appears that the total area of these states embraces more than two hundred millions of acres of land, a surface as great as that of forty states as large as Massachusetts; and that the quantity actually improved is less than twenty-eight million acres—one acre in eight.

"The valley of the Mississippi, which, by the opening of water routes will become connected with the valley of the St. Lawrence, and tributary to the commerce of the lakes, contains 768,000,000 acres 'of the finest lands on the face of the globe,' enough to make more than 150 states as large as Massachusetts. More territory than the areas of Great Britain, France, Spain, Austria, Prussia, European Turkey, and the Italian Peninsula combined. If peopled as Massachusetts is, it would contain five times the present population of the United States; and as France is, it would hold as many people as the whole area of Europe contains; and as Belgium and the Netherlands are, with not the same danger of famine, it would contain four hundred millions of souls, largely more than one-third of the entire population of the world.

"With the valleys of the Mississippi and St. Lawrence so connected there would be an uninterrupted lake, river and canal navigation from New York to Fort Benton, at the falls of the Missouri, a distance, east and west, of nearly five thousand miles. Barges loaded at Green Bay might be discharged of their cargoes in Montana. The distance on the Mississippi navigable by steamboats, from St. Louis, north to the falls of St. Anthony, and thence on the Dacotah, is about 1,300 miles, and south from St. Louis to New Orleans, 1,200 miles. Steamers go loaded with freight to be delivered at the heads of navigation upon the rivers which run through Illinois, Ohio, Arkansas, Louisiana, Tennessee, Mississippi, and Alabama; and to Pittsburg, Pennsylvania. Steamers of a large class go from St. Louis to Ft. Benton, a distance of 3,100 miles."

THE SAVING TO BE MADE.

Considering the question of savings more narrowly and definitely, the following facts and figures are presented in the memorial:

"The improvement will save by reducing the freight charges upon every ton of coarse freight moved from the Mississippi eastward or from lake Michigan westward by water or rail.

"It is ascertained from reports and tables carefully prepared, by comparing the receipts and the cost of transportation of a large number of railroads for a period of eight years, that the average cost by rail is eighteen (17.90) mills per ton per mile, and the average receipts thirty (29.80) mills per ton per mile, making the cost over sixty per centum of the receipts.

"It is also ascertained by comparing the receipts and the cost of transportion of fourteen different canals, that the average cost of transportation is from 4 to 6 mills per ton per mile, and the average receipts 11 1-2 mills per ton per mile, making the cost about thirty-four per centum of the receipts; it is ordinarily stated at thirty per centum. Upon the Erie canal, the average up to 1866, inclusive, was 21 2-3 per cent.

"The following table shows the comparative cost and receipts upon railroads, canals, rivers, bays and seaboard:

Classification.	*Per ton per mile, cost, mills.*	*Per ton per mile, receipts, mills.*
Transportation by railroads	17.90	29.80
..do..by canals, including deduction, lockage, &c.	6.40	11.40
. do..by Erie canal..........do........do	4.05	....
..do..by rivers, steam towage	2.26	2.90
..do..by bays	2.27	3.73
..do..by ocean	1.26	2.50

"*From this statement it appears that the receipts and cost of transportation by rail are each about three times as great as by canal, and about eight times as great as by river.*

"From the auditor's report for 1866, it appears that the tons moved per mile in New York, on the Central and Erie railroads for that year were 809,561,319, and on the canals 1,012,-448,034, yet the railroad receipts amounted to $20,282,943 and the canal receipts to only $10,160,651, making the charges by rail nearly *three times* as great as by canal.

"In the ten years, 1854 to 1864 inclusive, the total number of tons moved one mile by the Central railroad was 2,132,-073,612, by the Erie railroad 2,587,274,914, and by the New York canals 8,175,803,065; and the average charges of the Central were 2 6-10, the Erie 2 22-100, and the canals 91-100 cents per ton per mile, making the average charges by rail nearly *three times* (2 2-3) as great as by canal.

"Had the freights which were carried by canal for the ten years referred to, been carried by rail the *additional* freight charges would have amounted to $122,637,045.97; add to this that portion of canal receipts which was applied to the extinguishment of the canal debt—a sum which, it will be remembered, is quite three-fourths of the total receipts from tolls and which, after paying in full the cost of repairs and management is $73,184,640, and of which sum it is estimated that $56,000,000 was paid in the ten years referred to, and it then follows that, in addition to the reduction of railroad freights, a benefit, probably the greatest rendered, and in addition to the appreciation of real estate on the line of the canals, at New York city, and at the west, the canals have in the ten years referred to, saved the public $178,637,045.97 or $17,-850,000 annually.

"It is estimated by Governor Fenton and the state engineer of New York that by adapting the Erie or New York canals to the use of steam, the cost of transportation will be reduced at least fifty per centum.

"The improvement of the Wisconsin, as proposed by Gen Warren, partakes of the nature of both river and canal improvement. The motive power upon the Erie canal is horse-power and upon the river steam; and the movement upon the river is at least four times as great as upon the canal. It is believed that in the matter of transportation, the proposed improvement approximates more nearly to an ordinary river improvement than to a canal. If so, it is safe to say that the cost of transportation and receipts per ton per mile will be less than one-fourth of the same by rail; and will be still less if the government shall collect tolls only sufficient to pay the cost of repairs and management."

From the foregoing facts, sustained by a reference to the accompanying map, it will appeaar how vast are the areas to to be affected and the interests to be promoted by this improvement of the Wisconsin and Fox rivers. Indeed it is doubtful whether the most sanguine friends of the enterprise themselves fully realize the bearing it would have upon the development of the far northwest, much less how imporant a link it is destined to be in the commerce of the two hemispheres.

OF THE FEASIBILITY OF ECONOMICAL CONSTRUCTION

There is no longer any question with those who have carefully investigated the matter. Under this head I again quote from the memorial above referred to:

"The Wisconsin river having its rise in the northern part of the state of Wisconsin, runs southerly until it approaches the Fox river, turns abruptly southwesterly and, running in that course one hundred and eighteen miles, empties into the Mississippi at Prairie du Chien. The Fox river having its rise in the southern part of Wisconsin, runs northwesterly until it approaches the Wisconsin river, turns abruptly northeasterly, and running in that course one hundred and sixty miles, empties into lake Michigan at Green Bay.

"The course of these two rivers below the portage, the point of nearest approach, is surprisingly straight and nearly upon a due line passing through Prairie du Chien and the straits of Mackinaw. The divide, or portage, separating the Wisconsin river waters, putting into the gulf of Mexico, from the Fox river waters, putting into the St. Lawrence, is a level sand prairie, without rock, and in width, one and one-half miles. The Wisconsin, at the portage, is at the summit level. It is about seven feet higher than the Fox at the portage, about two hundred feet higher than lake Michigan at the mouth of the Fox, and one hundred and sixty-nine feet higher than the Mississippi at the mouth of the Wisconsin.

"Already a canal, at the portage, connects the Wisconsin and the Fox, and a slack water communication extending from the portage to Green Bay, a distance of one hundred and sixty miles, overcomes by locks and dams the fall of two hundred feet, and connects the Wisconsin river with lake Michigan. The Fox river from its mouth to Oshkosh, on lake Winnebago, has a low water channel of about four feet, and from lake Winnebago to the portage, of about three feet. At stages of high water, boats of three, four and even five feet draft have passed from lake Michigan up the Fox river and down the Wisconsin into the Mississippi river. As late in the season as June, boats of three hundred tons burthen have made the passage. In stages of *low* water, the Wisconsin cannot be navigated on account of the drifting sand.

"It is proposed that the general government be urged to improve the navigation of the Wisconsin river, from its mouth to the portage, so that boats of five feet draft may pass with facility in the lowest stages of water.

"The works of improvement now in operation upon said rivers are owned by the Green Bay and Mississippi Canal Company, and chiefly extend from the portage to the mouth of the Fox.

"This company will make the navigation of the Fox river as good as the government will make the Wisconsin, *so that the project is narrowed down to the improvement of* 118 *miles of river navigation.*

ITS PRACTICABILITY IN COMPARISON WITH NEW YORK CANALS.

"There are twelve canals in the state of New York, of an aggregate length of 886 1-2 miles. These canals connect natural channels to the extent of 386 miles, making the total length of navigable channels within the state 1,272 1-2 miles. The construction of these canals was commenced in 1817, and the Erie was completed in 1825. The enlargement was commenced in 1835, and the construction account closed in 1862, although practically completed in 1859.

"The cost of the twelve canals, including enlargement and land damages, was $65,644,848. To this add interest on loans and the cost of repairs and management up to 1855, inclnsive, and the total cost to New York was $107,853,056. The amount of tolls received, inclusive of the year 1865, was $93,-272,287, enough, *even then*, into $14,580,769, to pay off in full the entire cost of the canals. In a few years more the tolls on the New York canals can be reduced to a sum just sufficient to pay for repairs and management. The cost of repairs and management up to 1865, inclusive, was 21 2-3 per cent of the gross receipts.

"Of these canals, the Erie is the only eastern and western through canal. The remaining eleven are lateral canals, feeders to the Erie and outlets for from two to four counties each. Two or three of these lateral canals are self-sustaining. The remainder only become so by crediting to them the tolls on freights which they bring into the Erie. Without this credit, tolls on the lateral canals, with the exception of two or three, have not more than paid, and in most cases have not paid the cost of repairs and management.

"The receipts from tolls on the Erie canal alone, up to 1865, inclusive, have paid:

"1. The cost of the original Erie canal.

"2. The enlargement, including improvements and land damages.

"3. Interest on loans.

"4. The total cost of repairs and management up to 1865, inclusive.

"5. A net profit amounting to $15,622,836.

"In all, the extraordinary sum of $83,629,243.

"The improvement of the Wisconsin and Fox rivers, of which it is proposed that the government shall build the western end, and the Green Bay and Mississippi Canal Company the eastern end, as compared with the Erie canal, is as follows:

"The length of the enlarged Erie canal is 350 miles.

"The length of the improvement, Green Bay to the Mississippi, is 278 miles.

"The summit level of the Erie canal is, at Buffalo, 654 feet above the Hudson river at Troy.

"The summit level of the improvement is, at the portage, about 200 feet above lake Michigan at Green Bay, and 169 feet above the Mississippi at the mouth of the Wisconsin.

"The waters received into the Erie canal at Buffalo, are in great part wasted at Lockport. From that point eastward the canal is supplied by artificial feeders. For all practical purposes the summit level of the canal is the long level from Syracuse to Utica (55 miles), a level fed by ten artificial feeders, built at great cost, of which the largest and most expensive is the Black River canal. The supply of water is still insufficient, and it is proposed to build other feeders for this level.

"The full volume of the Wisconsin river, three-fifths as large as the Mississippi at St. Paul, is at the summit level of the improvement.

"The bottom of the Erie canal, throughout the long level, is an artificial bottom, from ten to thirty feet above the level of the country through which it passes. It is liable to break away and difficult to repair, endangering life and property. At Syracuse, the New York Central railway passes under the canal. At Utica, the bottom is on a level with the second story windows of many of the houses on the river side of the town. The city sewers, the street and highway drains, and the various streams and rivulets along this level, all pass under the canal. At Rochester, the Genesee river passes under it, and at Schenectady the Mohawk.

"The bottom of the Wisconsin improvement, as built and projected, is a natural bottom, safe, and not liable to break away, and passes neither over nor under other bodies of water.

"On the enlarged Erie canal there are seventy-one locks, 110 feet long by eighteen feet wide.

"Upon the improvement on the Fox river side, there are built and projected about twenty-three locks, of which all but two are 160 feet long and thirty-five feet wide. Of the two referred to, both to be enlarged, one is 140 and the other 145 feet long. On the Wisconsin side there will be needed, it is supposed, from ten to fifteen locks, making in all, when completed, thirty-eight locks, 160 feet long by thirty-five feet wide.

"The depth of the Erie canal is nominally seven feet, but practically six feet.

"The present depth of the eastern end of the improvement from lake Winnebago to Green Bay is about four feet. The proposed depth for the proposed entire improvement is five feet.

"The bottom of the Erie canal is narrow and the locks small, only permitting the passage of narrow boats, which, for the most part, are sharp at the bottom to avoid friction.

"The improvement, and the locks upon the improvement, will permit boats to pass which are flat-bottomed and fifty per cent. longer and one hundred per cent. wider than the boats upon the canal

"It is estimated that the tonnage which will sink a river boat four inches will sink an Erie canal boat one foot, so that for the purposes of commerce a depth of four feet in the improvement is equal to a depth of at least six feet in the canal.

"The motive power on the canal is horse power, and on the improvement steam. The movement of freights on the canal is one and one-quarter miles per hour, and on the improvement (when running) from five to seven.

"Both are eastern and western through routes, the one a continuation of the other; and later an effort will be made to show that the commerce demanding the improvement to-day is little less in amount than the commerce seeking the Erie canal.

"With a length less than the canal, less than one-third of the lockage, abundant water on the summit level rendering artificial feeders unnecessary, a natural and not an artificial bottom, few or no streams to cross, and about one-half the number of locks, it must be apparent that the great cost of the Erie canal can be no measure for the cost of the improvement; a deduction fully sustained by the reports of Gen. Warren, hereinafter referred to, and a work, only a part of which it is proposed to ask the government to undertake.

"Six of the eleven side canals of New York cost from two to six millions each, and the remainder less. In length they vary from 38 to 124 miles each. They are fed, in part, by artificial feeders. The Genesee Valley canal has 112 locks, the Chemung canal 116 locks, with 1,015 feet of lockage, and the Black river canal 109 locks, with 1,082 feet of lockage. They are outlets for two or, at the most, four counties each.

"The improvement of the Wisconsin river is about the same number of miles in length, has less than one-fifth of the lockage and one-fifth of the number of locks, and is the outlet for six states and a vast territory beyond."

COMPARISON WITH OTHER RIVER IMPROVEMENTS.

"Compared with the improvements proposed for other rivers putting into the Mississippi, the proposed improvement of the Wisconsin, is in the number of miles in length, and the number of feet of fall not greater than the rivers having the least number of miles in length and the least number of feet of fall, and not more than half as great, as the rivers having the greatest number.

"An impediment, and possibly the greatest, in the way of the improvement of rivers, is the sudden and great rise of water at certain seasons of the year. In the Ohio river the flood rises above low water mark as high as sixty feet, and in the Illinois, Rock and Chippewa rivers, as high as thirty feet. But not so in the Wisconsin. The difference between high and low water mark is, at the mouth, ten feet, and at the portage six feet. Two mountains of rock, twenty miles above the portage, situated at each side and close against the river, by reducing the channel, hold back the floods.

"Major Charles R. Suter, in his report of the survey of this river, made January 2, 1867, says:

'Twenty-three miles above Portage City the river passes through the Dalles, and is there very much reduced in width. The Dalles act as a dam to prevent any very great rise in the lower Wisconsin. The average yearly rise is about six feet. In the spring of 1866 it rose nine feet, which is the greatest height it has attained for many years. The rise in the river just above the Dalles, on this occasion, was *more than fifty feet.*'

"The shifting nature of the sand bars is the main obstacle to navigation. It is met with in all the rivers referred to, the Illinois, the Mississippi and each of its tributaries, including the Wisconsin, and not more in the Wisconsin than in the rest. It has long been claimed that the regular passing of boats would keep the channel clear.

"Major Suter says:

'In former years, when the Wisconsin was navigated by steamboats, it was found that the frequent passage of boats not only deepened the channel but tended to keep it permanently in the same location. The pilots who take rafts down the river bear testimony to the little stability of the bars and the slight disturbance of the bottom which is required to cut a deep channel through them.'

"It is probably true that an impression has prevailed, more or less, that, owing to the shifting sand, the main channel of the river, as such, cannot be improved. That question is left for settlement to engineers and experience. After a careful survey and study of the river, extending over two years, General Warren has reported that such an improvement of the channel is practicable. But while upon that question, many, even of those acquainted with the river, may doubt, they cannot, nor can any one have doubt, upon the other question of the practicability of a canal, or slack-water improvement.

"REPORTS OF GENERAL WARREN—THE COST.

"Under instructions from the engineer department, issued in July, 1866, Major General G. K. Warren took charge of the surveys of various rivers, including the Fox and Wisconsin. Under date of January, 1867, his report was made to the department, and was subsequently submitted to congress. To this report reference is made.

"Estimates were made of the cost of enlarging the improvement of the Fox river to a uniform low-water draught of four feet and to one of six feet, which were, for four feet, $444,442, and for six feet, $1,288,515.40. The surveys of the Wisconsin river were not then completed, and estimates of the cost of the improvement were not then made.

"Under date of April, 1868, General Warren made a further report to the department, which was subsequently submitted to congress, and to which reference is made. In speaking of the Wisconsin he says:

'From the present state of our investigations, therefore, I am in favor of dams, jettees, revetments, etc., of brush and stone, in connection with dredging, in preference to a canal along the banks, or to locks and dams in the river, though the estimates have not been completed. The question as to the kind of improvement will mainly turn upon the making of six and seven feet navigation; but with three and four feet at lowest stages, and boats properly constructed and with a wide passage way, almost any amount of transportation can be done.

'I have thought that from $20,000 to $30,000 per mile would secure this low-water navigation of from three to four feet depth of water. * * An expense annually would afterwards be required for repairs amounting to from $20,000 to $30,000. * * *If a canal of great size is required between the Mississippi and the lakes, there is no question but that of cost involved in its construction.* It is a very favorable feature that the Wisconsin river, at low stage, is nearly on a level with the summit of the canal at Portage, and no expensive works are required to procure from the river all the water that might be needed for lockage thence to Winnebago lake. As a canal route' the natural feeders are inexhaustible.'

"Since the making of this report in April, General Warren has completed his estimates, and has made to the department under date of October last (1868), his final and working report, from which report we have kindly been permitted to make the following extracts. He says:

'For improving the navigation along the Wisconsin river from Portage City to its mouth, I present three plans and estimates:

'*First Plan.*—All in river, using wing dams and Long's scrapers, distance 118 miles, *to secure a depth of three feet*, low water navigation, $427,749.37. Improvement to be available the second year, the money all wanted the first year. Annually thereafter $30,000.

'*Second Plan.*—To secure *four feet depth* for navigation at low water, twenty-seven miles in the river, ninety miles of canal, seventy feet wide at bottom and eighty feet at top, twenty-four miles being in wider places of old river bed, locks 160x30 feet, total lock lift 138 feet, sides of canal in cuts paved for use of steamboats—$3,206,790.95. In order to finish in third year, require $1,603,385.95 the first year, the remainder the second year, and $50,000 annually thereafter.

'*Third Plan.*—To secure *five feet navigation* at low water, all to be canal, 118 miles. Canal seventy feet at bottom, eighty feet at top. Locks 160x35. Total lock lift 175 feet. Sides of canal in cuts paved to allow the use of steamboats—$4,164,270.00. In order to finish in third year, will require $2,082,130.00 the first year, the remainder the second year, and $60,000 annually thereafter.

'I would urge the adoption of the third plan if means can be raised, providing, however, at first for only a four foot navigation. The second plan, if adopted, should be carried out with a view to being changed to the third if required. The first plan, three feet navigation, may have too much inconvenience for the great amount of transportation designed for this route.''—(P. 360, Rept. Sec. War.)

"It is then reduced to this, that a low water channel in the river of *three feet* depth can be had for less than $500,000; that a low water channel of *four feet* depth, partly in the river, but chiefly a steamboat canal, paved at the sides, wider at the bottom by fourteen feet than the Erie canal, can be had for a little over $3,000,000, and that a like channel of *five feet* depth, all canal, can be had for a little over $4,000,000."

With such an amount of facts, and so moderate an estimate by one of the most competent officers of the government before them, there ought to be no question on the part of congress as to what they should do in the premises. Action may be unwisely delayed; but the claim of the petitioners is one that must continue to grow stronger and stronger.

BY WHOM SHOULD THE WORK BE DONE?

Not by Wisconsin. For although the proposed work is to be wholly confined to her territory, she cannot constitutionally undertake it. Besides, which, she will only share with the other northwestern states in the benefit.

Not by Iowa, or Minnesota; for the same reason.

Not by these three states combined. For, although, at present, more largely and immediately interested in its early completion, the great states of the future which lie just beyond are also interested, and, before many years have passed, will have quite as much at stake in it as any of those first named.

Not by the entire northwest, even were that vast area this moment occupied by states fully organized and constitutionally authorized to make the necessary appropriations. For it concerns not the food-producing states alone. The food-consuming states and the manufacturing states, whose exports will make the proposed canal the channel of their westward shipments, have also great interests involved.

Not by the northwestern and the eastern states combined. For its advantages will not be confined to these. Nor yet by some powerful corporation authorized to collect tolls in large amount and so make it a great source of revenue, as it certainly would be. Not by any corporation whatever. For to make the improvement what it ought to be, it must be a *free highway of the nation* for the transit of its commerce in time of peace and of its military stores and munitions in time of war. Nothing less than this will satisfy the people of the eastern, middle and western states. Nothing less should satisfy the government of the United States.

I do not say the work should not be done at all unless done by the general government. That is quite another proposition. Somehow it must be done and that without much further delay. Better that it be put through at the expense of Wisconsin, Iowa and Minnesota alone than be delayed another decade. Better that the state and the nation relinquish *in toto* their entire right and title to the vast results of the prelimminary work already done by the Almighty to some sufficiently strong corporation, and allow it to make a gigantic monopoly of the commerce of this entire belt of great states—better almost anything that would insure the work than that it should altogether fail. But then it is eminently a *national work, and therefore ought to be done by the nation.*

NEW RAILROADS CENTERING AT GREEN BAY.

The Green Bay and Mississippi Canal is certain to be a fact in the early future, and to exert a marked influence upon the development, not only of that wide belt of country through which it will pass, and which will be more directly tributary to it, but likewise upon the whole state.

That it will also add to the importance of Green Bay as a commercial point—that it will powerfully contribute, in fact, to the making of that city what nature seems to have designed it should be, namely, an important commercial center, there is no room to doubt.

Appreciating these circumstances, and recognizing the fact that Green Bay must not rely solely upon this river improvement and the railroad facilities it already enjoys, a vigorous effort is making to push two new lines across the state from that point—one directly westward to Wabashaw, on the Mississippi, and one northwestward into Oconto county, with its final terminus on lake Superior.

The first-named road is intended to open central Wisconsin to the rest of the world, and to furnish a more direct line of transportation than can otherwise be had for the products of southern Minnesota; the second to promote, in like manner, the development of northern and northeastern Wisconsin, and to secure to Green Bay the advantages of an entrepot for these sections of the state.

IMMIGRATION.

As was predicted at the close of the war, which established the confidence of the world in the perpetuity of our free institutions, the influx of foreign populations has been greater than at any former period of our national history.

The opening of the southern states to free labor, and the completion of the Pacific railroad have turned the tide of immigration partly into unaccustomed channels, and thus deprived the northwestern states of a portion of the increase they would otherwise have had, as a result of that greater influx. Still the actual number of immigrants who have settled in these states during the year 1869 is believed to have been greater than at any former period.

Owing to the extraordinary efforts made by some of the other of these states, including especially, Minnesota, Iowa, Missouri and Kansas—efforts begun years ago, while Wisconsin was trusting to Providence and doing nothing—this state has received less than its fair proportion of the total number.

The new board of immigration has done what it could, with its limited resources, to restore the equilibrium, and is enabled to present in its report for 1869 data that warrant the estimate of some thirty or thirty-five thousand as the number of immigrants who have come to the state within that period.

Of this number, 15,576 are reported to have entered the state by way of Milwaukee; the remainder coming by way of the other lake ports and via Chicago.

Distributed by nationalities, 7,037 of the 14,576, were Germans, 7,052 were Scandinavians, 171 were English, 50 were Irish, 16 were Scotch, 45 were Welsh, 37 were French, and 170 were Hollanders.

The amount of $3,000 per annum is certainly inadequate to the important work that ought to be done by the board. For if statisticians and political economists are right in claiming that their capacity for productive labor, added to the amount of cash actually brought with them, warrants an estimation of the average valuation of immigrants at over $1,100 each, then a more liberal amount than $3,000 would be a paying investment.

It is a just ground for congratulation that the class of immigrants who annually choose Wisconsin as the place of their future abode are so largely from the most intelligent, industrious and enterprising of the working populations of the old world.

AGRICULTURAL EDUCATION IN WISCONSIN.

But two years having elapsed since the organization of the agricultural department of the state university, and the total proceeds of the congressional grant upon which it was based not yet having reached $6,000, it were unreasonable to expect large results in the work of industrial education thus begun.

The labors of the farm committee of the board of regents, of the president of the university, who has given much attention to this department, and of Prof. Daniells, in immediate charge, have by no means been fruitless, however.

At the date of organization, the farm recently purchased for experimental uses was nearly every foot of it in a state of nature, and such portions as were first demanded for improvement were incapable of cultivation without the expenditure of much labor in removing the great number of boulders imbedded in the surface. There were no farm buildings of any kind on the premises; nor was there a team or an implement with which to commence operations. And as to facilities for instruction, the only laboratory was in an unfinished condition; while an industrial museum and a much needed agricultural library were yet to be begun.

Fortunately for the improvement of the farm, the law of re-organization, which made provision for the purchase of the necessary lands, also included these words, "and to *improve* the same." Under this provision the board had a surplus of a few thousand dollars, after paying for the farm, to use in improving it. Employing this money, they have grubbed and debouldered a number of acres, erected a good farm barn and a dwelling for the foreman of the farm, and done something towards improving the grounds more immediately about the university buildings—operations, the details of which are found, in part, in the report of Prof. W. W. Daniells, a portion of which will be embraced in this volume.

Besides the instruction given by the agricultural professor, occasional lectures and courses of lectures have been given by the president, Professor Addison, E. Verrill of Yale College, and one or two other parties.

A want of funds must long be a barrier to progress in this department; and until the people are willing either to give out of their own individual pockets, as some have nobly done in the other states, or to instruct their representative law-makers to make more adequate provision, they must patiently wait for the desired results.

That agricultural education is not in demand in Wisconsin, as has been strangely enough asserted in high places, since the date of organization of the agricultural department, we hold to be nothing less than heresy.

THE AGRICULTURAL SOCIETIES OF THE STATE

Have had an active, and, in the main, a prosperous year. —— county and a number of other local societies have held exhibitions, most of which were unusually well attended by exhibitors and people. These organizations are doing much good in the way of stimulating the industry of the state, correcting stereotyped errors of practice, diffusing knowledge and elevating the profession. An abstract of the returns made to this office in accordance with the provisions of law for the years 1868 and 1869, together with concise statements of the doings of other industrial organizations will be found accompanying this report.

The state agricultural society has had the most prosperous year since the date of its organization, if we consider the work it has done and the practical results of that labor independent of the pecuniary returns from the exhibitions. Early in the season the society issued its seventh volume of transactions, embracing the years 1861 to 1868, both inclusive. The exhibition of 1869 was the largest and most complete in all the departments, and during the continuance of fair weather, the best attended of the sixteen exhibitions hitherto held in Wisconsin.

The last day was a rainy one, however; on which account its attendance and receipts were almost nothing, instead of the $2,000 reasonably expected.

The number of entries in the several departments was 1762; 489 of which were in division A., (domestic animals); 585 in division B., (products of the earth, the dairy and the household); 637 in division C., (manufactures of every kind and works of art); and 51 in division D., (department of personal effort).

The total cash receipts for the year were, $12,711,31; of expenditures, $12,032,54—the balance being $678,77.

For a full account of the financial transactions reference is made to the report of the treasurer, herewith submitted.

The attendance of Lieutenant General Sheridan, with Gen. G. A. Forsythe, of his staff, and Maj. Gen. Merritt, U. S. A., gave *eclat* to the occasion, and added to the number of citizens who would otherwise have attended. To these distinguished men of arms, as well as to the large number of scarcely less distinguished civilians who served the society in the capacity of orators, the managing officers are under great obligations.

For the speeches of those gentlemen as well as for a detailed account of the exhibition generally, including the list of premiums awarded, you are respectfully referred to the accompanying statement entitled "Exhibition of 1869."

It is now ten years since the society relinquished its former standing appropriation of $3,000. It was the purpose at that date, and has been the purpose ever since, not to ask a reinstatement of that appropriation, or any appropriation at all, so long as the society could carry on its work independent of aid from the state. So far it has been remarkably successful; though, with the constantly increasing amount of premiums offered, there has been a gradual decline in the amount of surplus annually left in the treasury.

The time has come in the growth of the state, when the more effective stimulation of various important branches of industry requires that the society should be able to offer larger prizes. But to do this without the danger of utter bankruptcy, in the event of stormy weather during any one fair, is out of the question. The officers have formed plans which promise to increase the revenue of the society the present year. Should they succeed, we shall be able to replenish the treasury and again stand on better footing. If not, it will be imperative upon the managers to ask the enactment of a law making to the society a reasonable annual appropriation for an increase of the premium fund.

By some appreciative friends of industry and of the faithful and vigorous efforts of the society in times past, the question has already been raised, whether it is wisdom on the part of the state to allow its industrial organizations, upon whose constant labors the material growth and prosperity of the state so much depend, to struggle half fettered and hampered for want of a little pecuniary aid—whether it would not be better policy to deal with them liberally and so put them in a position at once to make their labors more effective.

In behalf of the executive board, I have the honor to be,

Very respectfully,

Your obedient servant,

J. W. HOYT,

Secretary.

STATE AGRICULTURAL ROOMS,
January, 1870.

PROCEEDINGS.

EXECUTIVE MEETINGS.

STATE AGRICULTURAL ROOMS,
MADISON, February 2, 1869.

The executive board of the state agricultural society met pursuant to requirement of by-laws, in their rooms, on February 2.

Present—Messrs. B. R. Hinkley, president, Nelson Dewey, C. H. Williams, W. R. Taylor, Rufus Cheney, W. W. Field, J. H. Warren, N. S. Green, David Atwood and J. W. Hoyt.

President Hinkley in the chair.

The place for holding the fair having been fixed for two years at the date of the meeting of 1868, and the grounds still being in excellent condition for the exhibition of 1869, the only business of importance to be considered was the revision of the rules of the society, as to the management of the annual fairs and the preparation of a list of premiums.

Accordingly, on motion,

The committee proceeded with said work and, with necessary recesses and temporary adjournments, continued therein until noon of February 4, when it adjourned *sine die.*

The result being the regulations and list of premiums and judges, as published in the *Western Farmer*, and afterwards in a pamphlet widely distributed throughout this state it is not deemed necessary to occupy space in this volume with a recital of the details of the meeting—especially as the only important changes made in the rules and premiums of the year 1868, were the following:

1. The opening of all classes of the exhibitions, except those comprised by division A, "to the world."

2. An increase of premiums and the amount of premiums in division A, and B—"domestic animals" and "products of the earth."

3. The addition of cash premiums of $100, and $50 to the offer of a Prize Banner for the best exhibition to be made by any one county, exclusive of Dane, at the fair.

4. The formation of a resolute purpose to make timely and thorough provision for a superior exhibition in the department of operative machinery.

5. The requirement of life members as well as others to purchase carriage tickets.

A proposition from the state horticultural society for a joint exhibition on the basis of said exhibition being a department of the general exhibition of the state agricultural society, but under the immediate direction of the officers of the horticultural society, was accepted; the horticultural society to have the preparation of the premium list of that department, the selection of the judges, and the award and delivery of the premiums; and the agricultural society to appropriate from its funds $600 for the payment of said premiums so awarded.

The officers agreed upon for the management of the exhibition in its several departments were as follows:

General Superintendent—B. R. Hinkley, President.
Controller of Entry Office—J. W. Hoyt, Secretary.
Controller of Ticket Office—David Atwood, Treasurer.
Marshal—W. R. Taylor, Vice-President.
Superintendent of Gates—J. O. Eaton, Member Executive Committee.
Ticket Accountant—D. H. McArthur.
Superintendent Horse Department—N. S. Green, Member Executive Committee.
Cattle Department—C. H. Williams, Vice-President.
Sheep Department—Eli Stilson, Vice-President.
Swine and Poultry Department—Jas. Baker.
Agricultural Department—W. W. Field, Member Executive Committee.
Horticultural Department—O. S. Willey.
Machinery Department—Rufus Cheney, Vice-President.
Department of Manufactures—Saterlee Clark, Vice-President.
Department of Fine Arts—J. H. Warren, Member Executive Committee.
Department of Personal Effort—W. R. Taylor, Marshal.

STATE AGRICULTURAL ROOMS,
MADISON, Sept. 27, 1869.

The executive board met pursuant to requirement of the by-laws.

Present—Messrs. Hinkley, Taylor, Cheney, Field, Atwood, Stilson, Green and Hoyt. Notice was received from the other members of the committee, explaining their absence and declaring their purpose to arrive the following day.

President Hinkley in the chair.

The secretary made an encouraging statement of the condition of affairs relating to the exhibition, and presented various questions of detail touching the management of the several departments.

Members of the society not of the board presented themselves at the meeting and communicated the fact, that there was much clamor against the new rule requiring life members to purchase carriage tickets, a thing they had not been in the habit of doing.

The president and secretary explained that a life membership properly covered the privilege of free exhibition, of admission of the holder and family to the exhibition, the voting for officers, and upon all questions raised at the annual meetings of the society, together with a copy of the society's transactions—when the same could be furnished—nothing more. That the question of details concerning admission, what constituted a man's *family*, etc., were determinal by the board on the basis of common sense and justice to all parties concerned. Acting on this principal as the constitutional guardians of the interests of the society and its members, the board had resolved that a member's family should be construed to include his wife and children *under age*; and that inasmuch as free admission of life members' carriages had been considered by the board in the light of a special favor, to be continued only so long as the society should not be seriously inconvenienced by it; since the time had now come when the large number of life members, made it inevitble that the grounds should be greatly encumbered with their carriages and wagons, if free admission were allowed; since, a large proportion of members to be benefited by such free admission are residents of the county where the fair is held, and whose extra convenience wouid thus be secured at the sacrifice of the comfort and convenience of outside members, not so circumstanced as to avail themselves of the privilege in question; and since, moreover, the premium list of the society demanded the largeest possible receipts consistent with strict justice to all parties concerned, there was ample warrant for the rule under consideration.

The other members of the board concurring, the said regulation was adhered to.

After the arrangement of various details connected with the fair, the board adjourned to meet the following evening, and on each successive evening during the progress of the exhibition.

Which meetings were held accordingly.

STATE AGRICULTURAL ROOMS,
MADISON, October 5, 1869.

The executive board of the society met pursuant to call of the president, for the auditing of accounts and the payment of claims growing out of the exhibition.

Present—Messrs. B. R. Hinkley, President, W. R. Taylor, David Atwood and J. W. Hoyt.

President Hinkley in the chair.

The board continued in session two days, in discharge of the duties named in the call, and adjourned *sine die.*

STATE AGRICULTURAL ROOMS,
November 30, 1869.

The executive board met, pursuant to requirement of the by-laws, on the 30th of November—being the day previous to the date of the annual meeting of the society—for the examination of all accounts of the secretary and treasurer, the adjustment of any unsettled accounts and the preparation of the annual report of their transactions to the society at large.

The report of the treasurer showed total receipts of $12,712.31, and disbursements amounting to $12,032,54; the balance in the treasury being $678.77.

[For the treasurer's statement in full, see report as published under the head of "Annual Meeting of the Society."]

The board having concluded its work adjourned *sine die.*

SOCIETY MEETINGS.

MEETING FOR THE ELECTION OF OFFICERS.

STATE AGRICULTURAL ROOMS,
September 30, 1869.

The soceity met, pursuant to requirement of the constitution and to published notice, in their rooms, at 7 o'clock, for the election of officers of the society for 1870.

A large number of life members were present.

President B. R. Hinkley in the chair.

On motion, the usual committee on nominations was appointed. During the absence of the committee, the secretary read a statement of the financial transactions of the society for the year 1868.

The following is the list of officers nominated and duly elected:

President—B. R. Hinkley, Summit.

Vice-Presidents—W. R. Taylor, Cottage Grove; C. H. Williams, Baraboo; Eli Stilson, Oshkosh; Saterlee Clark, Horicon; J. G. Thorp, Eau Claire; Rufus Cheney, Whitewater.

Secretary—J. W. Hoyt.

Treasurer—David Atwood.

Additional members Executive Committee—C. L. Martin, Janesville; N. S. Green, Milford; W. W. Field, Boscobel; J. O. Eaton, Lodi; J. H. Warren, Albany; L. B. Vilas, Madison; Nelson Dewey, Cassville.

On motion, the society adjourned *sine die.*

ANNUAL MEETING.

STATE AGRICULTURAL ROOMS,
MADISON, December 1, 1869.

Pursuant to a requirement of the constitution, the society met in the State Agricultural Rooms at 3 o'clock P. M.

Quorum present.

President Hinkley in the chair.

The secretary stated the business of the meeting to be the examination of the treasurer's report and its approval or amendment by the society.

Mr. H. A. Lewis moved that a committee of three life members be appointed by the chair for the purpose of examining the accounts of the secretary and treasurer.

The president appointed Messrs. H. A. Lewis, Timothy Brown and Chas. L. Williams.

The following is the report of the treasurer, with the report of the committee of examination :

TREASURER'S REPORT.

To the Executive Board of the Wisconsin State Agricultural Society.

The financial transactions of the Wisconsin State Agricultural Society for the past year have been as follows:

Receipts.

Dec. 9, 1868.	Balance in treasury as per report.....	$357 10	
March 1, 1869.	Received on Driving Park note.......	500 00	
May 24, 1869.	....do............do...............	1,000 00	
Aug. 2, 1869.	....do............do...............	800 00	
Oct. 1, 1869.	....do...as entry fees, at fair.......	699 25	
	....do...as rents, (refreshment lots)..	1,704 80	
	....do...from sale of tickets........	6,360 20	
	....do...for life membership........	20 00	
	....do...for grain and hay..........	69 96	
Nov. 3, 1869.	... do...from Driving Park Association, balance of note..............	200 00	
Nov. 5, 1869.	Received of Dr. J. W. Hoyt, (loan)....	1,000 00	
			$12,711 31

Disbursements.

Dec. 1, 1869.	By cash paid on orders, from No. 1 to 396 inclusive, (except Nos. 344, 357, 371, 372 and 394), and on orders numbered 349, 356, 360, 361 and 362, of 1862, this day balanced and canlelled..	$12,032 54
Leaving balance in treasury Dec. 1, 1869......................		$678 77

Respectfully submitted,

DAVID ATWOOD,
Treasurer Wisconsin State Agricultural Society.

REPORT OF COMMITTEE OF EXAMINATION.

We hereby certify that, having examined the foregoing report of the treasurer of this society, with the accompanying vouchers, and compared the same with the secretary's accounts, we find the said accounts in all respects just and true, and that bills and vouchers for the several items are on file and open to inspection in the office of the society.

Respectfully submitted,

H. A. LEWIS,
TIMOTHY BROWN,
C. L. WILLIAMS,
Committee.

STATE AGRICULTURAL ROOMS, Dec. 1, 1869.

On motion of Robt. Wootton, the report of the committee of examination was approved by the society.

On motion, the society then adjourned *sine die.*

EXHIBITION OF 1869.

The exhibition of 1869 was held on the beautiful grounds of the Madison Driving Park Association—the same with those occupied in 1858, 1860, 1867 and 1868. Additional improvements had made them more attracttve than ever; so that it was not without good show of reason that they were repeatedly pronounced by the many visitors from abroad the handsomest fair grounds in the United States.

As usual, Monday and Tuesday were devoted to getting articles and animals in place, and making everything as thoroughly ready as possible, although the afternoon of Tuesday, was made interesting by a fine display of horses on the track.

On Tuesday evening, according to the special programme of the fair,

THE ANNUAL MEETING OF THE STATE WOOL GROWERS' ASSOCIATION

Was held in the senate chamber. There was not a large number present. The meeting was called to order by the president, Eli Stilson, Esq., of Oshkosh, who made a few remarks in reference to the depressed condition of wool-growing, which prevented that interest being felt in, and attendance at, this meeting, which would otherwise have been the case, but expressing the hope that there was a good time coming, and advising the maintenance of the organization and all possible efforts to improve in wool growing. R. S. Graves was chosen secretary *pro tempore.* The following officers were elected for the ensuing year:

President—Eli Stilson, Oshkosh.

Vice-presidents—Geo. F. Wheeler, of Fond du Lac county; O. Cook, of Whitewater.

Secretary—T. H. Goodhue, of Whitewater.

Treasurer—C. K. Stewart, of Danville.

Executive Committee—R. Richards, of Racine; W. B. Kingsbury, of Ripon; E. S. Hammond, of Fond du Lac; C. H. Lewis, of Sun Prairie; H. H. Dixon, of Ripon.

FORMAL OPENING OF THE EXHIBITION.

The exhibition was formally opened under favorable auspices on Wednesday morning, the 29th of September, with an appropriate address by the president, B. R. Hinkley, a copy of which will be found in the succeeding pages.

The several departments had been unusually well filled—"Agricultural Hall," decidedly better than even before—and the quality of articles and animals gave encouraging proof of the steady progress making in all branches of our state industry.

The roll-call of the judges yielded the usually unsatisfactory result; not more than one-fifth of the whole number appointed responding to their names. The consequence was that the whole of Wednesday and a good part of Thursday had passed, before it was possible for the officers to get the last of the class books into the hands of such committees as gave satisfactory evidence of competency. This non-appearance of the judges elected by the executive board, and the necessity imposed of forming committees on the grounds, is one of the most serious difficulties with which the society has to contend. Various remedies have been suggested, but no way has yet been found for avoiding this embarrasment.

As the duties of the secretary, during the exhibition, necessarily preclude his carefully observing either the articles or animals shown, or what transpires in the execution of the special daily programme, he must of necessity rely upon the reports of others. Trusting to their accuracy, quotation is accordingly made from the very full accounts published in the *State Journal* of that date:

[Condensed from the State Journal.]

THE DEPARTMENTS.

The exhibition as a whole is fully equal to that of former years, and in some respects superior.

The display of horses on the track Tuesday afternoon was a magnificent one, though only a portion of the fine animals on the ground were brought out, and as they passed over the track with proudly arching necks and stately steppings, or flew like the wind, the grand descrption in the book of Job of this one of the most noble of the animals over whom God has given dominion to man, was recalled: "Hast thou given the horse strength, hast thou clothed his neck with thunder? The glory of his nostrils is terrible; he paweth in the valley and rejoiceth in his strength; he mocketh at fear and is not affrighted; he swalloweth the ground with fierceness and rage; he saith among the trumpets ha ha! and he smellelth the battle afar off." * * There are 200 entries of horses; 6 thoroughbreds; 6 running; 6 sweepstakes; 7 trotting stallions; 6 trotting mares; 3 matched trotting teams; 21 roadsters; 16 draft; 43 matched horses and mares; 46 for general purposes; 26 single geldings and mares. Among these horses are some of the best thoroughbred and fastest "goers" in the state; long-bodied, smooth-limbed, thin-necked, far-striding coursers, and whom admiring grooms assiduously care for; stallions with tremendous necks and powerful legs and shoulders; drafthorses of great strength and well rounded forms; horses famous on the turf and younger animals who give promise of becoming equally illustrious; yearling and two year old colts, and handsome mares with pretty sucking colts, besides some scrub stock that serves as a foil to set off the superior beasts. * * * * * * *

The show of blooded cattle has seldom been equaled, though made up largely by the splended herd of Durhams shown by Mr. E. P. Brockway of Ripon, and the herd of 21 beautiful Devons, shown by Luther Rawson of Oak Creek. Mr. Brockway has the most symmetrical Durham Bull, "Lord Lieutenant," that we ever saw, and very fine cows and calves with pedigrees as well established as any of the "F. F.Vs'." Mr. Rawson's Devons it would be hard to excel anywhere. W. Rhodes of Salem, also has some fine Devons. Waukesha county fills eight stalls with good Durhams. * * *

The sheep pens are all full and contain fine representatives of the different breeds, Merino, Cotswolds, Leicesters and Southdowns. The principal exhibitors that we noticed were H. H. Dixon of Ripon; Robert Henry, McFarland: J. Goodman, West Middleton; L. Rawson, Oak Creek; G. H. Daubner, Brookfield; I. N. Chamberlin, Beloit; and Robert Ogelvie, of this city, who had eighty-nine long-wooled sheep, including a Cotswold buck, twenty-seven months old, weighing 330 pounds, which sheared twenty-five pounds of wool this spring and has five inches of wool on now.

The show of swine is rather meager. The principal exhibitors were J. N. Chamberlain, of Beloit, who had some very handsome Berkshires; D. McNeil of Stoughton, and D. R. Hyer, of Madison, who showed a Berkshire and Essex cross pig, 22 months old, weighing 800 pounds.

The show of poultry is not large, including some peacocks, varieties of geese and ducks, and different sorts of chickens.

In the building devoted to the products of the soil, dairy and household, there is such a great variety and so much that is noteworthy, that we hardly know of what to make special mention. There is a fine collection and variety of grain and seeds. Wheat, spring and winter, oats, Norway, surprise and common, buckwheat, barley, rye, sufficient corn, of a dozen or more different varieties, field and garden growth, showing that the crop is by no means a failure, peas, beans, (16 varieties raised by Arthur B. Taylor, a boy ten years old); clover, timothy, and other seeds. J. C. Starkweather, of Oconomowoc, shows some Norway oats, yielding 48 pounds to the bushel, and 113 bushels to the acre, and 12 varieties of grain, including extraordinary pop corn; a mammoth marrow squash, raised by A. Hubbard, of Oshkosh; superb cauliflower, and other vegetables; a fine lot of potatoes, cabbage, turnips, parsnips, carrots, and other vegetables, remarkably fine celery, very fine onions, pure white and dark purple; fine collections of various sorts of vegetables from Waukesha, Kenosha and Winnebago counties, the latter showing some very fine cabbages; some elegant late potatoes; a fine show of potatoes, called "Early Rose," shown by J. Cary, of Footville, which yielded ten bushels from one pound of seed. In the corner is what seems to us the most valuable thing in the hall, a show of thirty-nine choice varieties of potatoes raised by Hon. M. K. Young, of Glen Haven, Grant county, who has devoted much time, care and money to developing the best varieties of potato for our soil and climate, and who paid many dollars a pound for some of his seed. Among his varieties are the "King of the Earlies," "Climax," "Early Prince," "Excelsior," "Prolific," "Willard," and others, and best of all, a very handsome, smooth, white skinned, oblong hybrid potato, raised by himself, and which for appearance, uniform texture and other superior qualities and enormous yield, is a little ahead of anything else, and which he proposes to call "The White Rose," of which he has very few as yet. Hard by are two splendid lots of melons by various exhibitors.

Machinery and implements abound every where on the grounds about the building devoted to operative machinery. The steam engine in the building kept up a constant whirr and buzz among the hub and other machinery, and the agricultural machines and implements cover acres of ground. The finest show ever made in Wisconsin.

The manufacturers of the state are well represented in Manufacturers' Hall, which is crowded to overflowing with carriages, cabinet ware, willow ware, wagon work, iron manufactures, carpeting, cloths, satinets, flannels, shawls, etc., etc.

The Fine Art Hall is not crowded but has some things worth looking at—paintings, fancy work, specimens of dentistry, sewing and knitting machines, pianos, a statue carved in wood, and especially a unique set of furniture made by Victor Wiscolsil of Sauk City, the legs of table and chairs, back and arms of chairs in great part composed of stags' horns. Madison has but little to contribute in this way, and articles of *vertu* rarely come from a distance.

Pacing Horses.—The first performance of the day after the opening address was a mile-dash pacing match. After inspiriting music by the Madison brass band, the judges, Messrs. R. T. Pember, of Janesville; William Casor, of Janesville, and George A. Mason, of Madison, took their places upon the stand. There were three entries.

J. Leslie, of Platteville, Grant county, entered "Joe Bowers;" Billy Welch, of Madison, the sorrel horse "Kelley Davis,"; Geo. Young, of Madison, the bay mare "Lady Norway." "Joe Bowers" and "Kelley Davis" first went round together, the bay taking the pole—after two or three trials they got off pretty well together. The Platteville horse went in good shape, pacing squarely round until he started on the home stretch, when he broke a little, but did not gain, and came in in 2.30¾. "Kelley Davis" broke badly and was distanced on the first quarter, coming in a long way behind. "Lady Norway" then went round alone, rather slow, however, taking 3.20 to pace the mile. "Kelley Davis" having made it in 3.05, and winning the second prize of $15, the first of $25 having been awarded to "Joe Bowers."

LADS' EQUESTRIANISM.

The pacing match was followed by a display of lads' equestrianism, for excellence in which there were three prizes: first, "Forester's American Horses," two large royal, octavo volumes; second, silver ice pitcher; third, gold-lined silver cup,—and of which N. B. Van Slyke, of Madison; Richard Richards, of Mount Pleasant, and W. C. Allen, of Walworth, were judges. There were ten entries, as follows: Del Donald of Berlin; George Fratt of Racine; Clarence Schuyler of Janesville; H. D. True of Fitchburg; Charles Warren of Madison; Leighton Bement of Oregon; F. Salsbury of Fitchburg; Fred Wallace of Baraboo, an accomplished rider and winner of the prize last year; James Wells of Lodi; Asa B. Hill of Token Creek, who came on the track on a bay horse too late to compete for the prize.

* * * After the trial, Mr. Van Slyke, in behalf of the committee, awarded high praise to all the youthful contestants for the excellence of their riding, and announced that, taking all things into consideration, the skill in management of horses, manner of sitting and riding, they had awarded the first prize to Master Warren, second to Master True, and third to Master Fratt.

The Running Horses—Two Mile Heats.—The principal feature of interest was a two mile heat of running horses. This was a trial of speed of running horses, two mile heats, best two in three, first premium $100, second $50; three entries required. It was very satisfactorily managed, the judges being Mr. R. T. Pember and Dr. C. Loftus Martin and William Casar of Janesville.

The following horses were entered and came on the course.

D. Harver of Monroe, sorrel mare "Prairie Lilly;" F. Bradley of Fall River, sorrel stallion "Twenty Cents;" J. R. Hunter of Clinton, Rock county, a sorrel gelding. There were two other entries, but they were withdrawn before the race. The gelding drew the pole, "Prairie Lilly" the second place and "Twenty Cents" the outside.

For the first heat the horses got off the first time they scored, getting a beautiful start. The first mile was run in two minutes, the mare keeping ahead through the mile and the stallion second and "Prairie Lily" keeping the lead till the home stretch. On the home stretch the race was very close and was won by "Twenty Cents" by the throat latch. Time for the heat 3.56, the sorrel gelding being distanced. This was the closest race ever known on the track.

For the second heat the horses got off well, "Prairie Lilly" leading off and keeping the lead the first mile which was made in 2.02; on the second mile "Prairie Lilly" kept her lead to the last quaarter post, where "Twenty Cents," with a fine burst of speed, passed her, winning the race by a length. Time 2.53¾.

The first prize was taken by "Twenty Cents" and the second by "Prairie Lilly."

MR. FLINT'S ADDRESS IN THE EVENING.

The assembly chamber was filled at the appointed hour (8½ P. M.) with a discriminating audience of farmers and citizens, to listen to the address of Hon. C. L. Flint, of Massachusetts, a gray-haired, dark-eyed, pleasant-looking man, with a good voice—the subject "Concentration of Labor on the Farm."

Mr. Flint spoke without manuscript, and he treated his theme exhaustively, as was to be anticipated from one of the first agricultural authors and highest agricultural authorities in America. Since the publication of his admirable work on "Dairy Farming," he has been in wide demand wherever farmers have assembled.

[For synopsis of this address see subsequent pages.]

ARRIVAL OF GEN. SHERIDAN.

The gallant Lieutenant-General of the army, who won so many laurels in the east and the west during the war, the hero of Winchester and Five Forks, arrived here from Chicago at 11.25 P. M. He was met at the depot with carriages by Secretary Hoyt of the agricultural society, Gov. Fairchild, Secretary Allen, Bank Comptroller Rusk, and an escort of a company of veteran soldiers belonging to the G. A. R., and a large number of citizens. He was greeted with heavy cheers as he stepped on the platform and escorted by the G. A. R. with lighted torches to the music of the Madison brass band, taken to the Vilas House, where quarters were provided for him.

He was accompanied by Major General Wesley Merritt, one of the dashing cavalry leaders of the war, the successor of General Sheridan in the command of his corps, and by Brig. Gen. A. Forsythe, of his staff.

Fourth Day.—The heavens are propitious and finer weather than that provided for the great day of the fair could not be imagined.

The crowd, which by the way yesterday afternoon must have been swelled to some 8,000, bids fair to-day to be beyond all precedent. The road from the city to the Fair Grounds is a constant procession of wagons and carriages, and only those who were there early this forenoon can have any very good opportunity of inspecting the contents of the halls.

During the early part of the forenoon there was a magnificent display, which would do credit even to the famous "Blue Grass" stock region of Kentucky, on the track and within its circle near the grand stand.

ARRIVAL OF GEN. SHERIDAN ON THE GROUNDS.

At 10 o'clock Secretary Hoyt brought Lieut. Gen. Sheridan on to the grounds. He was received with music by the band at the gate, and escorted to the executive office, where he was introduced to the officers of the society, and then taken to see different parts of the exhibition. Crowds gathered around the gallant general, and hailed his presence with delight wherever he went.

By 11 o'clock the fast coming crowd, which kept the ticket sellers busy all the morning, was thronging all over the grounds and surging through buildings, where it was almost impossible to see anything, though the superintendents arranged to facilitate ingress and egress, as much as possible, and at noon there were over 20,000 people on the ground.

LADIES' RIDING.

The display of female equestrianism, on which the crowd looks with more interest than on almost any feature of the state fair, came off at 11.40 A. M., and ladies never had an opportunity to show their skill in horseback riding before such a crowd of spectators. On the grand stand were the gallant Phil. Sheridan, Lt. General of the armies of the United States, Maj. Gen. Wesley Merritt, and Brig. Gen. Forsythe, Gov. Lucius Fairchild, and Col. Chas. D. Robinson, the rival candidates for governor, Gen. Allen, secretary of state, Gen. Rusk, bank comptroller, Mayor Proudfit. President Hinkley and Secretary Hoyt of the state agricultural society, President Chadbourne of the State University, and Mr. Flint, of Massachusetts, Hon. Geo. B. Smith and others. The seats opposite, and the eminence around the hall of fine arts, were crowded with people from all parts of the state, while all along the western part of the track was crowded with people in carriages and on foot. Just as the riding commenced the children from the orphans' home, preceded by an independent band of music, and escorted by Secretary Hoyt of the society, and Superintendent Towers, of the home, filed over the hill from the entrance beyond the track, presenting one of the most beautiful and touching spectacles we ever witnessed, and producing a decided impression upon the minds of the multitude.

The acting judges wers Messrs. N. B. Van Slyke of Madison, Hon. W. C. Allen of Walworth, and Richard Richards of Mount Pleasant. There were eight contestants, all but two from Dane county, as follows:

Miss Mary J. Smith of Burke; Miss Nellie Webb of Belleville; Miss Nellie Root of Verona; Mrs. D. F. Salsbury of Fitchburg; Miss Eliza Daily of Cottage Grove; Miss Luella Scott of Lowville, Columbia county; Miss —— Heath of Burke, who declined to give her first name when asked by the judges; Miss Luella H. Owen of Brooklyn.

After all had been arranged in front of the stand, Mr. Van Slyke, that there might be no misunderstanding, explained the views of the committee as to the kind of riding that they thought most deserving—not violent, fast or rough riding, but easy and graceful, such as showed the most skill in managing and controlling and adapting oneself to the horse ridden, and general good carriage. If any one had a poor horse it was her misfortune. After these sensible suggestions had been made, and Marshal Taylor had cleared the track, the ladies were directed to ride by twos up and down the track, then by fours, and then singly round the track, and then, to settle the question of precedence, Misses Daily and Webb rode alone a short distance. The Judges then awarded—according, we think, to the general verdict of those witnessing the riding—the first prize, a silver tea set, six pieces, to Miss Smith; second premium, a silver tea set, five pieces, to Miss Scott; third, a gold bracelet, to Miss Root; fourth, a silver cake dish, to Mrs. Salisbury; fifth, a silver card receiver, to Miss Daily. The riding was all unusually good, and highly praised by Gen. Sheridan and others.

Gen. Sheridan was then loudly called for, and as he appeared at the front of the stand and was introduced by President Hinkley, was received with hearty cheers; in response to which he said:

"I am very happy to make your acquaintance. You do not expect me to make a speech at this time. I will only say I am most happy to be here on this occasion."

After viewing the crowd for some time and giving them an opportunity to see him, the general entered a carriage provided and drove around the grounds for some time, expressing himself greatly pleased with what he saw of the exhibition of Wisconsin products.

The train from the west came in at 12:30 with sixteen cars heavily loaded with passengers, and trains from other directions brought other hundreds; while teams poured in over the country roads from all quarters with farmers and their wives and children. Experienced gate keepers think there were more on the ground to-day than in any one day of former fairs—over 30,000 persons in all.

TROTTING HORSES.

At 2 o'clock time was called for the first trotting match, a single dash of a mile, for stallions over five years old, for a purse of $100 for the best and $50 for the second best. The judges were Messrs. R. T. Pember, William Casar and L. Dearborn, of Janesville. For this race there were five entries—

W. S. Wells of Fond du Lac, naming "North Hawk;" J. C. McKisson of Bloomfield, "Grey Eagle;" E. Brown of Brodhead, "Berkley;" and H. Annis of Bristol, "Black Prince." Three horses started. "Gray Eagle" was given the pole, "North Hawk" second and "Berkley" outside. The race was led off by "Grey Eagle," who broke occasionally but trotted pretty fairly. "Berkley" broke badly and ran a good part of the way. "North Hawk" trotted fairly and squarely and came in third. "Black Prince" then trotted alone, keeping well at his work, showing some very fine traveling. "Grey Eagle" was awarded the first prize and "North Hawk" the second. The time made by "Grey Eagle" was 2.40¼.

Next in order was the trot of a single dash of a mile for mares, for a purse of $60 for the best and $40 for the second best. There were five entries—W. D. Edgerton, of Beaver Dam, naming "Capitola;" H. M. Johnson of Mazomanie, gray mare, "Dorcas Gray;" E. D. Stanley of Lodi, sorrel mare, "Fanny Fern;" Geo. A. Mason of Madison, bay mare, "Mollie Brooks;" L. Dearborn Janesville, sorrel mare, "Mauston Maid." A fair start was obtained, "Mauston Maid" taking the lead and keeping it, coming in ahead. "Mollie Brooks" came in second and "Capitola" third. "Mauston Maid" took the first prize, in 2.39¾, and "Mollie Brooks" the second.

Next followed a trot of geldings over five years, the first prize being $25 and the second $15. N. B. Edgerton, Beaver Dam, entered sorrel gelding, "Kentucky George;" Geo. Manning, Madison, bay gelding, "Captain Jencks;" J. Boyles, sorrel gelding, "Robert Lee." "Captain Jencks" took the lead and won the race, trotting very handsomely in 2.39¼. "Kentucky George" took the second prize.

For the best and fastest trotting matched span over five years, there were three entries. Geo. A. Mason, Madison, span of geldings; T. W. Brandt, Milton, span of matched mares; John Hayden, Lodi, span of bay geldings. Mr. Mason's team took the lead, and kept it, winning the heat and the purse. Time 3.16. The beautiful and even trotting of Mr. Mason's team attracted much attention. The second prize was given to Mr. Brandt's team. This concluded the races for the day.

During the races a large number of distinguished gentlemen were on the stand, among them Lt. Gen. Sheridan, Maj. Gen. Merritt, Brig. Gen. Forsythe, Gov. Fairchild, Col. Chas. D. Robinson, Secretary Allen, and others.

BASE BALL.

A game of base ball was played during the afternoon between the University nine and the Stoughton club, resulting in a victory for the University boys by a score of 43 to 14.

To-day the Capital city club play the University club for the first and second prizes. The base ball matches attract much attention.

FIRE EXTINGUISHERS.

A trial of fire extinguishers was had on the hill, just east of the track, which excited a great deal of attention.

The first trial was that of "Babcock's Fire Extinguisher." A pile of kerosene barrels and other inflammable matter was set on fire, and after it had got well going the agent set his machine to work, and put it out readily.

Shortly after Mr. J. R. Smith, the agent of the "U. S. Chemical Fire Engine Company" of Chicago, set on fire quite a good sized shanty, with ridge roof, which he had put up, with a quantity of inflammable matter piled in and around it, and it was soon burning with great fury, attracting a great crowd, who were kept at a distance, however, by the intense heat. The agent then charged a little garden engine, having an inch pipe, with his preparation, and in less than two minutes had the flames subdued and with the use of less than forty gallons of water, quickly caused the last vestige of fire or smoke to disappear from the badly charred wood. A committee consisting of Prof. Daniells of the University, Prof. Mason of Appleton, D. Williams and ex-Gov. Dewey, examined the apparatus and inquired into its working with much interest. It was claimed that some half dozen pounds of the preparation used, (sulphite of soda), costing less than $2, was sufficient to extinguish such a flame as just put out: that the small engine used with this preparation was equal to any ordinary $2,000 hand engine, and that the "Fire King," a larger kind, was equal to any $4,500 steam fire engine. The test was eminently satisfactory.

DR. WARDER'S HORTICULTURAL ADDRESS.

The farmers of the state, assembled here, and others interested, were last evening addressed upon the subject of horticulture, at the assembly chamber, by Dr. John A. Warder, of Cincinnati, a favorite authority on gardening and fruit, and the author of an excellent volume on "Hedges and Evergreens," and other books having a direct or an oblique bearing on rural affairs. Dr. Warder has long been a popular feature of western horticultural gatherings, and the assembly last evening bore witness to his fame, for, after a fatiguing day at the park, the farmers turned out *en masse*, and the chamber was crowded in every part, by an appreciative audience.

[For address, see Report of State Horticultural Society at the end of this volume.]

ELECTION OF OFFICERS.

At 7 o'clock, P. M., the annual election of officers took place in the rooms of the State Agricultural Society, in the capitol, where the fine collection of cereals, minerals, birds, etc., was examined with much interest.

[For list of officers see official account on a preceding page.]

Friday, the last day, treated the fair-goers to dark threatening clouds early in the morning and drenching rains during a good part of the day. Nevertheless, the programme was carried through, except that the grand cavalcade of premium animals on the track—usually a very attractive feature—was omitted.

THE ANNUAL ADDRESSES

Were several in number and highly interesting in character, as will appear from a report of them on subsequent pages, under the general heading "Addresses."

OPENING ADDRESS.

Delivered on the Fair Grounds, Sept. 29, 1869.

BY PRESIDENT B. R. HINKLEY,

FELLOW CITIZENS:—After another full period of seed-sowing, of cultivating the various crops that flourish in this northern, but yet not ungenial, climate, and of gathering in a bountiful harvest, the farmers of Wisconsin have again met to compare the fruits of their annual labors, and to rejoice over that general good fortune which has marked their operations in nearly every section of the state. Here, also, are gathered our many enterprising gardeners, vintners and orchardists, whose well directed and persevering labors have already done so much to insure the success of fruit-growing in the northwestern states, and whose samples of apples, pears, plums, grapes and other fruits are higher praise than any mere words by whomsoever uttered.

And here are our inventors with their many ingenious contrivances, their labor-saving implements and machines; our practical mechanics, whose many handicrafts add so much to the progress of every branch of industry; and our manufacturers with their multiform illustrations of the recent progress of the mechanic arts. Here, too, are our own artists, with the products of their genius and skill; and last, but by no means least, our country-women and our ladies of city and town, with the substantial products of their domestic industry and the many pleasing evidences of cultivated taste.

Nor is this great gathering confined to individual devotees of the several arts and professions. Here are likewise the representatives and the best collections of products of whole counties, some of the more spirited of which, in a most honorable rivalry, are found vieing with each other in a demonstration of their natural advantages and of the progress hitherto made by them in the several departments of their varied industry. And, finally, here also are gathered, and are coming, from every quarter of the state, and from the neighboring states, thousands of our citizens of the other pursuits, to share in this pleasant re-union and to acknowledge their common independence upon the great industrial arts.

That occasions like this, for a comparison of the best results of individual and collective effort in all that tends to advance the prosperity of communities and the civilization of the world, should have come within these past years to be not only almost universal, but to enlist the active efforts of the ablest and most distinguished men of all countries, and even to command the patronage and service of the most powerful sovereigns, is not surprising; for experience has shown them to be a most influential agency for good. The greater wonder is, that in America, where it is the theory of both government and people that labor is honorable, and an intelligent and progressive industry the foundation of national prosperity and power, there should not be a juster appreciation of them, and a more cordial support of those who inaugurate and manage them; that even among our public and prominent business men there are those who practically, if not directly and by word, deny the utility of organizations like this, and to the extent of their influence are obstructions in the way of their growth and prosperity.

It is not my purpose to show by arguments that might be brought in great force the falsity of the position occupied by persons of this class. For if a little reflection should fail to convince them, argument would probably be barren of results. It is sufficient to effect their opinion by the practical deeds of those governments of the Old and New World where national and international exhibitions, organized at vast expense and gathering products and people from every part of the globe, have been a marked characteristic feature of this wonderful age. If this and kindred associations are guilty of devoting their energies to a mission not useful in an eminent degree, they may console themselves with this—that they bear company with the greatest monarchs and wisest practical statesmen of the world.

If, leaving the main question, we occupy ourselves with details, it is not unlikely that nearly every industrial organization in the country will be found less than absolutely perfect. But if their policy and practice are in some respects obnoxious to criticism, it is less their fault in most cases than their misfortune; for the want of suitable aid from the state often necessitates the adoption of plans, and the introduction of features that find as little real favor with those who conduct such associations as with those who so persistently misrepresent and abuse them.

There ought to be appreciation enough of the worthy and important objects they seek to accomplish, to insure a support sufficient to enable them to rise superior to the necessities that now compel the adoption of measures they themselves reluctantly approve. And when the affairs of state come to be shaped and regulated by men of practical wisdom as well as true patriotism—when, in a word, the men of state come to be statesmen, instead of mere partizan politicians—our industrial organizations will doubtless enter upon a new career and better fulfill their mission than heretofore.

But I must not allow these regrets to occupy my mind to the exclusion of all thoughts of the good degree of success that even now characterizes the efforts of a very large number of industrial organizations like ours, and of the cordial and noble manner in which numbers of our most influential citizens have rallied to their support. Your presence, members and friends of the Wisconsin State Agricultural Society, is most grateful to us who are immediately responsible for the administration of its affairs, and we are glad to find in it an earnest of yet greater prosperity in the future.

On behalf of the society, I thank you, fellow citizens, and especially those of you, who, at some sacrifice of private interests, have come up to the place of annual re-union with the definite purpose of helping, by every means in your power, to make our sixteenth general exhibition the most satisfactory in its results of all that have ever been held. I thank you for your devotion to its interests, and for the zeal with which you are ever ready to labor for the public good. I will not reiterate my expressions of the anxiety felt by the executive board that all who are charged with special duties on this occasion should be mindful of the importance to the society and to the industry of the state of a prompt and faithful discharge of those duties. Nor will I attempt to urge upon the public in general the great advantage as well as pleasure that may be derived from a study of the exhibition here organized. A little reflection on the part of each will supply not only abundant suggestions but likewise every needed incentive.

Grateful for the favorable auspices under which it has been inaugurated, I now proclaim the sixteenth annual exhibition of the Wisconsin state agricultural society open.

CONCENTRATION OF LABOR ON THE FARM.

AN ADDRESS BY HON. CHARLES L. FLINT, OF MASSACHUSETTS.
[As reported for the *Western Farmer*, Sept. 24, 1869.]

The speaker began by saying it was with much diffidence he appeared before a western audience, at the earnest invitation of his friend Dr. Hoyt and the officers of the state society. His own personal experience and his observations had been confined, for the most part, to a condition of agriculture quite different from that prevailing here, and it would be highly presumptuous in him to attempt to instruct them in the details of western farming. If he were to come here to settle, to begin a new agricultural career, the first thing would be to visit their own farms, to seek information and instruction from them, to observe and to learn the results of their experience, before attempting to start a plow in the furrow. But, without pretending to advise with regard to the details of western farming, there are certain general principles which are applicable and valuable everywhere, and it was to these that he should ask attention.

In traveling over the country with an eye to the condition of agriculture, a vast difference will be noticed in the looks of farms, and as great a difference in the thrift and enterprise of the farmers. Farmers that appear to have a soil equally good, will often present quite strange contrasts to the eye of even a casual observer. How do you account for this? With a soil equally as good, with about the same amount of labor perhaps, how is it that results will differ so widely? Is it not the difference in the quality, and especially in the direction of labor? The one seems to be mere physical force; the other is guided by mind and thought, calculation and energy. It is the contrast of brute physical force with the system, the forethought and the plans of the human brain. It is the concentration of labor in contrast with its aimless diffusion.

Many a farmer who is up early and down late, who seems to be trying hard to do his best, fails to reach statisfactory results by attempting to do too much, by too much labor and too little thought, by a wrong direction of his labor, by applying it over too large a surface in proportion to the means he has at his control. He does not do all that is necessary for the complete success of his labors. He is perhaps ambitious of a large rather than a good farm, and he takes burdens upon his shoulders that he cannot bear. The consequence is he has no time for the early and minute supervision of his affairs which economy demands. He suffers the accidents that are apt to befall things left to themselves. His method is one of diffusion instead of the concentration of effort. He is compelled to let things slide. Work as hard as he may he does not do all that is necessary for the complete success of his labors. He is compelled to negligence by overwork. The weeds grow up in dense masses in his corn and his potatoe patch, sucking away at the vital elements of the corn and the potatoe in the soil, reducing the yield from a splendid crop to one of only ordinary extent, ripening their seeds for another crop next year, and so it goes. There's a waste, a leak in the potatoe field, a leak in the corn field, a leak in the orchard, and the biggest kind of a leak in the barn yard.

If you talk with such a farmer from the west, you may be sure that he'll maintain there is no need of manures there, that the soil is inexhaustible, and possibly that manures are a positive injury. The speaker has heard that maintained repeatedly in the progress of his journey hither. He replied: "Don't flatter yourself, sir, with such a soothing belief. It will bring you to rack sooner than there is any need of." All history shows that no soil is so rich as to be inexhaustible. All history shows that the great law of compensation is inevitable; that no soil is so fertile as to be able to withstand a long course of mismanagement and robberry. If it enriches the fathers it will impoverish the sons, and the earlier this fact is realized, and the sails are trimmed accordingly, the better it will be for the west. Where are the black soils of Russia that were considered absolutely inexhaustible? Where are the soils of western New York, once called the great granery of the east? They require manure for the wheat crop, almost as much as the thinner soils of New England. And the west will as surely have to come to a system of higher manuring as the laws of nature are sure to last.

If you talk with such a farmer from the east, you may be sure he'll maintain that there is no profit in farming. He shuts his eyes to the leaks about the place; or if he sees them, they seem so small as to be wholly unworthy of notice, while in the aggregate, they are eating up his substance and are the source of all his embarrassments. And ten chances to one he'll tell you he wants capital. He has hands and feet and muscle and brains, the only capital God has given to any man, but he does'nt appear to know how to use them. He allows the hand and the muscle to lead, instead of making the brain the guide of the hand. His plans are loose and defective, if he has any plan at all.

The great mistake the farmer is liable to make is that of making his work too diffusive. He spreads it over too much ground, instead of concentrating thought and energy and skill upon a few leading crops. It may not be good policy to cultivate one crop to the exclusion of all others; to put all the eggs into one basket, and in fact every farmer should cultivate even a greater variety of crops for the supply of his own family. It would promote the comfort, the health and the economy of every household to raise a greater variety of vegetables for the home table, and especially all the vegetables essential to the health of the family in their season, like asparagus, celery, lettuce, rhubarb, and many others that might be named; but so far as the management of the farm is concerned, the labor should be concentrated upon a few specialties, bringing them to the highest degree of productiveness and profit, and looking to them as the great money crop of the farm, from which the income of the year is to be derived.

Many instances of the results of concentrated labor were given, showing how much more profitable the system of concentrated labor could be made, than the system of scattered and diffusive labor too commonly adopted. A gentleman in northern New York began a few years ago as a harness maker. It was slow and unsatisfactory business in his particular locality, and though he had but limited means, he bought a small tract of land, and set out a hop plantation. He cultivated well and brought it to the highest state of perfection. Large prices ruled during the war and he was able to extend his plantation by degrees till at last he had sixty acres in hops and amassed by this crop alone, a fortune of over $200,000, and at this day he is one of the wealthiest cultivators of his neighborhood, living in a princely mansion, and commanding the respect and confidence of the whole community.

It was not a question of large or small farms. The size of the farm should depend chiefly upon the amount of working capital the owner had in hand. If he had capital enough, he could work a large farm to profit. If he has little or no capital, a very small farm would be more profitable than a large one, because he would concentrate his labor upon a few acres, bring them to a higher degree of productiveness and profit, and thus save the expense incident to a large tract of land, which is, necessarily, comparatively unproductive.

Suppose, for instance, a farmer should conclude to make the dairy the leading specialty. He had been told there are many parts of Wisconsin admirably adapted to it, with rich, luxuriant, well-watered pastures. The dairy offers special inducements to one who is so situated as to be able to adopt it, for the reason that it is subject to rather less competition than some other branches of farming. The wool-grower, for example, has to compete with the wool-grower on the vast plains of South America, and in Australia. The beef-raiser has to compete with the boundless extent of fertile lands in Texas and in South America, but there are only a comparatively few sections so well adapted to the dairy. You have the sweet hilly pastures of Vermont and western Massachusetts, the luxuriant, well-watered hills of the Mohawk valley and the central counties of New York, the deep lands of the western reserve in Ohio, but where else can you find lands so eminently adapted to the dairy? And what other product, except the exhaustive process of the grain-growing west, what other product is so well calculated to meet the demands of the home and foreign market as the products of the dairy?

Now for making a specialty of the dairy a certain extent of good pasturage is essential. Good cattle are essential and good management of cattle, especially dairy cows, is essential.

The cheese factory system now thoroughly established in many parts of the country, has come in to relieve the household of the great objection of this branch of labor, and to add to the aggregate value in the improved quality of the product. He knew of no branch of farming, which under judicious management, promises such favorable results in a pecuniary point of view as the dairy, but then it is exacting and requires that all other work should be subordinate to it, and that the course of cropping should be directed to the supply of the largest amount of feeding substance for winter use and the provision of good shelter for cows. And as an encouragement to the further development and perfection of the cheese factory system, the home market system is gradually improving as the great nutritive value of cheese, as an article of food, is becoming better known, while the foreign English and French markets are brought almost to our doors with an almost exhaustless demand for an article of high quality and at remunerative prices. And more important still, the market in California and the great Chinese empire is but just opened to the enterprise of the western farmers. The demand in China alone, for goods of medium quality, will offer inducements enough to make it an object to carry the factory system to the highest degree of production throughout the dairy sections of the west.

It is a source of congratulation therefore, to the farming interest of this state, and throughout the country, that the factory system has put it in our power, by the concentration of labor and the application of greater skill and system and method, not only in the manipulation, the details of manufacture, but in the greater knowledge and control of the market to meet this growing demand.

He did not mean to imply that sheep husbandry may not be made equally profitable, when followed intelligently as a special object of attention. It has its ups and downs, like any other special pursuit, but in the long run it may be made as profitable as any other branch of farming. And, indeed, where grain growing is adopted as a leading pursuit, as it often is at the west, it becomes almost necessary to unite sheep husbandry with it as another permanent interest.

Sheep husbandry, intelligently followed, may be made to keep up the fertility of a farm, that is constantly liable to exhaustion by the continual growth and sale of grain. Sheep, also, can be made to work up the surplus straw on the farm, which, instead of being burned on the land to get rid of it, as is too commonly the case among you, should, it seemed to him, go into the sheep yard, to be trodden down into a rich and very valuable manure.

Nothing had surprised him more, than to be told, that the practice of burning straw to get it out of the way, is still very common at the west. In England, a country that offers us many valuable lessons in progressive agriculture, it is considered an important and essential element in an improved system of farming. Work it up into manure, therefore, and apply it to the corn crop, if it is not practicable to use it on your wheat land. By means of sheep or well selected cattle, you can maintain the fertility of your lands, and indeed, increase their productiveness.

One of the many difficulties the farmer has to contend with is the want of good markets. The middle men come in to pocket the profits. The farmer does'nt get his fair proportion of the money which the consumer has to pay, while the consumer has to pay a larger price for every article as a profit to the middle man. The whole system of marketing, in many sections of the country, needs to be changed, and only a radical change can effect the object. And a radical change would involve a reduction of the cost of transportation, so as to enable you to reach the eastern or the foreign market, to the lowest possible point. But the farmer who adopts some specialty, who raises only one or two leading market crops, is in the position to study and take advantage of the market, and it becomes his interest to do so.

Now the lesson which the many illustrations he had given ought to teach us is that good farming requires the concentration of labor rather than its diffusion. It applies mind and thought and does not rely on hard work alone. It contrives new methods. It is ready to avail itself of every aid from whatever source, whether it be from the investigations of science or the skilful hand of the mechanic.

If there is one branch of human knowledge more than another to which our agriculture is indebted for its progress, it is that of mechanics. By the application of mechanical ingenuity the labor of the farm has been lightened, while at the same time its efficiency has been increased and the power to meet the demands of a growing population multiplied.

There was a time in the early history of this country when labor was cheap, when strong limbs and the power of endurance were the requisites chiefly sought for in the man on the farm, and when his labor was paid for as so much brute physical force. Thought and skill found higher rewards in other callings and the practical farmer was thought to be sufficiently well informed if he was able to hold a plow, to mow, to sow and to reap.

When labor or the physical force necessary to carry on the operations of the farm could be obtained so easily, a limited variety of implements was enough to satisfy the necessities of the times, while the isolated position of the farmer and his limited opportunities for travel and observation among people engaged in the same pursuits was well calculated to strengthen prejudice and to create a repugnance to the trial of new implements, and to striking out into novel and untried experiments.

Why, even no longer ago than when he was a boy, which he said, was'nt such an everlasting while, nothwithstanding a few gray hairs to the contrary, such a thing as a reaping machine was never heard of as a practical implement on the farm. Most of the wheat and rye had to be gathered with the sickle, and a day's work at reaping was by no means calculated to enable one to practice the Grecian bend. Such a thing as a threshing machine was very rare in the back country towns, and those we had were slow and inefficient compared with those of the present day. Most of our grain had to be separated with the common flail.

> "Thump after thump resounds the constant flail
> That seems to swing uncertain and yet falls
> Full on the destined ear."

He had even driven the cattle day after day to tread out the grain on the barn floor, not by way of experiment to see if the thing could be done, but in real earnest, week in and week out, as if it were the best way in the world. What a waste of human power and time!

Nor was the want of other labor-saving implements less general. Our smaller tools, the shovels, the hoes, the rakes, the forks, all the essential implements of the farm, in fact, were rude and imperfect, and required a vast expenditure of strength, to say nothing of time and patience, while the power to accomplish results was also limited, and much time and labor lost, or unproductive. But how is it now?

The reaper, the thresher and the mower are types of the ever restless and progressive spirit of the age. They point out to us a glorious future, in which they will accomplish for us and for our country, triumphs grander far than the triumphs of arms, for they will develop the means of supporting the millions of human beings which the implements of war can only destroy.

Could the learned Malthus—who proclaimed the gloomy theory that war, famine and pestilence were checks designed by an All Wise Being to keep down the increase of population to a level with the means of sustenance—now rise up from his sleep of death and see the population of England more than doubled since his day, and that of this country multiplied many times, while the people are far better fed and better clothed, with less labor and less suffering, with the possibility of famine practically removed, he might change his shameful doctrine and adopt a more cheerful and more hopeful view of the providence of God. With an immense multiplication of the human species in all civilized countries which have been devoted to the arts of peace and the development of their material resources, a bountiful Father has sent us a super-abundance of food instead of famine, and has taught us to rely on the exhaustless bounty of the fruitful earth, and upon His benificent promise that seed time and harvest shall never fail to supply the daily wants of his children.

But with all the progress which we have made in improving the implements of the farm, we have not reached perfection. No bound is set to human ingenuity, and further means may yet be devised to shorten labor and increase the products of the soil.

We cannot hope, nor is it desirable, to avoid labor. This is not the object of improved machinery; to make labor more attractive, agreeable and productive; to bring into subjection the rude forces of nature and make them do our bidding and increase our stores; to redeem thousands of acres now lying waste from wildness and desolation, and to make our country the granary of the world—these are triumphs we may hope to gain from the introduction and use of improved machinery, and in this respect, the effort to improve and to reach a higher standard of productive agriculture, commends itself to the highest intellect and opens a field for the labors of the noblest philanthropy!

[The address of Dr. John A. Warder was delivered in the assembly chamber on the evening of Sept. 30th, in the presence of a large audience; the president of the state agricultural society, and the president of the state horticultural society both upon the platform. As the address was exclusively horticultural, and as the state horticultural society desire its publication in the separate edition of their reports as well as in the edition embraced in this present volume, authority has been given for its transfer from this, its proper place, to the pages of said report.]

ANNUAL ADDRESSES.

[The society had expected the services of a stenographer during the delivery of the annual addresses, but was disappointed. In view of this fact, we are under special obligations to Mr. H. M. Page of the *State Journal*, for the following quite correct report of the several speeches made.]

LIEUTENANT GENERAL SHERIDAN.

When the seats within the pavilion were filled, and the space along the track in front of the stand crowded, calls were made for "SHERIDAN!" and the general came hesitatingly forward, laughingly protesting to the gentlemen about him that he "couldn't make a speech, indeed." But he did; for he said, when "three cheers for Sheridan" had been given with a will:

"Ladies and Gentlemen: I know you do not expect me to make a speech, and so I will only make my bow."

He bowed again in response to the cheers, which greeted him. Retiring, he was again called for, and came forward, bowing, and said humorously, "Ladies and gentlemen, I will repeat my little speech and give way to others."

GOV. FAIRCHLD'S SPEECH.

Gov. Fairchild was then introduced.

Gov. Fairchild said he would not extend Gen. Sheridan's speech to any great extent. He could only congratulate all upon the beautiful weather for the fair. He had noticed that every annual fair increased our home manufactures; the show of wagons and carriages is larger; the show of farming implements is much more extensive; the exhibition of cloths, &c., is far better; and it behoves us all to improve our local manufactures by patronizing them, by giving them preference always over all other goods. If you want a wagon or carriage, go to our factories and buy it; if you want a reaper, you cannot be better served then by your own neighbors; if you want a seed-drill, or rake, or other implement, remember that it can be furnished within the limits of our own state. And every citizen ought to wear at least *one* suit of clothes a year fabricated by Wisconsin manufacturers. This expression was warmly received by the crowd, and the governor withdrew.

HON. MATT. H. CARPENTER'S SPEECH.

Senator Carpenter was greeted with general applause, and began by remarking that, wishing to say exactly what he meant, he had committed his words to writing; and never having done such a thing before, he should not, probably, be able to read half of it, which would be entirely in their favor. (Laughter). He then spoke as follows:

The interests of labor in an agricultural state like ours depend upon the capacity of production and the expense of exportation. The report of the chamber of commerce of Milwaukee for 1868, shows the following shipments from that city alone for that year:

Barrels flour		1,017,598
Bushels	wheat	9,878,099
	oats	536,539
	corn	342,717
	rye	95,036
	barley	91,443

Business men, best qualified to estimate it, give the following as the value of these products in the eastern market during the year 1868:

Flour	$9,339,000
Wheat	18,711,000
Oats	428,000
Corn	387,000
Rye	148,000
Barley	205,000
Total	$29,218,000

And the cost of transportation from Milwaukee to the sea-board, as follows:

Flour	$1,379,200
Wheat	2,073,400
Oats	91,211
Corn	68,543
Rye	19,957
Barley	18,288
	$3,650,599

Such are the aggregate results:

Total value in eastern markets	$29,218,009
Total expense of transportation	3,650,599

That is, the business men of Milwaukee alone paid, in 1868, the good round sum of $3,650,599 for transportation of cereals from that city. This sum, of course, comes out of the producers; the purchaser always making his offer to the farmer with an open eye to the cost of moving the commodity to the available markets.

These figures show the deep pecuniary interest which the people of Wisconsin have in the general subject to which I wish to call your attention for a few moments, viz.: *the growth of monopoly in the carrying business.* The pecuniary interest of our people in this subject, great as it is, is unfortunately not their only nor their greatest interest. The people of Wisconsin are a portion of the people of the United States, and as such are jointly interested in and jointly responsible with the people of other states for the perpetuity of our free institutions.

It was for many years believed by our wisest and purest statesmen that our institutions were in danger from slavery. But it is my honest belief, that they are to-day in far greater danger from the combinations of capital, the consolidations of monopolies,—the great trinity of power, railroad, express and telegraph companies, which are struggling to control the destinies of this country—than they ever were from slavery. Slavery was spread over a vast territory; it could only act through political agencies; so that its plottings and proceedings were *seen of all men.* It was a sin so damning and a curse so heavy that the moral sentiments of the people and the sympathies of the world were against it; against it altogether and under all circumstances; in detail and in general. It was circumscribed by geographic limits, and the numercial majority of our people, who watched it with jealousy and hatred, always had the *power*, if not the *technical constitutional right*, to suppress it at any time; and it was always certain that whenever it should openly assail the existence of free institutions, the people, who believe that constitutions are made for men and not that men are made for constitutions, would find a way to put it down. And so it finally was extinguished. (Applause.)

But railroad, express and telegraph companies, under proper regulations and within wholesome restrictions, are not only harmles but absolutely a necessity of our modern civilization. They may proudly and truthfully point to the immense service they have rendered to the people in facilitating commerce and bringing the comforts of life to every man's door. The dangers to the public arise not from the use, but from the abuse of the powers which have been granted to these corporations. Unmixed evil is always condemned and avoided, and is therefore harmless. It is evil that comes in shining raiment, with seductive manner, with much that is really pleasant and good, and wins its way into the paradise of popular approbation. There is no conflict between labor and the legitimate profits of capital. Each is necessary to the other. But the great passion in this country is the love of wealth. And as life is short and every man impatient of results, the great tendency is the consolidation of agencies to accomplish vast results speedily. So, that whenever competition begins, consolidation results. A short time since the Merchant's Express Company was organized with an immense capital, in the interests of the people, as it was said, to break down the monopoly of the then existing company. Competition went on until both companies came to the not unnatural conclusion, that it would be more profitable to unite and plunder the people for their joint benefit, than it was to carry merchandize for too low a rate to amount to compensation. So they consolidated, and now have everything their own way. Various telegraph companies have passed through the same experience and reached the same result. Railroad companies are not behind in the wisdom of this generation, and are now bending all their energies to a consolidation which will prevent competition, and deliver the people bound hand and foot into their tender keeping. For all practical purposes we have but one telegraph company in the United States, and but one express company. If nothing is done to check the present tendencies, it will not be long until we have but one railroad company in the United States, and then it is by no means improbable that three monster monopolies may, "in order to form a more perfect union, insure *domestic tranquility*," provide for their "common defense" and promote their "general welfare," "ordain and establish a constition," which shall combine all three in one, and it will be owing to the mercy of Heaven or the vigilance of our people, if they do not so far extend their schemes as to *ordain a constitution for the people of the United States*. (Sensation.)

This fearful consolidation tends to withdraw corporate action from public observation. Slaveholders could not plot in secret; but to execute their schemes they had to publish their platforms and "*go to the country*" for a trial. The people were thus informed of what was intended, and it was their own fault if they did not take care of themselves. But the railroads, express and telegraph business of the United States embracing untold millions of capital, reaching into every state, territory, county, town, village and farm of the country, may all be managed by a board of fifteen directors, sitting with closed doors, by candle light, in Wall street. What they determine upon, they need not submit to public examination, nor to the contingency of a general election by the people; and thus a power more formidable than the powers of this gigantic national government, because more closely touching the rights and pockets of the people, will come to be exercised by a few men whose interests in all things are directly opposed to the interests of the people, without the consent or even the knowledge of the people. The power of such an organization upon our popular elections with, their paid agents in every school district, the immense number of their employes and officers, men of influence and intelligence, all capable of being directed by telegraphic communication by a central head in Wall street, and the immense capital capable of being poured out secretly at any point, their power to build up or destroy towns and cities by descriminating tariffs, and to create or destroy the fortunes of individuals, cannot be over estimated.

But some good easy soul, who never smarts until he is hit, may think this is trembling at imaginary evils, or rallying to combat shadows. I hope so. But certainly it is wiser to apprehend a little too much danger and guard against it, than to apprehend too little and be destroyed by it, and any candid man who looks back fifty years and considers from what feeble beginnings these tremendous monopolies have attained their present power and greatness may see reason to fear that they may still farther advance their views and their consumations.

Railroad companies first sought franchises from the state upon the grounds that railroads were public highways, and as such under the control of the legislative power as any other highway. It was upon this ground, and this only, that the courts upheld the exercise of the right of eminent domain in favor of railroad companies, which enabled the company, as the agent of the state, to take any man's land for the use of the road, in face of a constitution which forbids the taking of private property, *except for a public use.* Then, too, the influential and wealthy men of a community became stockholders of the companies and controlled the roads in the interest of the communities along the line. But all this is changed. I venture to say that not five men, and the chances are that not one man in Madison, owns a dollar of stock in any railroad running to or through this town. And as the character of the stockholders has changed, they have ceased to be the leading business men of the communities interested in the management of the roads, and come to be a few immense capitalists residing abroad. So, too, the theory upon which the roads were originally constructed, is changing; and the supreme court of Wisconsin, and the supreme court of Iowa two most intelligent and upright courts, have recently decided that a railroad company is a *mere private* corporation, and that the legislature has no more power over its property or affairs than it has over those of a bank, a manufacturing company, or over a grist mill. They are public corporations when they want to take your land without your consent; they are private corporations as soon as they get your land, and, of course, entirely exempt from legislative control. The supreme court of Iowa, in a recent case, say:

> "It is to be remembered also that railway corporations are not organized for the purpose of developing the material prosperity of the State,—this is a mere incident of the business they prosecute. But they are organized, SOLELY to make money for their stockholders, and *the legislature have no more power over their property and rights than it has over the like property and rights of natural persons or other private corporations.*"

Thus, by one bold declaration, the entire theory of corporate rights and obligations is changed; and the railroads of that state are transformed from public highways into mere private property. The railroad company is under no more obligations to consult the interests of the public than you are to ask the public whether you shall raise wheat or corn upon your land; and the legislature has no more right to control tariffs or regulate the management of a railroad, than it has to fix the compensation you shall pay your laborers, or the price for which you shall sell your wheat. In a single sentence, spoken by the supreme court, the state of Iowa has abdicated its sovereignty over the great highways of the state, and transformed them from trust property, held by the corporations for public use, into absolute estate in individual and private right. This declaration is not less important and startling than the Dred Scott decision; and exhibits the dangerous tendencies I have been considering.

If two railroads in our state, with their rolling stock, buildings, fixtures and other property pertaining to them, are private property owned, operated and used by the respective companies "*for the exclusive benefit and advantage of the stockholders*" of the respective companies, then they may, as easily and as legally, be consolidated, as two farms owned by two individuals may be changed from individual to joint ownership. As soon as a railroad is declared to be *private property*, all the consequences of private property attach to it; and it may be operated or abandoned, kept or sold, at the option of its owners. In other words the public have no control over it, and the owners have a right to operate it without the slightest regard to the interests of the public; which they will be certain to do. Consolidation will destroy competition; and then the capitalist can exact just what he pleases for transportion of commodities, which of course, must be paid by the producer

It is evident, that at any rate of toll above a fair profit upon the amount of capital *actually* invested in railroads, is an unjust exaction which should be restrained by law, if any power exists to restrain it. It is further evident that if the doctrine be conceded that our railroads are mere private property, and legislatures powerless to control them, the grossest abuses and oppressions will follow. Most civilized countries regulate the rate of interest by penal laws; visiting severe penalties upon the capitalist who takes advantage of the necessities of the borrower. But there is infinitely more need of legislation here. Loaning money is a thing within the power of any private citizen having money; he needs and obtains no legislative franchise, or monopoly of the loaning business. Competition is therefore certain to exist; and this, of itself, is thought by many, to be a sufficient protection against the extortion of lenders. But how does it stand with capital invested in railroads? In the first place, the company has a monopoly The state has clothed it with corporate power and immunities. The farmer must export his produce over *the* railroad, because *there is but one.* Every man does not own a railroad; every man could not operate it, exacting tolls from the public, if he did own one. That requires legislative sanction. The producer is therefore in the power of the capitalist, as to transportation; and unless the law can restrain or limit his demands, oppression may and will be practiced. And, until within two or three years, the power of the legislature to control railroads, as public highways, has universally been conceded. But the new doctrine now contended for, that a railroad is private and not public property, strikes a death blow at all legislative control, and leaves the people at the mercy of our corporations, so far as the state government is concerned. The state can control the management of public property, but has no right to control the use of *mere private property.*

If the state of things now existing is an evil, and the tendency is to an aggravation of that evil, it is interesting to consider whether any, and what, remedy can be invoked.

It is evident that a corporation which owns a railroad through half a dozen states, cannot be controlled by any one state, and if every state should enter upon the task, it is certain that each would have a theory of its own, and nothing but confusion would result. A regulation to be of any avail must be uniform; there can be no uniformity where thirty sovereignties are uttering their voices and enforcing their wills upon the same subject. This consideration led to the adoption, in the constitution of the United States, of the provision that congress should have power "*to regulate commerce* with foreign nations, *and among the several states*, and with the Indian tribes." Art. 1, sec. 7.

Commerce, in the general sense is defined to be "an interchange or mutual change, of goods, wares, productions, or property of any kind, between nations, or individuals, either by barter, or by purchase and sale; and includes the transportation of persons as well as of merchandize." Every railroad company employed in moving merchandize or transporting persons from one state to another, or from one state through one or more states, is engaged in commerce "among the several states," as much as the owner and master of a ship sailing from New York to Liverpool, is engaged in foreign commerce; and consequently, as to such business, is equally subject to the constitutional power of regulation by congress. Congress may at any time regulate the running of trains, fix the tariff of rates, and in every respect regulate and control the proceedings of any railroad company in regard to such commerce. A company whose road is situated wholly within the limits of a particular state, as to all produce which is destined for a distant state, is also engaged in commerce among the states. And even those cases, where the charter of the company amounts to a contract which would prevent the interference of a state, are nevertheless within the power of congress; because no state can exonerate any person or corporation from the duty of obedience to all constitutional regulations of commerce by the general government. Therefore, the railroads of Iowa and Wisconsin, although wholly exempt, by recent decisions, from state control, may nevertheless be kept within just limits by the exercise of congressional authority. (Applause).

Another course is worth considering. There may be insuperable objections to it; or it may become a necessity in the future.

The power to regulate commerce, includes the power to facilitate commerce; if not, then every lighthouse on the Atlantic coast is shedding an unconstitutional light upon the midnight mariner. (Laughter.) It is impossible, I think, to distinguish between the power, in congress, under the constitution, to build a lighthouse, and its power to build a canal or a railroad. The practical construction which the constitution has received, is, that congress may legislate in aid of commerce. It may build harbors, improve lakes and rivers, and do whatever else may render commerce easy, safe and profitable. The *encouragement* as well as the *protection* of commerce was one of the chief motives which led to the adoption of the constitution; and in this light the constitution has been regarded by all our statesmen. The United States might build roads between such prominent points as the general interests of commerce require, and make the common highways, over which any merchant or farmer might run a train of cars, on conforming to such regulations as should be prescribed.

To illustrate, suppose the government should build a railroad with two or four tracks from Chicago to New York, and throw it open to public use, under certain regulations as to use, and at certain rates of toll to be paid by any person running a train upon the road. It would thus be in the power of the government to regulate the carrying business which is so important an element in domestic commerce, so as fully to protect the people. The power to do this is unquestionable. If any man doubts the power as a regulation of commeece, there is no doubt of the power of congress to build a *military road*, with four iron tracks from Chicago to New York; and when not actually required for the transhipment of troops or military supplies, to authorize its use at certain rates of toll by private individuals. Our navy is employed not only in protecting our foreign commerce but in succoring merchant vessels in distress; and no doubt might be employed, when not needed for national defence, in any way to promote national prosperity. But, conceding the power, it will be said there are many objections to be urged against it. Undoubtedly; but the question is, whether there are more blessings to be expected than dangers to be apprehended.

(1.) It may be said that it would increase the patronage of the general government which is already very great. Admit it; would not the same reasoning abolish the post office department? Oh, says the objector, the post office is a necessity. Precisely; and the question is whether the railroad, also, will not soon become a necessity.

(2.) It may be said that the expense of such a work would be much greater if executed by the government than by private individuals. This I do not admit; nor do I believe it.

Should the government be compelled by the course of business in the country to enter upon such an enterprise, it would possess many advantages over private persons in the same field. It would do things upon a larger and safer basis; and having sufficient capital could afford, as a poor man cannot, to be economical. Suppose congress should erect a department to be called "The Department of Internal Commerce," with a secretary, assistants and clerks, as the interior department is now organized; and should then proceed with this work, as it does through the interior department in building court houses and post offices. There are plenty of officers in the engineer corps of the army who could be spared from doing nothing in the eastern cities, to do something in the country; to survey, locate and superintend the building of such a road. Fifty thousand Chinamen could be employed for three or ten years to grade the road, at one-third what the grading of any other road in the country has cost. Ties, and all other materials required could be procured by contract, as the government gets materials for harbors and other public improvements. The only thing needed for the work which would cost the government what it would cost a private party, would be the iron. In every other respect the government would have an advantage. What has made the building of our railroads so expensive, has been the poverty of the companies, and the notorious stealing of all parties employed by the companies. The company has usually been compelled to mortgage its road before it was completed; sell its bonds at a fearful discount; give contracts in which directors were interested, agreeing to pay twice what the work was worth. But the objector will say, the stealing from the government would be much greater. I do not believe this. I have heard no complaints lately that the money which has been appropriated to build post offices and court houses, and improve our rivers and harbors, has not been honestly applied. If the government cannot find among our people honest men enough to administer its affairs, men who will disburse its funds without stealing, then it should stop, and pronounce free institutions and government by the people a failure and an impossibility. (Applause.)

(3.) It will also be said that the government is already burthened with a heavy debt, that it would be madness to enter into so gigantic a scheme of internal improvement in our present condition.

This depends upon a mere question of profit and loss in regard to the particular transaction. If a farmer who was heavily in debt, should, for that reason, fold his hands in the spring, and refuse to buy seed wheat on credit, and so let his farm go to waste, his wisdom would not be approved. If he buys wheat and corn to sow and plant, if he employs laborers, and buys oxen and horses to carry on his farm, he will temporarily increase his indebtedness; but in no other way can he realize the rich crops of autumn which may not only repay the expense of the year, but go far towards liquidating his indebtedness.

So if the government could build a railroad from Chicago to New York in three years, upon which it should levy such tolls as would have the effect to reduce the cost of transporting merchandise one-half, and still pay for its own construction in twenty years, after which the tolls could be still farther reduced down to the actual cost of keeping the road in repair, then it would not be an extravagance but an act of prudence to do it; because the government would by this proceeding lose nothing and the people would be greatly enriched. And it is to be borne in mind that the people have got to pay this national debt. The government could not redeem a postage stamp without the people, and whatever enriches the people, developes the resources of the country and increases its property, tends to increase the capacity of the people to pay the debt.

Congress has heretofore granted aid to railroad companies in the form of grants of land and bonds. The government gets nothing back for the lands granted, and the people get no benefit, if the companies are to band together to plunder the commerce of the country. As a mere investment it would be better for the government to build and hold a railroad until it should be re-embursed for its construction, and in the same time save the people as much more, than to grant to irresponsible parties land or money from which no return will be realized either by the government or the people.

Now, fellow citizens, I have made these remarks, simply, if

I could, to direct the public mind to a consideration of a matter worthy of their thought, which will, I believe, before many years grow to great practical importance. I have not sought to advocate any scheme, not even to recommend any particular proceeding. It is for the people of Wisconsin to determine what they want done, and for their servants in congress to execute their judgment. (Hearty applause.)

SPEECH OF HON. C. L. FLINT.

Hon. C. L. Flint, of Massachusetts, was then introduced. He had already had his talk, but he wished to say how delighted he had been with this, his first, visit to Wisconsin. The magnificent fields and the quite remarkable show had given him new and interesting stories to tell to the small farmers of Massachusetts. Not only, he said, had he found material prosperity and success, but great intelligence and general information. Excellent schools he found here, among the best in the union, and he ventured to attribute their excellence largely to the old New England character and influence. The very way in which New England emigrants came here assured this, in the tender relations which existed between father and mother, husband and wife, parent and child.

The speaker gave a brief *resume* of the origin and progress of the common school system, which has been transplanted to Wisconsin, and predicted from it continued thrift and prosperity for every community. More than two hundred years ago, New England towns, surrounded by a wilderness, made grants of land for common school purposes. To these schools and their influence he traced the origin of free government in America, and the success of the revolution. Mr. Flint closed by referring again to the remarkable exhibition of the agriculturists of Wisconsin this year.

PRESIDENT CHADBOURNE, OF THE UNIVERSITY.

President Chadbourne was introduced. He agreed with everything which the senator had said about monopolies; they ought to be taken by the throat and held until they subserve the interests of the people. But the mischief can be greatly diminished by the encouragement of home industry. It seems as if the people would not much longer endure it to go 3,000 miles for articles that can be manufactured here at home.

The speaker understood that there were 6,000 or 7,000 of one particular important machine sold in this state every year, and that machine is made more than a thousand miles from here, near by where he used to live. He believed in concentration of labor; in the promotion of home interests; in the encouragement of immigration from every quarter of the globe; and in this way Wisconsin shall grow to a still greater empire of happy homes.

DR. WARDER.

Dr. Warder, of Cincinnati, was introduced, but excused himself after a few remarks, complimenting this fair in comparison with others.

SPEECH OF HON. GEO. B. SMITH.

Hon. Geo. B. Smith was then called upon. He said he was a lawyer by profession, but by practice a farmer. (Laughter). The gentlemen who had spoken were very good theorists; but there wasn't one of them who ever knew anything about farming! He had devoted his life to the interests of agriculture; his days had been given to the promotion of the public good. (Laughter). These other people were all politicians; they were all after votes. Mr. Smith continued to insist on his valuable agricultural experience, though his claim seemed to be received with some incredulity, except by the people from the unpaved districts. He had been to California, he said; the rest of the party went merely for fun and sight-seeing, but he went as an agriculturist. (Laughter). And what he had to say was, that there wasn't forty acres of land in Wisconsin that wasn't worth more than any forty thousand acres on the central plains. If anybody heard that great subsidies were given away along that belt, let them not be troubled about it; the land isn't worth taking. There is no place between here and the Pacific coast fit for anybody but Mormons.

Mr. Smith spoke further, in a quite taking manner, not forgetting to call frequent attention to his valuable agricultural acquisitions, but diverging to give railroad monopolies a back-handed lick, to bewail the prevalence of political jugglery, and to recommend a "consolidation" of the people for self-defence against all comers.

At the conclusion of the speeches, a motion, tendering the thanks of the society and people to the distinguished and eloquent speakers for their several highly instructive and entertaining addresses, was unanimously carried by three hearty cheers.

AWARDS OF PREMIUMS.

HORSES, JACKS AND MULES.

Class 1.—*Thoroughbreds.*

Best stallion, 4 years old and over, C. J. Simmons, Monroe............$40
Second best, 4 years old and over, F. Bradley, Fall River.............. 20
Best brood mare, 4 years old and over, B. Hoover, Monroe............. 30

Class 2.—*Roadsters.*

Best stallion, 4 years old and over, W. L. Wells, Lodi................$40
Second best, 4 years old and over, James Ryder, Waterloo............. 20
Best stallion, 3 years old and under 4, T. W. Brandt, Milton...Wallace's American Stud Book and.. 10
Second best, 3 years old and under 4, J. Y. Shue, Beloit................ 12
Best brood mare, E. D. Stanley, Lodi................................ 30
Second best, J. W. Sumner, Madison............ 15

Class 3.—*Horses for General Purposes.*

Best stallion, 4 years old and over, James Douglas, Lake Mills..........$25
Second best, 4 years old and over, Thomas Tomkinson, Janesville....... 15
Best stallion, 3 years old and under 4, Donald Stewart, Verona..Wallace's American Stud Book.
Second best 3 years old and under 4, J. Elliott, Port Andrew.......... 7
Best stallion, 2 years old and under 3, T. W. Brandt, Milton............ 7
Best stallion, 1 yoar old and under 2, I. S. Newton, Middleton.......... 5
Best sucking stallion colt, Donald Stewart, Verona.................. 3
Second best sucking stallion colt, William Stanley, Lodi................ 2
Best brood mare, 4 years old and over, Richard Horton, Salem.......... 20
Second best brood mare, J. Diment, Mazomanie........................ 12
Best filly, 2 years old and under 3, J. S. McMillan, Union............. 6
Second best filly, 2 years old and under 3, B. F. Larkin, Madison........ 3
Best filly, 1 year old and under 2, R. H. Spencer, Windsor.............. 5
Second best filly, 1 year old and under 2, I. S. Newton, Middleton...... 3
Best sucking mare colt, I. S. Newton, Middleton...................... 3
Second best sucking mare colt, J. R. Hiestand, Madison............... 2

Class 4.—*Draft Horses.*

Best stallion, 4 years old and over, Simon Ruble, Beloit................$25
Second best stallion, 4 years old and over, P. Wakem, Madison........ 15
Best stallion, 3 years old and under 4, Richard Horton, Salem..Wallace's American Stud Book
Second best stallion, 3 years old and under 4, Robert Oglevie, Madison.. 7
Best brood mare, 4 years old and over, William Stanley, Lodi.......... 20
Second brood mare, 4 years old and over, William Stanley, Lodi..Wallace's American Stud Book.
Best filly, 3 years old and under 4, E. D. Stanley, Lodi..Wallace's American Stud Book
Second best filly, 3 years old and under 4, Simon Ruble, Beloit.......... 7

Class 5.—Jacks and Mules.

Best jack, Adam Smith, Burke..$25
Second best jack, Adam Smith, Burke.. 15
Best jenny, Adam Smith, Burke.. 15
Second best jenny, Adam Smith, Burke....................................... 10
Best pair working mules, W. S. Wescott, Monroe..Wallace's American Stud Book.
Best single mule, R. H. Spencer, Windsor................................... 5
Second best single mule, R. H. Spencer, Windsor............................ 3

Class 6.—Matched Horses and Mares.

Best pair of carriage horses or mares, J. H. Garnhart, Madison $25
Second best pair of carriage horses or mares, Joseph Spaulding, Janesville 15
Best pair of roadsters. J. C. & H. A. Owen, Footville.................. 25
Second best pair of roadsters, George A. Mason, Madison................ 15
Best pair of farm or draft horses or mares, David McLay, Emerald Grove 25
Second best pair of farm or draft horses or mares, A. Shultz, Waterloo... 15

Class 7.—Geldings or Mares for single Harness, Saddle, etc.

Best gelding or mare for single harness, 4 years old and over, T. W. Brandt, Milton..........................Wallace's American Stud Book.
Second best gelding or mare for single harness, 4 years old and over, Geo. A. Mason, Madison.. $5

Class 8—Trotters and Pacers.

Best and fastest trotting stallion, over 5 years old, J. C. McKesson, Bloomfield, "Grey Eagle," time 2.40½..................................$100
Second best, W. L. Wells, Lodi, "North Hawk," time 2.49.............. 50
Best and fastest trotting mare, over 5 years old, L. Dearborn, Janesville, "Mauston Maid," time 2.39¾.. 60
Second best, Geo. A. Mason, Madison, "Mollie Brooks,"............... 40
Best and fastest trotting gelding, over 5 years old, Geo. Manning, Madison, "Captain Jencks," time 2.39¾.................................. 25
Second best, W. D. Edgerton, Beaver Dam, "Kentucky George"....... 15
Best and fastest trotting matched span, over 5 years, Geo. A. Mason, Madison, time 3.16.. 25
Second best, T. W. Brandt, Milton.. 15
Best and fastest pacing horse or mare, J. Leslie, Platteville, "Joe Bowers," time 2.40¾.. 25
Second best, B. Welch, Madison, "Kelly Davis," time 3.05.............. 15

Class 9—Running Horses.

Best running horse, two-mile heats, "Twenty Cents," F. Bradley, Fall River, time 1st heat, 3.56; 2d heat, 3.53¾..........................$100
Second best, D. Hoover, Monroe, "Prairie Lily" 50
Best running horse, mile heats, best 3 in 5, "Prairie Lily," D. Hoover, Monroe, time 1st heat, 1.53¼; 2d heat, 1.53; 3d heat, 1.59¾.......... 75
Second best, "Limerick Boy," F. Bradley, Fall River.................. 50

Class 10—Sweepstakes on Horses.

Best stallion and five of his colts, Simon Ruble, Beloit..Grand Silver Medal and..$100
Best brood mare, with foal by her side, Donald Stewart, Verona..Grand Silver Medal and.. 50

CATTLE.

Class 11—*Short Horns*

Best bull, 3 years and over, Edward P. Brockway, Ripon	$40
Second best, Wm. Rhodes, Salem Station	20
Best bull, 1 year and under two, S. A. Tenney, Durham Hill	7
Second best, J. Elliott, Port Andrew	5
Best bull calf, Edward P. Brockway, Ripon	5
Second best, Thomas George, Kenosha	3
Best cow, 3 years and over, Edward P. Brockway, Ripon	30
Second best, Edward P. Brockway, Ripon	15
Best heifer, 2 years, Edward P. Brockway, Ripon	20
Second best, S. Tenney, Durham Hill	10
Best heifer, 1 year, Edward P. Brockway, Ripon	7
Second best, Edward P. Brockway, Ripon	5
Best heifer calf, Edward P. Brockway, Ripon	5
Second best, Edward P. Brockway, Ripon	3

Class 12—*Devons.*

Best bull, 3 years old and over, P. Sheard, Burlington	$25
Second best, Luther Rawson, Oak Creek	15
Best bull, 1 year old and under 2, Edwin Dodge, Bloomington	7
Second best, Luther Rawson, Oak Creek	5
Best bull calf, Luther Rawson, Oak Creek	5
Second best, Luther Rawson, Oak Creek	3
Best cow, 3 years old and over, I. S. Newton, Middleton	20
Second best, Luther Rawson, Oak Creek	15
Best heifer, 2 years old and under 3, Luther Rawson, Oak Creek	15
Second best, Luther Rawson, Oak Creek	10
Best heifer, 1 year old and under 2, Luther Rawson, Oak Creek	7
Second best, Luther Rawson, Oak Creek	5
Best heifer calf, Luther Rawson, Oak Creek	5
Second best, Luther Rawson, Oak Creek	3

Class 13—*Alderneys.*

Best bull, 3 years old and over, J. W. Harvey, Madison	$25
Second best, Geo. E. Bryant, Madison	15
Best bull calf, J. W. Harvey, Madison	5
Best cow, 3 years old and over, J. W. Harvey, Madison	20
Second best, Geo. E. Bryant, Madison	15
Best heifer, 2 years old and under 3, Geo. E. Bryant, Madison	15
Best heifer calf, Geo. E. Bryant, Madison	5
Second best, J. W. Harvey, Madison	3

Class 14—*Ayrshires.*

No entries.

Class 15—*Grade Cattle and Working Oxen.*

Best grade cow, 3 years old and over, Luther S. Dixon, Madison	$10
Second best, 2 years old and over, Thomas Reynolds, Madison	5
Best yearling heifer, Byron Payne, Madison	5
Best yoke working oxen, Luther Rawson, Oak Creek	15
Second best, H. Bowers, Cottage Grove	10
Best yoke 3 year old steers, Luther Rawson, Oak Creek	7
Best 2 year old steers, Luther Rawson, Oak Creek	5
Second best, Thos. Reynolds, Madison	3

Class 16—*Milch Cows.*

Best milch cow of any breed, M. L. Butterfield, Waukesha..Silver Medal and	$20

Class 17.—*Fat Cattle.*

Committee report no cattle shown.

Class 18.—*Herds.*

Best bull and four cows or heifers, one year old and upwards, Edward P. Brockway, Ripon........................ Grand Silver Medal and $50

SHEEP.

Class 19.—*American Merinos.*

Best buck, 2 years old and over, H. H. Dixon, Ripon $15
Second best, J. H. Paul, Genesee 10
Best buck, 1 year old and under 2, H. H. Dixon, Ripon 10
Second best, J. H. Paul, Genesee 7
Best pen of three buck lambs, J. H. Paul, Genesee 7
Second best, O. Cook, Whitewater 5
Best pen of ten ewes, 2 years and over, O. Cook, Whitewater 25
Second best, H. H. Dixon, Ripon 15
Best pen of three ewes, 2 years and over, O. Cook, Whitewater 15
Second best, J. H. Park, Dodge's Corners 10
Best pen of ten ewes, 1 year old and under 2, J. H. Paul, Genesee ... 25
Second best, O. Cook, Whitewater 15
Best pen of three ewes, 1 year old and uuder 2, H. H. Dixon, Ripon 10
Second best, O. Cook, Whitewater 7
Best pen of ten ewe lambs, J. H. Paul, Genesee 20
Second best, O. Cook, Whitewater 12
Best pen of three ewe lambs, H. H. Dixon, Ripon 7
Second best, O. Cook, Whitewater 5

Class 20.—*Long Wool Sheep.*

Best buck, 2 years old and over, Robert Oglevie, Madison $15
Second best, Collard & Bro., Linden 10
Best buck, 1 year old and under 2, Robert Oglevie, Madison 10
Second best, P. Wakem, Madison 7
Best pen of three buck lambs, Robert Oglevie, Madison 7
Second best, E. Porter, Waukesha 5
Best pen of three ewes, 2 years old and over, Robert Oglevie, Madison .. 15
Second best, Robert Oglevie, Madison 10
Best pen of three ewes, W. H. Fox, Oregon 10
Best pen of three ewes, 1 year old and under, Robert Oglevie, Madison .. 10
Second best, Robert Oglevie, Madison 7
Best pen of three ewe lambs, Robert Oglevie, Madison 7
Second best, R. Henry, McFarland 5

Class 21.—*Middle Wool.*

Best buck, 2 years old and over, J. B. Stone, Oregon $15
Second best, D. W. C. Gates, Madison 10
Best buck, 1 year old and under 2, J. B. Stone, Oregon 10
Second best, J. N. Chamberlain, Beloit 7
Best pen of three buck lambs, Geo. H. Daubner, Brookfield Centre...... 7
Second best, Geo. E. Bryant, Madison 5
Best pen of three ewes, 2 years and over, Luther Rawson, Oak Creek ... 15
Second best, J. B. Stone, Oregon 10
Best pen of three ewes, 1 year old and under 2, G. H. Daubner, Brookfield Centre 10
Second best, J. B. Stone, Oregon 7
Best pen of three ewe lambs, Luther Rawson, Oak Creek 7
Second best, Geo. H. Daubner, Brookfield Centre 5

Class 22.—Fat Sheep.

Best pen of three fat sheep, Robert Oglevie.......................... $5

SWINE.

Class 23.—Swine.

Small Breeds.

Best breeding sow, with litter of pigs, David McNeil, Stoughton........ $5
Best sow pig over six months old, E. B. Crawford, Madison............ 5

Large Breeds.

Best boar pig, 3 yerrs old and over, J. N. Chamberlain, Beloit.......... 10
Second best breeding sow, 2 years and over, David McNeil, Stoughton... 7
Best boar pig, over 6 months old, J. N. Chamberlain, Beloit............ 5
Second best, J. D. Dowling, Fitchburg.............................. 3
Four pigs, J. N. Chamberlain, Beloit.................... Transactions.
One Poland boar pig, A. W. Vaughan, Madison............. Transactions.
One Barrow pig, 1 year old, D. K. Hyer, Dane, a remarkably large and fine pig.. Transactions.

POULTRY.

Class 24.—Poultry.

Best brahma pootras, R. H. Spencer, Windsor........................ $2
Second best, David McNeil, Stoughton.................... Transactions.
Best trio Polands, Daniel McNeil, Stoughton.......................... 2
Best trio bantams, R. H. Spencer, Windsor........................... 2
Trio game bantams, R. H. Spencer, Windsor................Transactions.
Trio of game bantams (not on premium list) Geo. J. Skinner, Madison, Transactions
Best pair geese, A. Hall, Belleville................................ 2
Best pair ducks, Collard & Bro., Linden............................. 2
Pair ducks, David McNeil, Stoughton......................Transactions.
Pair Rouen ducks, Collard & Bro., Lindon.................Transactions.
Two pair white and top knot ducks, R. H. Spencer. Madison....Transactions.
Best pair tea fowls, David McNeil, Stoughton........................ 2

AGRICULTURAL.

Class 25.—Field Products.

Best sample spring wheat (Rio Grande) F. R. Martin, Rutland............ $5
Second best, W. Lawler, Jr., Syene.................................. 3
Best sample spring wheat (Fyfe), W. Lawler, Jr., Syene................ 5
Second best, S. H. Hall, Burke...................................... 3
Sample white winter wheat, D. M. Aspinwall, Farmington................ 5
Sample red winter wheat, O. M. Palmer, Oregon............Transactions.
Best oats, (surprise) S. H. Hall Burke,.............................. 5
Second best, S. A. Goodwin, Beloit.................................. 3
Best barley, M. L. Ladd, Millard.................................... 5
Second best, S. H. Hall, Burke...................................... 3
Best buckwheat, M. L. Ladd, Millard................................. 5
Second best, Elias Long, Madison.................................... 3
Second best flax seed, David McNeil, Stoughton....................... 3
Best bale hops, W. W. Drake, Columbus............................... 5
Best sample timothy seed, W. R. Warren, Madison...................... 5
econd best, E. Bement, Oregon....................................... 3

Best sample clover seed, D. M. Aspinwall, Farmington.................. $5
Second best, Eli Stilson, Oshkosh.................................... 3
Best sample peas, C. Chipman, Lodi.................................... 5
Second best (English champion), Elias Long, Madison 3
Best sample beans, S. H. Hall, Burke.................................. 5
Second best, J. Bender, Oconomowoc.................................... 3
Best dent corn, Jonathan French, Madison.............................. 5
Second best, J. R. Heistand, Madison 3
Best flint corn, N. W. Dean, Madison.................................. 5
Second best, J. C. Starkweather, Oconomowoc........................... 3
Best bushel early potatoes, M. DeWolf, Delavan 5
Second best, J. C. Starkweather, Oconomowoc 3
Best bushel late potatoes, C. T. Wakeley, Madison 5
Second best, David McNeil, Stoughton 3
Secodd best bushel carrots, S. H. Hall, Burke 2
Best bushel turnips, O. M. Palmer, Oregon............................. 3
Second best, E. P. Danks, Stoughton................................... 2
Best bushel onions, S. H. Hall, Burke................................. 5
Second best, E. W. Sanders, Oshkosh................................... 3
Third best, D. D, Bryant, Madison..................................... 2
Best dozen watermelons, W. W. Field, Boscobel......................... 5
Second best, E. Elliott, Lone Rock.................................... 3
Best exhibition field products, S. H. Hall, Burke.......Silver Medal and 20
Samples of a new and excellent hybrid potato, W. K. Young, Glen Haven, Silver Medal.
Sample rape seed, Claus Oesand, New Holstein..............Transactions.

Class 26.—Garden Vegetables.

Best twelve stalks of celery, E. P. Titus, Verona..................... $2
Second best, J. H. Hicks, Oshkosh........................Transactions.
Best six heads cauliflower, Samuel Marshall, Madison 2
Best twelve beets, S. H. Hall, Burke 2
Second best, Samuel Marshall, Madison ....Transactions.
Best twelve parsnips, Samuel Marshall, Madison 2
Second best, A. C. Martin, Ashton........................Transactions.
Best twelve tomatoes, S. H. Hall, Burke................................ 2
Second best, B. A. Atwell, Madison.......................Transactions.
Second best twelve sweet potatoes, J. H. Hicks, Oshkosh......Transactions.
Best half peck lima-beans, Myron Martin, Rutland 2
Best show garden products, not less than ten varieties, F. Smith, Madison 10
Second best, S. H. Hall, Burke 5
Best three heads cabbage, P. A. Rogers, Oshkosh........................ 2
Second best, J. H. Hicks, Oshkosh ....Transactions.

Class 27.—Products of the Flouring Mill, Dairy and Apiary.

Best spring wheat flour, Robbins & Thornton, Madison.................. $5
Second best, P. M. Minch, Madison........................Transactions.
Best twenty-five pounds June made butter, Mrs. L. Bement, Oregon, Silver Butter Dish, revolving cover.
Second best, Mrs. M. McCaughan, Lodi ....Silver Butter Dish.
Third best, J. B. Stone, Oregon ....Set Silver Forks.
Best twenty-five pounds butter made at any time, F. S. Capron, Oconomowoc, Silver Bread Basket.
Second best, A. Hubbard, Oshkosh .... Silver Breakfast Caster.
Third best, A. C. Martin, Ashton, ...Six Silver Table Spoons.
Best three cheeses, farm made, T. A. Rogers, Oshkosh, Silver Butter Dish, revolving cover.
Second best, N. Richtenburg, Bristol............Gold Lined Silver Goblet.
Second best, W. C. White, Kenosha......................Silver Pie Knife.
Best three cheeses, factory made, R. S. Hauston, Kenosha.....Silver Medal.
Second best, F. H. Coburn & Son, Whitewater ....Bronze Medal.

Best sample ten pounds honey, E. W. Daniels, Auroraville, Silver Syrup Cup.
Second best, C. R. Chipman, Leicester....................Silver Goblet.
Best ten pounds maple sugar, D. M. Aspinwall, Farmington, Silver Syrup Cup.
Second best, D. M. Aspinwall, Farmington...........Set Silver Teaspoons.
Best gallon maple syrup, D. M. Aspinwall, Farmington $3
Second best D. M. Aspinwall, Farmington 2
Second best gallon sorghum syrup, N. Haight, Syene 2

Class 28.—Household Products.

Best two loaves graham bread, Miss Mary Hall, Burke..Set Silver Teaspoons.
Best two loaves white bread, Mrs. H. L. Smith, Janesville..Silver Call Bell.
Best two loaves Indian bread, Mrs. H. L. Smith, Janesville, Pair Silver Napkin Rings.
Best sponge cake, Miss. Mary Hall, Burke....................Silver Cup.
Best pound cake, Mrs. B. F. Brown, Madison..........Set Silver Teaspoons.
Best jelly cake, Mrs. H. L. Smith, Janesville......Solid Silver Napkin Ring.
Best silver cake, Mrs. H. L. Smith, Janesvile...........Silver Cream Ladle.
Best fruit cake, Mrs. B. F. Brown, Madison.......Solid Silver Napkin Ring.
Best exhibition of preserved fruits, Mrs. E. B. Crawford, Madison, Silver Berry Dish.
Second best, Mrs. E. Stilson, Oshkosh................Set Silver Teaspoons.
Best collection of sealed fruits, Mrs. E. Stilson, Oskosh, Set Silver Desert Spoons.
Second best, I. S. Newtown, Middleton.......................Silver Cup.
Best and greatest variety jellies not less than eight, Mrs. E. B. Crawford, Madison...Silver Forks.
Second best, Mrs. H. S. Vincent, Windsor...............Silver Teaspoons.
Largest display of jellies of different kinds, Mrs. C. M. Clark, Madison, Silver Cup.
Best and greatest variety of pickles, Mrs. E. Stilson, Oshkosh, Silver Breakfast Caster.
Sample crackers, W. A. Yerken, Kenosha.......... ...Honorable Mention.
Best vinegar, F. E. Josel & Co., Freeport, Illinois...............Diploma.

FRUITS, FLOWERS AND DELICACIES.

Class 29.—Fruits by Non-Professional Cultivators.

Best and greatest variety of apples, not less than 3 each, Eli Stilson, Silver Ice Pitcher and Gold lined Goblet.
Second best, John Bender, Oconomowoc................ Silver Fruit Dish..
Third best, F. S. Capron, Oconomowoc.. .... Set Silver Teaspoons.
Best 10 varieties apples named by State Horticultural Society, Wm. Findlayson, Black Earth................................. Silver Berry Dish.
Second best, J. H. Paul, Genesee.................. Silver Breakfast Castor.
Best 6 varieties apples named by State Horticultutal Society, Eli Stilson, Oshkosh .... Pair Silver Goblets.
Second best, Wm. Finlayson, Black Earth............... Silver Pie Knife.
Best 10 varieties of any sort, Wm. Finlayson, Black Earth, Silver Fruit Dish.
Second best, E. H. L. Dart, Kingston.................. Silver Cake Knife.
Best show of autumn apples, Eli Stilson, Oshkosh........ Set Silver Spoons.
Second best, John Bender, Oconomowoc................. Silver Pie Knife.
Third best, S. Rice, Fort Atkinson.......................... Silver Cup..
Best show winter apples, John Bender, Oconomowoc, Silver Card Receiver.
Second best, E. W. Daniels, Auroraville.......... Gold lined Silver Goblet.
Best variety of pears, E. B. Thomas, Dodge's Corners, Gold lined Silver Goblet.
Second best, J. W. Park, Dodge's Corners...........Gold lined Silver Cup.
Dr. W. W. Reed, Jefferson, premium received for 18 varieties. Peter Cannon, Milwaukee, honorable mention for 6 varieties; last not entered for competition.

Best variety of plums, Eli Stilson, Oshkosh, Downing's Fruit and Fruit Trees.
Best variety of grapes, Samuel Marshall, Madison...... Silver Fruit Basket.
Second best, Samuel Lewis, Lake Mills.................. Set Silver Forks.
Best 3 varieties grapes, Samuel Marshall, Madison.... Silver Card Receiver.
Second best, Victor Wyman, Madison................ Set Silver Teaspoons.
Best 2 varieties grapes, Samuel Lewis, Lake Mills............ Silver Goblet.
Second best, H. A. Atwood, Mendota........................ Silver Cup.
Best show of foreign grapes, F. Robinson, Kenosha......... Silver Goblet.
Best variety of fruit of all kinds, raised by exhibitor, Eli Stilson, Oshkosh, Elegant tete-a-tete Silver Tea Set, (4 pieces).
Crab apples, seven varieties, G. F. Whitney, Mazomanie, Breck's Book of Flowers.
Raspberries, "Mammoth Cluster," M. DeWolf, Delavan, Warder's Pomology.
Transcendant crab apples, J. W. Sharp, Door Creek.... Honorable Mention.
"Everlasting raspberry, juniper," J. C. Pratt, Madison, Honorable Mention.
"Walter Grape," J. P. Rowe, Oshkosh............Rand's Book of Flowers.

Class 30.—Fruits and Evergreens by Professional Cultivators.

Best variety of apples, not less than 3 specimens each, A. G. Tuttle, Baraboo.. Silver Medal.
Second best, Geo. J. Kellogg, Janesville.................. Bronze Medal.
Best 10 named varieties as recommended by Horticultural Society, A. G. Tuttle, Baraboo .... Silver Pitcher.
Second best, Geo. J. Kellogg, Janesville.............. Gold Lined Goblet.
Best 6 named varieties recommended by Horticultural Society, Geo. J. Kellogg, Janesville.. Set Silver Forks.
Second best, A. G. Tuttle, Baraboo................ Set Silver Tea spoons.
Best variety of pears, not less than 4 specimens each, G. P. Peffer, Pewaukee... Silver Goblet.
Second best, A. G. Tuttle, Baraboo......................... Silver Cup.
Best variety of plums, not less than 4 each, G. P. Peffer, Pewaukee, Downing's Fruits & Fruit Trees.
Committee call attention of the society to the Eldredge plum entered by J. G. Kellogg Janesville.
Best variety of grapes, not less than 3 clusters of each, C. H. Greenman, Milton.. Silver Fruit Dish.
Second best, Geo. J. Kellogg, Janesville................ Set Silver Forks.
Best 3 varieties grapes adapted to general culture, Geo. J. Kellogg, Janesvill.. Set Silver Tea spoons.
Second best, A. G. Tuttle, Baraboo.................... Gold Lined Goblet.
Best 2 varieties grapes, adapted to general culture, Geo. J. Kellogg, Janesville.. Silver Cup.
Second best, C. H Greenman, Milton................. Silver Fruit Knife.
Best variety of fruit of all kinds as independent cultivators, Geo. J. Kellogg, Janesville................... Silver Medal and Silver Ice Pitcher.
Second best, G. P. Peffer, Pewaukee, Bronze Medal and Silver Card Receiver.
Best exhibition of evergreens in tubs or boxes, J. C. Plumb, Milton.... $10
Variety of peaches, G. P. Peffer, Pewaukee.......... Fuller's Small Fruits.
Variety of quinces, G. P. Peffer, Pewaukee........... Honorable Mention.
Fot on premium list, R. G. Bell, Black Earth, ornamental trees and barberries, six each............................... Honorable Mention.

Class 31.—Seedling Fruits.

A. A. Boyce, Lodi, best seeding apples, theree varieties, Silver Medal.
D. M. Aspinwall, best seedling apple, single variety......... Silver Medal.

Class 32.—Flowers by Non-professional Cultivators.

Best floral design of natural leaves or flowers, Mrs. S. J. Hastie, Madison, Silver Vase for flowers.
Best collection of cut flowers, Mrs. S. J. Hastie ...... Silver Teaspoons.
Second best, C. Erckton, Madison .... Silver Cup.
Best pair round boquets, F. Smith, Madison.................. Silver Cup.
Best pair flat boquets, Mrs. A. M. Green, Albion .... Silver Cup.
Best boquet of eternal flowers, Mrs. Dr. J. Bailey, Madison, Silver Boquet Holder.
Best display of dahlias, not less than ten varieties, W. G. Pitman, Madison, Set Silver Teaspoons.
Best ten named dahlias, W. G. Pitman, Madison......... Silver Pie Knife.
Best five named dahlias, A. A. Boyce, Lodi.... Breck's Book of Flowers.
Best and greatest variety of verbenas, Mrs. Green, Albion, *Journal of Horticulture* for one year.
Best show asters, W. G. Pitman, Madison.............. Set Silver Spoons.
Best show phlox, B. F. Brown, Madison.............. Silver Napkin Ring
Best show pansies, F. Smith, Madison.............. Silver Boquet Holder.
Best show petunias, Mrs R. Williams, Palmyra.... Solid Silver Fruit Knife.
Best show dianthus, (pinks), Mrs. R. Williams, Palmyra, *Gardner's Monthly* for one year.
Best show gladiolas, Mrs. A. M. Green, Albion, *Gardner's Monthly* for one year.
Best show tuberoses, Mrs. A. M. Green, Albion................Silver Cup.
Best and greatest variety of all sorts of flowers, raised by exhibitor, and shown as an independent collection, Mrs. A. A. Boyce, Lodi, Silver Toilet Stand, with three pieces.

Class 33.—Flowers by Professional Cultivators.

Best floral design, Miss Cornelia Stevens, Madison, Silver Vase for Flowers.
Best collection cut flowers, Miss Kate F. Peffer, Pewaukee, Silver Teaspoons.
Second best, Miss M. L. Plumb, Milton...................... Silver Cup.
Best basket of flowers, Miss Kate F. Peffer, Pewaukee......... Silver Cup.
Second best, Miss Agnes Stevens, Madison.......... Silver Boquet Holder.
Best pyramid boquet, Miss Kate F. Peffer, Pewaukee.......... Silver Cup.
Best pair round boquets, H. G. Roberts, Janesville............ Silver Cup.
Best pair flat boquets, Miss M. L. Plumb, Milton................ Silver Cup
Most tastefully arranged boquet, Miss C. Stevens, Madison, *Horticulturist* for one year.
Best boquet eternal flowers, Miss C. Stevens, Madison, Silver Boquet Holder.
Best boquet of any desirable materials, H. G. Roberts, Janesville, Silver Boquet Holder.
Best display of dahlias, J. T. Stevens, Madison...... Set Silver Teaspoons.
Mrs. J. C. Plumb, Milton, premium recommended, being very superior in quality and arrangement.
Best ten named dahlias, Mrs. J. C. Plumb, Milton........ Silver Pie Knife.
Best five named dahlias, Mrs. J. C. Plumb, Milton, Breck's Book of Flowers.
Best display in quality of roses, Miss Kate F. Peffer, Pewaukee, Silver Tea Bell.
Best variety of verbenas, J. T. Stevens, Madison, *Journal of Horticulture* for one year.
Best ten named varieties verbenas, H. G. Roberts, Janesville, *Journal of Horticulture* for one year.
Best seedling verbenas, J. T. Stevens, Madison, *Journal of Horticulture* for one year.
Best show of phlox, H. G. Roberts, Janesville.........Silver Napkin Ring.
Best show of pansies, J. T. Stevens, Madison.........Silver Boquet Holder.
Best show of petunias, Miss Kate F. Peffer, Pewaukee, Solid Silver Fruit Knife.
Best show of gladiolas, H. G. Roberts, Janesville, *Gardner's Monthly* for one year.

Best show tuberose, H. G. Roberts, Janesville................ Silver Cup.
Best display green house plants (not entered for competition), discretionary premium of................................ Downing's Country Homes.

Class 34.—Wines.

Best sample grape wine, Mrs. H. S. Vincent, Windsor, Pair Gold lined Goblets.
Best sample currant wine, Mrs. J. W. Baker, Summit, Gold lined Silver Goblet.
Second best, Mrs. Geo. A. Mason, Madison................. Silver Goblet.

Class 35.—Society Exhibition.

Best exhibition in fruit and flower department, by society, Kenosha Horticultural Society, Kenosha..$50
Second best, Milton Farmer's Club, Milton.......................... 30

IMPLEMENTS AND MACHINERY.

Class 36.—Machinery for Agricultural Purposes.

Best threshing machine with power included, (the "Oasis," with "Woodbury" power), S. L. Sheldon & Bro., Madison...............Silver Medal.
Best feed-grinding mill in operation, "Challenge" Mill Company, Batavia, Ill..Silver Medal.
Combined feed-grinder and corn sheller, "Challenge" Mill Company, Batavia, Ill..Diploma.
Best fanning mill, S. L. Sheldon, Madison ....Diploma.
Fanning mill, Poole's patent, Carl Habich, Madison.....Honorable Mention.
Best cornstalk and straw cutter, Carl Habich, Madison ....Diploma.
Best broadcast seeder, (horse power) Jones & Co., Horicon ....Diploma.
Cahoon's broadcast seeder, S. S. Sherman's broadcast seeder, Van Brunt's seeder, J. S. Rowell & Co's seeder, and R. C. Farthing's seeder, each awarded a special ....Honorable Mention.
Broadcast seeder, with Turner's broadcast seeder attachment, S. L. Sheldon, Madison ....Honorabls Mention.
Broadcast seeder and cultivator combined, "Esterly's," O. & A. Flom, Madison ....Diploma.
Best windmill and pump combined, in operation, W. H. Wheeler, Beloit, Silver Medal.
Best windmill, in operation, R. E. Mills, Rockford, Ill. ....Silver Medal.
Best stump extractor, Joseph G. Fox, Oregon...................Diploma.
Best wood-sawing machine, in operation, P. H. Turner, Madison, Silver Medal.
Best and largest display of agricultural and horticultural machinery, S. L. Sheldon & Bro., Madison..................................Silver Medal.
American Turbine water wheel, S. S. Compton, Milwaukee ....Diploma.
Buckeye cider mill, S. L. Sheldon, Madison ....Diploma.
McFarland's bog cutter, Hebron..................................Diploma.
Turner's attachment to Buckeye drill for broadcast sowing, Honorable Mention.
Exhibition of reapers and mowers, best ever made in the state. No premiums offered and none awarded.

REPORT OF COMMITTEE.

The judges in class 36, having performed the duties assigned them to the best of their ability, beg leave to submit the following considerations that were suggested in the course of their investigations:

It seems eminently proper that a change should be inaugurated so far as the pre-announcement of judges is concerned. This would prevent the tampering with judges, and cut off all attempts to secure pledges in advance for premiums on competing articles in favor of interested parties. The great end and object of these public fairs should be to reward and encourage real merit, regardless of persons or favors, and every exhibitor should be entitled to a full exhibition and a candid award. Every machine should be subjected to a practical test in the presence of the judges, if possible. As this is not possible in all cases, it subjects the awards of judges to much criticism; perhaps in some cases justly, for no man, however learned in the general art or profession, can properly judge of the practical, operative merits of two or more machines, each differing somewhat from the other, by a mere casual looking over of inert parts. Perhaps there is no remedy to reach this difficulty, except it should be to select judges to meet at appointed times and places, after due notice to all competitors, and witness the actual trial of each machine in the proper season, and to report their decision at the next annual fair. Drills and broadcasters, plows, harrows, etc., could be tested and their merits truly ascertained, each in its season, and at the same time and place. Likewise reapers, harvesters, binders, mowers, hay rakes and loaders, etc., could be examined and their practical merits compared on the same day and at the same place, while threshers, potato-diggers, bog-cutters, meadow-eveners, stump-extractors, corn-huskers, etc., might be subjected to a like test in their proper season. This would involve a division of agricultural implements into three classes, according to their seasons of use—spring, summer and fall—with, perhaps, a "miscellaneous" class, that it would be only practical to examine on the days of the fair. It would divide the labor of the judges, and give them better opportunities to examine well and judge fairly. With all those multifarious implements in one class no one committee is equal to the test.

Our people are no exception to the general rule that has governed the world in all ages—they are fond of contests. The Grecian orators had their intellectual contests in the forum, the Roman gladiators measured their physical strength in the colosseum, while the Yankee universal genius is ever ready to test his skill and enterprise in field or workshop with the whole world as competitors.

These tri-annual exhibitions, located in different portions of the state, under the official sanction of the state agricultural society, while they need cost but a trifle, if anything, it seems would stimulate a spirit of rivalry that could not fail to be of lasting benefit to both the agriculturist and manufacturer.

The great and annually increasing exhibition of agricultural implements, overshadowing the representative implements of all other branches of industry, tell the tale, that agriculture is the basis of our national wealth; and yet it needs no argument to prove that agriculture receives the least remuneration in proportion to the labor performed. Hence, the more justice and policy in offering every species of encouragement consistant with our means and opportunity.

The general arrangement and disposition of the agricultural implements on the fair grounds was admirable, and great credit is due to Major Rufus Cheney for the skill and industry he has displayed. The committee, however, would suggest for the future, one improvement, and that is, to exhibit placards over the entrance of the superintendent's headquarters, stating at what time the judges would examine each class of implements. This would notify all exhibitors to be ready at the proper time to exhibit and explain the operation and nature of the machines. These suggestions are deemed necessary, because the judges in several instances could find no representatives to explain the machines on exhibition, and as the mass of labor was so great, a second examination was out of the question, and hence complaints passed unheeded, and dissatisfaction was the result.

As a general thing, the judges have the confidence to believe their decisions were satisfactory. The greatest contest seemed to be on drills and broadcast seeders, of which there was a large and splendid display. Many of them were manufactured in our own state. Without a practical test it seemed difficult to decide as to relative merits, because nearly all were of superior workmanship, varying but little in appearance in general characteristics. The display of reapers and mowers was magnificent, and shows great progress in the refinement of workmanship and the adaptation of the various parts to their general uses.

As to grain binders, the judges found themselves in somewhat of a quandary. The chairman being engaged in working up an automatic binder, felt a delicacy—perhaps a false one—and declined to act in reference to that subject. The other judges, therefore, as reported elsewhere, determined the award in the premises and their action was not without some misgivings in reference to the following facts:

There had been three entries under the head of "grain binders," one of which did not reach the grounds till after the examination and award, leaving the contest between the hand binder of Mr. Butler of Ripon, and the Marsh harvester entered by S. L. Sheldon & Bro. The perplexing question was,—Is the Marsh harvester a binder? The two acting judges did not hesitate to say it was not, technically, nor was the Butler binder—each required hard labor, and each was only *a means* of binding. Taken in this light, and arguing they had no right to change the letter or to determine the spirit of the entry, they examined the two machines as competitors, awarding the premium to the Marsh harvester, for the following reasons: Mr. Butler stated that his bands must all be made exactly of a length, and of course every bundle must be substantially of the same exact size. The committee believed that such exactness could not always be relied on, nor by the most expert operator. Mr. Butler claimed the bands could be made for half a cent each. Allowing this to be so, it was conceded that it would cost $1.50 per acre, average, for the bands; and allowing that one man could bind ten acres per day (on which point the committee were skeptical), it would cost $18 to bind 10 acres, while by the Marsh harvester it would cost but $6 for the same service. It is but proper to add that Mr. Butler claimed (but did not pretend to know), that his bands could be used for two years. Even if this be so, it would cost $4.50 per 10 acres more than by the Marsh harvester, and some $9 more than by an automatic binder, using wire bands.

Had the advertisement specified "automatic grain binder," as no doubt was intended, the judges would have made no award, as there was no entry of the kind, but as it was simply for a "grain binder," they did not feel at liberty to change the literal reading of the advertisement to what appeared was the intention, and hence, at the risk of much censure, they awarded the prize as above stated.

S. D. CARPENTER, *Chairman.*

[The executive board awarded the Marsh Harvester a Silver Medal.]

Class 37.—Implements, etc., for Agricultural and Domestic Purposes.

Best sod plow for stiff soils, honors equally divided between J. H. Ward, Oshkosh, and F. T. Woodward, Utica, N. Y.
Best plow for light soils, honors equally divided between Jones & Sumner, Madison, and S. L. Sheldon & Bro., Madison.
Best steel crossing plow, committee reported all the crossing plows so excellent in appearance, and so well made that it was impossible to determine their relative merits without a thorough trial in the field, and concurred in recommending an award of honors to the following exhibitors:

Firmin & Billings, Madison;
O. & A. Flom, Madison, on elliptical standard stubble plow;
Jones & Sumner (for Moline Plow Company), Madison;
S. L. Sheldon & Bro., Madison;
L. P. & M. P. Jerdee, Madison;
M. K. Dahl, Waupun, on adjustable beam plow;
Chas. Engle, Bunker Hill, on crossing plow with iron beam and handles.

Best gang plow, S. L. Sheldon & Bro., Madison .... Diploma.
Sulky gang plow, S. L. Sheldon & Bro., Madison .... Honorable Mention.
Display of plows in variety, by manufacturer, F. T. Woodford, Utica, N. Y. .... Silver Medal.
Best harrow, A. J. Craig, Loxa, Ill .... Diploma.
Best corn cultivator, J. H. Ward, Oshkosh .... Diploma.
Improved cultivator, J. G. Knapp, Madison .... Diploma.
Best sulky cultivator, Brown, Wattles & Co., Rockford, Ill. .... Diploma.
Best horse hoe, S. L. Sheldon & Bro., Madison .... Diploma.
Hay rake, O. & A. Flom, Madison .... Diploma.
Hay rake, M. E. Fuller, Madison .... Diploma.
Best horse hay fork, A. J. Nellis, Pittsburg, Pennsylvania .... Diploma.
Best broadcast seeder (hand power), L. P. & M. P. Jerdee, Madison, Diploma.
Best corn planter (hand power), W. D. Stroud, Oshkosh .... Diploma.
Best hay knife and fork combined, Ellingwood, Stafford & Co., Chicago, Ill., Diploma.
Best stock pump, Bliss, Wallace & Hamilton, Milwaukee .... Diploma.
Best apparatus for cooking feed by steam, H. Brown, Albany...... Diploma.
Best portable fence, J. H. Smith, Elkhorn, Michigan .... Diploma.
Best farm gate, Aldrich & Canada, Milton Junction.......... ... Diploma.
Best carriage gate, automatic, D. C. Brown, Beloit .... Diploma.
Best bag-holder and truck, Clow Manufacturing Co, Janesville... Diploma.
Best churn, S. S. Hall, West Salem............................ Diploma.
Best six hay forks, S. L. Sheldon & Bro., Madison .... Diploma.
Best six grass scythes, Ellingwood, Stafford & Co., Chicago, Ill... Diploma.
Best six bush scythes, Ellingwood, Stafford & Co., Chicago, Ill. .. Diploma.
Best six manure forks, S. L. Sheldon & Bro., Madison............ Diploma.

Best six corn knives, Ellingwood, Stafford & Co., Chicaoo, Ill., Diploma and Silver Medal.
Pump and fire engine combined, J. Cammack, Madison .... Diplomo.
Road scraper, E. W. Skinner & Co., Madison.................... Diploma.
Sanford's reciprocal sickle grinder, Chicago Reciprocal Sickle Grinder Co., Chicago, Ill.. Diploma.
Refrigerator, Perkins & Smith, Fond du Lac.................... Diploma.
Fruit gatherer, J. McClellan, Berlin .... Diploma.
Meadow smoother and potato digger, Jno. W. Newton, Elkhorn .. Diploma.
Adjustable hoe and rake, A. W. Cogswell, Pewaukee............Diploma.
Patent brooms, C. B. Winchell, Ripon..........................Diploma.
Brooms of usual manufacture, O. Bates, Oregon, Dane co..........Diploma.
Clothes dryer, A. W. Cogswell, Pewaukee,............Honorable Mention.
Clothes line holder, A. W. Cogswell, Pewaukee.........Honorable Mention.
Patent saw buck, S. N. Blanchard, Appleton...........................Diploma.
Scythe grinder, O. & A. Flom, Madison..........................Diploma.
Adjustable rolling coulter, S. L. Sheldon & Bro., Madison.........Diploma.
Grain register, S. L. Sheldon, & Bro., Madison..................Diploma.
Potato fork, S. L. Sheldon & Bro., Madison.........................Diploma.
Hay tedder, Ellingwood, Stafford & Co., Chicago.................Diploma.
Adjustable plow point, K. Altand, North Cape..................Diploma.
Vandiver corn planter, horse power, Joshua S. Wood & Co, Quincy, Ill., Diploma.
Knife sharpener, C. Marsh, Providence, R. I.,.....................Diploma.
Best display of agricultural and horticultural implements, S. L. Sheldon & Bro., Madison.

Class 38.—Machinery for Manufacturing Purposes.

Best portable steam engine for farm use, J. E. Mann, Madison..Silver Medal
Best spinning wheel for wool, Woodford & Heistand, Madison..Silver Medal
Improved hub-turning machine, Hugo Luebben, Howard Grove, Sheboygan co..Silver Medal
Pegging machine, J. E. Brown, Palmyra.........................Diploma

MANUFACTURES.

Class 39.—Carriages, Harness, Etc.

Best double carriage, Bird & Ledwith, Madison.... ....$10
Best single top buggy, Rice, Mock & Co., Milwaukee.................. 7
Best single riding buggy, Bird & Ledwith, Madison.................... 7
Best lumber wagon, M. Pool, Monroe................................ 5
Bob sleds, Oviatt's patent, S. G. Abbott & Son, Oregon............Diploma
Trace buckle, W. G. Bunker, Portage City.............Honorable Mention
Pad press, W. G. Bunker, Portage City.................Honorable Mention
Best and largest display of carriages, sleighs, etc., by manufacturer, Bird & Ledwith, Madison......................................Silver Medal

Class 40.—Stoves, Furnaces, Hollow Ware, etc.

Best cooking stove for wood, W. Ramsey & Co., Madison..........Diploma
Best ornamental parlor stove, W. Ramsey & Co., Madison..........Diploma
Improved revolving extension stovepipe shelves, J. Parkham, Beloit..Honorable Mention.

Class 41.—Bee Hives and Bee Management.

Best bee hive, A. H. Hart, Appleton..............................Diploma.
Best demonstration of handling and management of bees, James Bullard, Evansville ....Silver Medal.

Class 42.—Cabinent Ware, Wagon Work, Cooperage, Willow Ware.

Best display of furniture, Fisher & Reynolds, Madison..........Diploma.
Best display of wagon work, Webster & Lawson, Menasha.....Silver Medal.
Best display of tubs, firkins, &c., Menasha Wooden Ware Factory, Diploma.
Osgood patent extension table, Matthews Bros., Milwaukee........Diploma.
Flour and meal chest, Folsom & Trumbull, Columbus..............Diploma.
Spiral spring bed, Jones & Slayton Bros., Berlin.................Diploma.
Set of furniture ingeniously made of deer's horns, V. Wilscolsel, Sauk City..Diploma.

Class 43.—Leather and Leather Manufactures.

Best display of leathers of different kinds by manufacturer, H. K. Leonard & Son, Beloit .... Silver Medal and $10
Best and largest display of gents' boots and shoes manufactured in Wisconsin, F. A. Stoltz, Madison... .... Silver Medal and $10
Samples of sheep, goat, calf and deer skins, tanned and colored, in excellent manner, H. K. Leonard & Son, Beloit........................ Diploma.

Class 44.—Stone Cutter's Work, Brick and other Building Material.

Best mantel piece, C. S. Rankin, Cincinnati, Ohio...... .... Diploma.
Best shingles, H. R. Smith, Oshkosh.......................... Diploma.
Best apparatus for manufacturing gas from gasoline, Wisconsin Gas Company, Janesville.......................... .... Diploma.

Class 45.—Surgical, Dental, Mathematical and Philosophical Instruments and Apparatus.

Best display of dentistry, Dr. N. J. Moody, Madison ....Silver Medal.
Mechanical appliance for cleft palate, Dr. N. J. Moody, Madison ...Diploma.

Class 46.—Mineral, and Various Metallic and Chemical Manufactures.

Sample horse-shoe nails, Globe Nail Company, Boston, Mass ...... Diploma.
Pyle's "O. K. saleratus," G. A. Slocum, Chicago. ....Diploma.

Class 47.—Silver and Brittania Ware.

No entries.

Class 48.—Paper, Printing, Bookbinding.

Best exhibition plain and fancy binding, W. J. Park & Co., Madison, Silver Medal.

Class 49—Textile Fabrics, Clothing, etc.

Best piece kersimere, Chapman & Co., Menasha,.............. Silver Medal
Best piece blanketing, Chapman & Co., Menasha............. Silver Medal
Best ladies' blanket shawl, Blake & Co., Racine.............. Silver Medal
Best afghan blanket, J. H. Dean & Co., Baraboo............. Silver Medal
Afghan blanket shawl, hand made, J. H. Hicks, Oshkosh...........Diploma
Best assortment machine-knit hosiery, Lamb Knitting Machine Co., Chicago....... ....Silver Medal
Best exhibition of furs and fur hoods, Richard Black, Mazomanie..Silver Medal.
Fine wool shawl, Blake & Co., Racine..........................Diploma
Fine wool wrap, Blake & Co., Racine...........................Diploma
Exhibition sheep and dog skin gloves and mits, beaver gloves and carriage mats, H. K. Leonard & Son, Beloit.......................Diploma

Two lap robes, J. H. Dean & Co., Baraboo......................Diploma
Case of clothing, manufactured on the Florence sewing machine, Florence Sewing Machine Co., Milwaukee....................Honorable Mention

Class 50—Domestic Manufactures.

Best woolen kersey blankets, Mrs. Riddle, Lodi.......Set Silver Teaspoons
Best ten yards flannel, Mrs. F. R. Martin, Rutland.... Set Silver Teaspoons
Best ten yards woolen cloth, Mrs. A. Bull, Wyocena...Set Silver Teaspoons
Best fifteen yards wool carpet, Mrs. Samuel Riddle, Lodi...Set Silver Forks
Best stair carpet, (not on premium list) Miss Angie Babcock, Lodi..Honorable Mention
Best rag hearth rug, Mrs. J. H. Hicks, Oshkosh .... Set Silver Teaspoons
Best fifteen yards rag carpet, Mrs. L. V. Carr, Madison......Set Silver Forks
Best woolen stockings, J. Gale, Merton................Silver Napkin Ring
Best wool mittens, Mrs. F. R. Martin, Rutland ....Silver Tea Bell
Best two pounds woolen yarn, Mrs. E. Newton, Oregon..........Silver Cup
Best ten yards towel cloth, Mrs. F. R. Martin, Rutland..... Silver Teaspoons
Best pair cotton stockings, E. Martin, Rutland.........Silver Napkin Ring
Best pound linen thread, Mrs. F. R. Martin, Rutland.....Silver Fruit Knife
Best white quilt, John Gale, Merton................ Set Silver Teaspoons
Best crochet bed quilt, (not on premium list) Mrs. S. Klauber, Madison..Silver Cup
Best double carpet coverlet, Mrs. J. H. Hicks, Oshkosh ..Set Silver Teaspoons
Best single carpet coverlet, Mrs. Salisbury, Fitchburg ..Set Silver Teaspoons
Best Knit counterpane, Mrs. J. H. Hicks, Oshkosh..............Silver Cup
Best wrought counterpane, Mrs. L. J. Steiner, Madison......Silver Tea Bell
Best wrought shawl, Mrs. A. Bull, Wyocena....................Silver Cup
Best suit boy's clothing, Mrs. S. Riddle, Lodi........ Set Silver Teaspoons
Best gent's shirt, Miss F. Wheeler, Madison.............Silver Napkin Ring
Best taste and skill in crotchet work, Mrs. L. J. Steiner, Madison....Set Silver Teaspoons.
Crotchet tidies, Mrs. S. Klauber, Madison............ Honorable Mention.
Crotchet tidies, Mrs. C. M. Goodnow, Burke.......... Honorable Mention.
Crotchet tidies, Mrs. J. R. Adams, Burke............. Honorable Mention.
Crotchet tidies, Miss E. Henry, MacFarland.......... Honorable Mention.
Crotchet tidies, Miss Mattie Wells, Madison.......... Honorable Mention.
Worsted tidy, Mrs. J. H. Hicks, Oshkosh............. Honorable Mention.
Cotton tidy, Mrs. J. H. Hicks, Oshkosh............ .. Honorable Mention.
Worked skirt, J. Gale, Merton....................... Honorable Mention.
Rag mat, Mrs. J. Dunn, Roxbury..................... Honorable Mention.
Best taste and skill in knit work, (machine knit) Chas. H. Barton, Madison, Set Silver Tea spoons.
Best specimens straw hats, Mrs. F. R. Martin, Rutland, Set Silver Teaspoons.

JUVENILE.

Best six skeins woolen yarn, Martha Riddle, Lodi............. Silver Cup.
Second best, Clara L. Boyce, Brooklyn................ Silver Napkin Ring.
Patchwork quilt, Carrie P. Root, Verona, (4 years old).. Silver Sewing Bird
Best pair woolen socks, Miss Clara L. Boyce, Brooklyn, (13 years old,) Silver Cup.
Second best, Viola Martin, Rutland................. Silver Napkin Ring.
Best pair woolen fringed mittens, Miss M. Salisbury, Fitchburg. Silver Cup.
Second best, Miss D. Martin, Rutland................. Silver Fruit Knife
Best specimen darning, Miss Clara L. Boyce, (13 years old,) Silver Napkin Ring.
Best skill and taste in crotchet work, Miss Clara L. Boyce, Brooklyn, Solid Silver Fruit Knife.
Second best, Miss M. Salisbury, Fitchburg........... Silver Sewing Bird.
Best plain needle work, Miss Clara L. Boyce, Brooklyn, Silver Vase for flowers.

Second best, Marie L. Park, Dodge's Corners, (10 years old,) Silver Napkin Ring.
Best display in this class by one exhibitor, Miss Clara L. Boyce, (13 years old).. Silver Cake Basket.

Class 51.—*Millinery.*

Best variety of articles of millinery manufactured by exhibitor, Mrs. E. D. Lyon, Madison.. .... Silver Medal
Rich and handsomely made infants' cloak, Miss Alzina Waite, Madison, Solid Silver Napkin Ring.

ORNAMENTAL WORK AND WORKS OF ART.

Class 52.—*Ornamental Needle and Fancy Work.*

Best silk embroidery, Mrs. E. Coleman, Fond du Lac..Set Silver Teaspoons.
Muslin embroidery, Mrs. O. M. Crane, Cottage Grove.... Silver Teaspoons.
Muslin embroidery, Mrs. Dr. Bailey, Madison........ Set Silver Teaspoons.
Best lace embroidery, Mrs. O. M. Crane, Cottage Grove, Set Silver Teaspoons.
Best lace embroidery, Mrs. S. O'Brian, Madison....... Honorable Mention.
Best worsted embroidery, Mrs. L. Suhr, Madison..... Set Silver Teaspoons.
Best worsted embroidery, Mrs. E. B. Crawford, Madison..Honorable Mention.
Best worsted embroidery, Mrs. Dr. J. Bailey, Madison.. Honorable Mention.
Tatting, Mrs. B. M. Worthington, Madison............. Honorable Mention.
Feather flowers, Mrs. Ellen Cheney, Madison.......... Honorable Mention.
Hair work, J. H. Ault, Fond du Lac.................. Honorable Mention.
Fancy bead work, Mrs. L. Suhr, Madison.............. Honorable Mention.
Miss Emily Rider, Madison, beautifully wrought brushes, ornamented with bead work....................................... Silver Sewing Bird.
Wreath shell work, Miss E. Young, Madison.......... Honorable Mention.
Two pillow slips, Mrs. L. J. Steiner, Madison....... . Honorable Mention.
Worsted wreath, Mrs. N. B. Crampton, Madison....... Honorable Mention.
Shell work, H. G. Roberts, Janesville.......................... Diploma.
Best display in entire class, Mrs. E. B. Crawford, Madison... Silver Pitcher.

Class 53.—*Music and Musical Instruments.*

Musical Instruments—Free Exhibition.

Class 54.—*Works of Art.*

Best carving in marble, J. F. Willoughby, Prairie du Chien....Silver Medal.
Best carving in wood, John Lambert, Dane................ Silver Medal.
Best painting in oil, Mrs. Dr. J. Bailey, Madison............ Silver Medal.
Second best, Miss Bertha Pradt, Madison......... .... Bronze Medal.
Best show of paintings by modern masters, N. Marshal, Madison, Special Notice.
Best exhibition of sun pictures, M. Mould, Baraboo......... Silver Medal.
Best exhibition of pencil or crayon drawings, Mrs. A. Atwood, Lake Mills, Silver Medal.
Second best, J. Jellings, McGregor, Iowa.................. Bronze Medal
Best exhibition of penmanship and pen drawing, B. M. Worthington, Madison, Silver Medal.
Album of sea moss pictures, Mrs. M. K. Stone, Fond du Lac..Silver Medal.

MISCELLANEOUS.

Class 55.—*Miscellaneous Articles.*

Liquid glass cement, Robert W. Patten, Brodhead................Diploma
Live trout, artificially spawned and hatched, A. Palmer, Boscobel.Diploma.

[A very fine collection of speckled trout. If the exhibitor can accomplish what he claims,—the ability to breed the fish in large quantities, so that they will live in hard water,—it is certainly a matter of great importance, and should receive special encouragement.—*Report of committee.*]

Condition powders, J. H. Woodman, Monroe............Honorable Mention
Grappling iron, A. J. Nellis, Pittsburgh, Pa.,............Honorable Mention
Method of extracting corns, J. B. Merrill, Madison................Diploma
Seed wreath, Mrs. A. Friese, Juda.....................Honorable Mention
Musical album, inkstand, brushes and bottle, L. Roeder, Madison, fine display of articles made in Berlin, Europe..................Honorable Mention
Fancy work box, G. J. Kreus, Delafield...............Honorable Mention
Rein holder for carriage and wagon, H. A. Grinnis, Chicago, Ill.,...Diploma
Window sash fastener, E. Johnson, Chicago, Ill.,.................Diploma
Display waterproof goods, Daniel Knight, Milwaukee..............Diploma
Dress box, K. Atland, North Cape................................Diploma
Preserved flowers, H. G. Roberts, Janesville......................Diploma
Handsome and attractive model of Swiss scenery, Chas. Erckton, Madison, Diploma and...$20

Class 56.—Exhibition of Counties.

Largest and the most creditable contribution to the exhibition made by the citizens of any one county, exclusive of Dane, Waukesha county, Prize Banner and...$100

PERSONAL EFFORT.

Class 57.—Ladies' Riding.

Best ladies' riding, Miss Mary J. Smith, Burke..Silver Tea Set, extra plate, 6 pieces.
Second best ladies' riding, Miss Luella Scott, Lowville, Silver Tea Set, tete-a-tete, 4 pieces.
Third best ladies' riding, Miss Nellie Root, Verona...........Gold Bracelet
Fourth best ladies' riding, Mrs. D. F. Salisbury, Fitchburg, Silver Cake Dish.
Fifth best ladies' riding, Eliza Daily, Cottage Grove..Silver Card Receiver.

Class 58.—Boy's Riding.

1st premium, Charles Warren, Madison....Forrester's "American Horses."
2d premium, H. D. True, Fitchburg,....................Silver Ice Pitcher.
3d premium, George Fratt, Racine..................Gold-lined Silver Cup.

Class 60.—Base Ball.

First prize, Silver Pitcher, Waiter and two Goblets, awarded to the University Base Ball Club "Mendota," Madison.

PRACTICAL PAPERS.

WHEAT-GROWING IN WISCONSIN.

BY ELI STILSON, OSHKOSH.

The question how to grow wheat successfully is one of great importance to us and to the "coming farmer." The decreasing average yield, the worn appearance of the old wheat fields, the shriveled and starved appearance of the berry in many parts of the state, all these admonish us that if we would save our farms from exhaustion, we must all adopt a higher system of farming, by a greater diversity of agriculture, by keeping more stock, (mixed farming,) and by a more scientific and systematic rotation of crops.

Farming, to be permanently successful, must be founded on the principle of returning to the soil the elements abstracted by the growing crop.

Nearly ten years prior to 1859, Ohio stood at the head of the wheat-growing states of the union, and the geological survey reported her possessed of a fine wheat soil. But according to the census based on the crop of 1859, she dropped to the fourth rank of wheat-growing states.

Again, in the year last named, Wisconsin rose to the third, and in the next year contended sharply for the honors of being the first wheat-growing state. She has now fallen down to 13 1-2 as the average product; and in the reports of the agricultural department, for October and November, 1869, the famous wheat district of Rock county is set down as yielding an average of 7 bushels.

Meantime Ohio has at least once gone down to four bushels per acre, and her agricultural leaders are very properly sounding the alarm. With such facts as these before us, it is useless for the wheat-growers of Wisconsin to close their eyes to the fact that our soil is fast being exhausted of its wheat elements; so that, with the present low prices, wheat-growing must have resulted in the loss of several million dollars, besides the exhaustion of the soil.

RESTORATION BY ROTATION OF CROPS.

In seeding with tame grass, it is advisable to use clover and timothy mixed; for while timothy grass is not a renovator of soil it improves the quality of the hay and helps the clover to stand up. One-third clover and two-thirds timothy seed makes a good mixture for meadow, and on very dry or worn land one-half clover would be better, while for pasture it is best to use two-thirds clover because of its renovating power; its long tap root drawing nourishment from the subsoil, while its immense foliage assists in supplying nitrogen for plant food.

Experience proves that it is not advisable to continue a field in grass longer than three years. When the farm is so fenced as to admit of pasturing the land, it is decidedly preferable to pasture it the last year or two of the three. The greatest amount oi hay and pasture can be obtained from the land when this plan is pursued.

The land should be manured and spring-plowed and planted to corn the fourth year, and the corn well tilled so as to leave the land clean for the crop of wheat that is to follow. The land should be plowed in the fall for wheat, as the difference of a few days, in the spring, in the time of sowing will often cause a loss of one-fourth or one-third of the crop. Fall plowing is the most productive, if the sowing is done at the same time; and if the land is not the best of wheat land, and in the highest state of fertility, it should be seeded down to grass again. But if the land is in a high condition and a good wheat soil, a second crop of wheat may be taken before seeding to grass again. But when our agriculture shall become more diversified it will be best to abandon this second crop of wheat on our best Wisconsin soil.

Summer fallowing is sometimes pursued on clover land much worn and with good success. The experiment has also been tried of allowing the land to remain in clover but two years, and after mowing the first crop the second season, to plow it first shallow, then deep in the fall, and in the spring to sow it to wheat. But this rotation will need further trial before recommending it for general adoption. Clover, corn and wheat form the best rotation for spring wheat, and to this barley may be added, if desired.

LAND PLASTER.

Some object to the use of plaster because they have tried it on crops to which it is the least adapted, and received little or no benefit; while others may have seen it used on land in excess, without a corresponding amount of manure, from either clover or the barn yard, and the soil in the end become more completely worn out and heavy than it would if no plaster had been used. But if properly used on the right kind of a crop, it can be made very serviceable to the farmer. It should be used on the second and third crops of clover, at from one-half to one bushel per acre. This will help to increase the quantity of clover for feed for stock, and thus increase the amount of manure, and at the same time fill the soil with clover roots; so that when the sod is broken up with the plow and the sod decays, the soil will be loose and full of plant food. The plaster will do more good to the wheat if put upon the clover than if sown directly upcn the wheat. The plaster should be applied to the clover soon after it starts to grow in the spring.

MODE OF MANURING.

The farmer should make it a rule to keep cattle, sheep and horses enough to consume all the hay on the farm with a sufficient quantity of corn and oats to make all the straw into manure with his stock. If there is more manure than is wanted for the corn crop the ensuing year, some portion may be drawn out early in the fall and put upon such clay lands as will bear manuring with the wheat crop, and spread and plowed in when drawn out. But on prairie soil it is best to apply it to the corn crop; and for this purpose it may be drawn out late in the fall or winter, on sod land, at the rate of fifteen loads to the acre and left in heaps until spring, when it should be *spread very evenly over the ground, taking care to remove all the manure from where the heaps lay*, as those places have got their share by the drenching of the rains. If the manure is applied too thickly, or is not evenly spread, it will cause the grain to lodge in places; and as the growing crop only requires a limited portion of the manure yearly, all excess has a tendency to cause rust and lodging and a greater loss of manure by evaporation and leaching. If surplus manure is made it will be far better to apply it to the land oftener than to increase the amount of manure used at one time. "Feed your land before it is hungry and rest it before it is weary," is a golden maxim. The reason why manure in moderate quantities helps to prevent lodging of the grain is that the silicate of potash—the silica or flint, which is the bone earth of the straw—does not enter in for the support of stock but will be returned to the soil in the manure, and with what little silica is annually rendered soluble by atmospheric elements will produce a bright glassy straw and thus help to prevent rust and lodging. An acre of wheat will require from fifty to one hundred pounds of soluble silica for the straw and only one or two pounds for grain. So, if the straw is made into manure and applied judiciously, it will help the grain to stand up. Again, with the exception of the large amount of silica in the straw, the elements of the wheat are nearly the same as those in the straw, but in different proportions; and as the straw is grown first, if there is any deficiency in the soil, it falls with the greatest weight on the grain; for the straw has its first choice of productive elements and obtains nearly its full growth before the grain is formed.

That the average yield of wheat will not decrease with good farming we have abundant evidence in our own state.

HOW TO PREVENT SMUT.

The smut in wheat is propagated by sowing smutty wheat. A single berry of smutty wheat will contain a million spores; and in threshing many of these smut berries are broken and the spores are scattered through and adhere to the sound wheat and poison the germ, so that the wheat planted will produce smut again. Hence any alkali, or acid, or salts containing any acid, which, if sufficiently diluted, will not injure the germinating power of the wheat, when applied, will be an antidote to smut.

The result of experiments conducted on scientific principles, has shown that *blue vitrol* stands at the head of all these antidotes for smut. The most convenient mode of applying the vitrol is as follows: Put, say, ten bushels of clean seed wheat on the barn floor and dissolve one pound of vitrol in hot water, and add cold water until you have two quarts of water for each bushel of wheat. Sprinkle on the solution while an assistant shovels over the wheat. To have it all equally saturated it should be shoveled over several times and the scattering wheat swept up. It should be prepared from six to twenty-four hours before sowing. Where farm and seed are both free of smut it may not be necessary to dress all the seed thus, but only that intended to raise seed for the next year.

MODE OF SOWING WHEAT.

For spring wheat the broadcast seeder stands unrivaled as a labor-saving implement. Its cultivation is more thorough than that of any other implement on land fall-plowed, while its sowing is equal to the best hand-sowing, and yet done so as to save the whole cost of that plodding process—as the cultivator does enough more to pay the cost of this implement. But for winter wheat, the wheat drill is the best implement as it leaves the land between the rows higher than where the wheat grows. The frost and winds of winter serve to cover the roots of the wheat plant deeper by the drifting and the crumbling of the soil from the ridges upon the rows of wheat.

The amount of seed for spring wheat, when sown broadcast should be from one and three-fourths to two bushels. Variety of wheat and difference of soil should be taken into the account in determining the amount of seed required. Seed wheat is better if selected from good wheat soil in a good state of fertility.

DOCILITY OF ALL STOCK ON THE FARM.

BY D. S. CURTISS, OF WISCONSIN.

Several classes of animals are natural and necessary servants of man, in his efforts to cultivate and fertilize the earth; and it is desirable that they should be rendered as valuable as possible. Constant and kindly handling of horses and cattle familiarizes them to the keeper, whereby they become far more gentle and tractable; and the keepers come to understand their wants, diseases and peculiarities, and learn how successfully to treat and provide for them all; thus reducing the management of stock to a pleasant science, largely increasing the intellectual pleasure of the operator, and rendering the whole business far more profitable and pleasant, by making the manager better acquainted with all the resources at his command, and his animals better disciplined for the various services required of them.

From numerous European authorities, and experiments of intelligent American farmers, with my own experience and observations, I am fully assured, that systematic handling and feeding *all* the stock on a farm, with regular rotation and cropping, in the manner known as *greensoiling*, is largely more profitable and delightful than any other mode pursued by farmers, besides being far more humanizing—inspiring more real dignity of character and sentiment; and whatever developes the intellectual activities, elevates the tone and temper of all or any of the industrial classes, and promotes their higher happiness, is desirable and should be encouraged.

Thus knowing his animals more fully, the keeper will appreciate and treat them more rationally and kindly, which will result in higher humanizing effects—rendering the animals better servants, and the keepers better men. But to secure this desirable result, all stock must be often and familiarly handled, and led with halters, while young—colts and calves; and if all be done kindly and without anger, they will be as docile and readily approached at all times as dogs and cats at the house. But farmers will not be likely to take the pains to do this, without they adopt a steady and regular system which will lead to it as an essential part of their operations on the farm.

To describe, in detail, such a course is the object of this paper; and the principal feature of it is, to urge the

KEEPING AND FEEDING ALL STOCK IN YARDS OR STABLES,

allowing none of the animals to run at large, in the streets or fields, whereby they would fail to be handled daily, and become more or less wild and unapproachable; to urge raising and cutting feed for all, to be delivered to and eaten by them in the yard or stable.

But, it will justly be asked—"Will this process pay?" will the increased benefits pay for the cutting all the feed and delivering it to the stock in the yards or stables? We believe the following facts and calculations fully prove that it will: 1. The stock being tame and approachable, at all times, are more saleable and will command better prices—other things being equal—than those which are not tame; as purchasers prefer animals which are gentle and orderly to those which are wild and captious—whether horses, oxen, cows or colts; while they are always ready at hand, in the best plight and condition for inspection by inquiring purchasers. The operation is thus as profitable to the purse as pleasant to the patience. 2. Then, being regularly handled and trained from infancy, the dangers and difficulty of breaking colts, steers and heifers are avoided, which the breeder is subjected to under the usual practice; as, under this system, they grow up already broken and manageable; needing only to be kindly taught what is required of them, which they will readily do without vicious contest or fright. 3. Being kept up and fed, the stock is secure from the many accidents incident to running out, of which every farmer knows. Those which need it, and at suitable times each day, will be allowed to run in the yards or lanes sufficiently for exercise. 4. Being quiet and peaceful and not-harrassed by dogs or other causes, they require less feed to sustain the same conditions of flesh, milk or toil, and being better sheltered they grow and thrive better. 5. Less trouble and expense are required to remove them from place to place, or to market. 6. The vexing annoyance of "breechy" cattle—at home and abroad—are all prevented. Often more damage is done in a single day or night than the worth of the animal commiting it; individual and neighborhood quarrels and expensive litigations are engendered very often by trespassing cattle running at large, resulting often in losses of time, money and expensive lawsuits, to a greater amount than the worth of the animal and the damage done combined, besides exciting enmities and hatreds of life-time endurance with the parties; all of which is avoided where stock is kept up. This fact alone should have great weight in the minds of all our operators. 7. Vast saving is made in the expense of fencing, as will be fully explained, further on in this article. 8. By the mode of cropping, required by this plan, the lands will produce much larger yield, annually, than under the usual mode. It is well known that lands which are liberally manured will yield much more in bulk and better quality of feed when frequently cut during the season, than if left to grow until ripe. For instance, if a field that is in high tilth be sown to oats, corn, millet, &c., and be several times cut, as it attains a fair growth, it will afford two or three times as much good succulent feed as if cut late and but once, during the growing season. The same is true with clover and meadow grasses. This result is in obedience to a common and well-known law of vegetable growth, whereby plants constantly strive to reproduce or perpetuate themselves, when interrupted by any cause, while the growing season lasts. Where meadows are kept well manured by annual top-dressing of fine manures, they will yield two to three tons of good hay per acre at one mowing in the usual season; but let the same meadow be mowed early, and then cut twice during the same season, at properly chosen periods, they will yield four to six tons of even better hay than that obtained in case of one cutting. 9. This order and serenity being secured, both man and beast will be able to accomplish a greater amount of labor in a given time; higher impulses will prevail and guide all the operations; every operation will be more surely done in its proper season, and everything saved and kept in its proper place; men will labor with more tranquility, and the teams be more tractable; he will not get "riled up," nor will his animals be vicious from his own fury; so that none will "fret" away their strength and flesh. Serenity and comfort will reign with all, and all enjoy thrift, whereby the highest profit and progress possibly attainable are secured. Greater cleanliness will prevail. Stock being kept up, litter is not dropped everywhere to be carried about on the feet; and there being few fences, less space of land is occupied in that way, and fence-corners grown up with weeds and brambles to cumber the ground and scatter seed everywhere, to hinder and annoy labor, will be unknown. 10. While these are some of the gains and advantages which make this system pay, the saving in expense of fences and increased product and value of animals are the great gains accruing from it, in a pecuniary point of view; while greatly enhanced order, humanity and dignity are the moral advantages derived.

VEXATION AND LOSS OF TIME.

There is probably no other annoyance by which farmers lose so much time, temper and service—of team and laborer—as in "hunting up" the animals which are allowed to "run out," or in getting up the teams which are not tame, and are "hard to catch." It is painful to witness the furious temper and tired puffing and blowing, often exhibited by men and boys, who have spent half the forenoon in chasing after teams or young stock which were "turned out." Here is a serious loss of time, and just when most needed, in the cool of the day or morning —the best time for work. Also in looking after cows, which failed to come up at night, there is a great loss of time and walk, with more or less injury to the cows. There is scarcely a farmer who has not suffered from this fact, and does not know its truth. The system here proposed profitably saves all this loss and vexation.

COST OF FENCING.

Fences are a heavy cost to the farmer, which may easily be dispensed with. To illustrate: Take a farm of only 160 acres, a quarter section, which is half a mile square, one side of which lies on the highway, the other three sides joining other farms, whose owners are supposed to make half of the "line fences." To enclose this, the owner must make the road fence, 160 rods, and half of three other sides, 240 rods—in all 400 rods; and this only encloses his farm; but with our plan this is *all* that would be required, except a little to enclose yards, garden, &c.; while on the common plan of pasturing, about as much more would be required for cross-fences, and to lay off separate fields. This fencing will cost, at the very least, one to two dollars per rod—say five hundred dollars—without any allowance for after repairs—enough to feed the usual stock for years; nearly or all of which, by our plan, would be saved; or, if expended in additional labor and seed, would return annually at least five times that much in produce—enough to pay for feeding all the stock, in this pleasant, quiet way, and leave a large margin of profits to the operator, above what he could realize under the usual manner. Besides, there is no loss of time and space by the frequent "turn-abouts," in plowing, and dragging, and harvesting smaller fields, caused by many division fences, and in opening and closing bars, gates and gaps—hindrances which all farmers know, but do not usually take into account, yet which *will tell* by consuming time during the best seasons and weather for work. So much for the loss or saving in the matter of fences alone; and by careful calculation of all the items and details, the farmer will find the account still greater in favor of feeding and absence of fences; for the labor and money expended in fences if judiciously expended in additional cropping and greensoiling, will be found to return much greater gains than are realized by the pasturing practice. And then if the new plan were generally adopted, and all farmers kept up their stock, as is the case in many of the best farming districts of Europe, most or all of the line fences would be unnecessary, and that great expense saved. In many portions of our country the cost of fences is greater than the cost of the land. The saving of manure—emphatically the farmer's most reliable mint and renovator—is another considerable profit realized from this system. Indeed, it is maintained by those of largest experience and observation in this matter, that *that* saving alone will more than pay the cost of cutting and feeding in yards and stalls, since the manure is all saved at the barn, to be used when and where most needed, instead of being dropped in the woods and roads, where it is mostly lost. This careful saving of the home manure is a far wiser and better paying plan than expending large sums of money and time in buying and hauling expensive foreign fertilizers from the market towns, many of which are of little value; while the manure from well-fed stock in the barnyard is much more useful than the fertilizers of commerce; though some of them, as guano, plaster, phospates, etc., are more or less useful on particular soils and locations.

To render this system as pleasant and profitable as possible, *rotation* of crops and raising of *roots* will be required; which will result in "keeping up" the land to the highest point and prevent exhaustion—in securing much greater bulk and value of product, and sustaining a much larger number of animals upon a given quantity of land. Only for fear of extending this article to an undue length, a concise and detailed statement of facts and figures might be here given of the order of rotation, and the manner of root-raising, which have been successfully practiced in many places. Such statement has been carefully prepared and may be given at another time. Hints at the leading features of the system—its noble, harmonizing effects—with some statements of facts, to arrest the thoughtful attention of those interested, was all that was aimed at by the writer in this paper. One word in

CONCLUSION.

In this as in every other proper pursuit of man, every advanced step in the right direction leads to another; every improvement in any part of the business opens the way for additional improvement; in fact, all improvements in any portion of a business or profession require improvement in all other parts, in order that the fullest benefits may be realized. True progress and reform begets, necessarily, other progress and reform; and here is seen the great importance and value of *first steps*, in the right direction; they not only incite but demand *further* right movements, in order that the highest blessings may result from them. For instance: the introduction of the seed drills requires that the soil be put in better condition than for the old harrow, in order to work to best advantage. The use of reapers and mowers requires the surface of the land to be put in the best condition to derive the greatest benefit from them. The introduction of improved species of seeds and plants needs improved preparation of soils to secure the greatest yield from them; and improved care and feed are required in order to realize the largest profit and pleasure from the introduction of improved breeds of stock; and so on, to the end of the chapter of all agricultural operations. The very march of the times demands of all improved intelligence and skill. The progress of these *material* improvements stimulates to higher *moral* and *mental* attainments, by inciting a broader and deeper exercise of the mind to devise and carry out elevated improvements of every kind. So, in the plan and efforts to secure greater docility and tractability among his animals the operator elevates his own character and improves his habits; the very practice of improving their condition necessarily leads to the improvement of his own profits and pleasures. He is, under this general system of progress and improvement, led to exercise more discrimination and reason in adapting crops to soils and seasons, and in selecting the most appropriate classes and breeds of stock for his particular locality and market. Thus, in becoming a complete and rational master of himself and "the situation," he is better qualified, with improved facilities, for controlling and handling, at all times, for all desirable purposes, all his animals for either sale or service—better prepared to gain in all his efforts.

While it is not expected that every farmer can arrive at and enjoy this pleasant and profitable state of things in a day, it is certain that he can, at once, take the *first step*, and then he may rapidly approach its consummation; and, what is encouraging, each step will show the practicability and desirableness of another, and so on endlessly.

THE FATTENING OF SHEEP IN WINTER.

A paper read before, and published by, the New York State Agricultural Society, 1869.

BY JURIAN WINNE, OF NEW YORK.

The subject before us is "The managing and feeding of fat sheep in winter," together with the difference in the various breeds. My first rule is, always to buy good stock, whatever the breed may be, and to be sure to select animals kindly disposed to fatten. The price of well-bred sheep may appear to be high, but depend upon it, if there is no money in feeding good stock, there is no money in poor. It will not do (as has often been said), to buy any kind of sheep for feeding, that you can double your money upon; for a one-dollar sheep will consume about as much feed as a six-dollar one, and as neither of them can be fed through the feeding season for much short of five dollars a head, you will readily perceive that the one-dollar sheep would stand you in six dollars, the other eleven dollars.

According to my experience, the one-dollar sheep would weigh in the spring about eighty pounds, and sell for seven cents per pound, which would make five dollars and sixty cents—a loss of forty cents; when the six-dollar one would weigh at least one hundred aud twenty-five pounds, and sell for ten cents per pound, making twelve dollars and fifty cents—a profit of one-dollar and fifty cents, besides getting the credit in the one case of bringing good stock to market, and in the other such as will be hooted at, and reported for you as *scalawags*. Now, as every good citizen values his reputation (and what is a man good for without it), I think this last item should not be lost sight of.

Next in order then, will be the conveniencies of fattening. It is bad policy in this country to undertake to fatten sheep in winter, with no protection or shelter, save a few trees or the side of some old building. I recollect an instance of that kind of feeding, which I went to see some ten years ago, where a man had some three hundred sheep feeding, running in a four or five acre lot, without any protection, save such as I have just described. It rained a little while I was there, the ground was soft, although it was February, and his sheep (though otherwise nice and good ones), looked wet, lank and muddy; his feeding troughs were in this lot, all covered with mud, and some of the feed, on account of the mud in the trough, was left. I expostulated with him about his slovenly manner of feeding. He replied that he could do no better. I said to myself, this is your first and last winter feeding, and so it was.

My buildings, which it will be well to describe as fully as possible, were put up with as much reference to storing the products of the farm as for protecting and sheltering the sheep. The barn first in order is nearly surrounded by other buildings; it is forty-four by forty-two feet, with twenty-foot posts, with upper and lower floors—horse and cow stables and granary, all below. Into this barn goes all the grain I raise, first, and then as much feeding hay as it will hold—and there was room this year for but very little.

When I thresh my grain (which I always do in the fall), I put the straw mostly back into this large barn for feed and litter. The granary in this barn will hold about six hundred bushels of grain, and has an alley through the middle where the corn, oil-meal, etc., is mixed for feeding the sheep. The upper and lower floors of the barn are used for hay, straw, etc., from one feeding to another. I have a wagon or carriage house close to this barn, twenty by thirty feet, with cellar the whole size, eight feet in the clear, middle and upper floors. This cellar is used exclusively for roots. The roots are generally cut by machine, and every day at half-past twelve, are fed to the sheep. When I have plenty of them, we feed daily at the rate of from three to four bushels to the hundred. The middle floor of this building is used for carriages, sleighs, harness, etc., and the upper floor for grain for the sheep, and holds from fifteen to sixteen hundred bushels (not without studding in the beams however). After the feeding and watering is finished in the morning, the grain that is needed from the wagon house is brought down and mixed with oil-meal, etc., in the alley heretofore mentioned in the granary in the barn, for the next two feedings.

The next building I shall mention, which I will call shed No. 1, is twenty-one by twenty-four feet, sixteen foot posts—on the south side of the barn. The upper part of this building is filled in the summer with market hay, which is pressed out and sold in the fall, the floor covered with sawdust and leaves, and when the time arrives, forty sheep are put up and kept there until they are sold in the spring. Of all my feeding yards and stables, I always find that these second-story sheep do best. The lower part of the building has manure piled under it in summer, as I always like to have what manure is not used in the spring under cover through the hot weather; it is taken out clean in the fall, and the shed arranged the same as the upper part, and, together with an open yard about twenty-four by sixty feet, holds sixty sheep. These sheep have always the run of this yard with the shed, except when it is stormy, and then they are closely confined to the shed.

The next in order is a small shed in rear of No. 1, about ten by twenty feet, in which the stock rams are kept. The next is another low shed west of the barn, about fourteen by twenty-four feet, for breeding ewes. Both these sheds have small yards attached for good weather, are used in summer for piling manure under, are cleaned out in the fall, and receive, like No. 1, a coating of sawdust and leaves, when they are ready again for the sheep.

Next comes another shed, also west of the barn, thirty by seventy-two feet, with twenty-foot posts. The upper part of this building is also filled with market hay in the summer, pressed out and sold in the fall, and the floor then covered with sawdust and leaves, the same as No. 1 and the others.

Although I say that I put in sawdust and leaves in the fall, I will correct that a little by saying that sometimes, as I have done this year, and as I always advise when practicable, I put in the sawdust before harvest on these upper floors. It then has time to get nice and dry, thereby not only preserving the floor better, but also absorbing the more liquid manure from the animals. The lower part of this building is also used for piling manure under in summer, and in the fall is treated the same as the other. Before the sheep are brought into this building in the fall, we put up, made expressly for the purpose, and put away in summer, three partitions on the upper floor and three partitions below. This gives us four pens above and four pens below, each eighteen by thirty feet. Each of these pens holds forty-five sheep, which makes one hundred and eighty for the upper floor, and one hundred and eighty below, or altogether for this building, three hundred and sixty sheep. On account of the lower part of this building being lower than the upper one, I have for each of these lower pens a small yard attached, about ten by eighteen feet, which in good weather they always get with their pens. Ventilating windows are also provided for all the pens, and are always regulated according to the weather. Two of these lower pens have two cisterns, supplied from the roof of this shed and one side of the barn, which generally, but not always, keep the sheep in this building supplied with water.

The next building is a shed, a "lean-to," on the north side of the barn, twenty by forty-four feet, used as the others for piling manure under in summer, cleaned out and treated as the others in the fall, and holding seventy sheep. The upper part is used for straw, corn-stalks, etc., in winter. Under this shed I have a well, which besides its natural supply, gets what water this roof brings, together with the other side of the barn and another shed not yet mentioned. This shed has no yard.

The next and last permanent shed (although I had another temporary one I used last winter), is thirty-five by thirty-six feet, eighteen foot posts. The upper part of this shed is filled in summer with feeding hay for the sheep, to be fed out in winter; twenty-one by thirty-six feet of this shed has also manure piled under in summer, used as the others in the fall, and together with an open yard about thirty-six by forty feet, holds seventy-five sheep. These seventy-five sheep, together with the yard containing sixty sheep, get their water from a well standing between the two yards. Of this shed, fourteen by thirty-six feet is floored and partitioned; one-half of it is used for a horse stable when needed, and into the other half I always put twenty of my best sheep.

I have now given as well as I can, a description of the buildings and arrangements I use, and although many of you may have better ones, still I must say I am very well satisfied with mine. I will now say something of feeding apparatus, and may premise with the declaration that all claimed improvements in sheep-feeding arrangements that have come under my observation for the last ten or twelve years, I have always examined very carefully, but have universally found after looking them over, that for fattening sheep, all things considered, they were no better than mine. For breeding sheep, however, I think there are better ones. I have a feeding box (after which I made others) sent me by my friend, William Chamberlain, Esq., the noted fine-wool sheep-breeder, which for breeding sheep is all that could be desired, as we can afford to take a little more time, and have little waste and trouble with a few nice breeders. When, however, we come to fattening five, six or eight hundred sheep, it makes quite a difference whether one man can take care of them, or whether we must have two; as an extra hand through the feeding season will cost, wages and board, with us, at least one hundred and fifty dollars. Then, also, it makes quite a difference whether five hundred waste a pint of grain per day, which I am satisfied was more than my whole flock wasted last winter, or whether they waste half a bushel per day; and I have seen more than that wasted by bad fixtures and management, thereby causing loss and discouragement to the person engaged in feeding. Also, whether we waste one hundred pounds of hay per day, or whether four or five hundred pounds will cover the waste for all winter. These wastings are what hurts, although it looks like but a little, when you come to figure it up, you will be surprised to see what it amounts to.

My apparatus or feeding box for feeding hay, grain, roots, etc., which it took me four years to perfect, and which you are all at liberty to use if you like it, is from twelve to fourteen feet long, twenty-two inches wide, with a tight bottom; the upper sides let in by the scantling at the ends and middle, and all the box, except the bottom, put together with good stout screws. I claim for this box economy, expedition and cleanliness.

The sheep cannot upset the feeder nor his basket, as he carries it on his shoulder or in his arms to the first box; he walks up perfectly straight, and scatters the feed from the basket evenly and quickly through all the boxes in the yard, the sheep falling in behind him, just as well drilled soldiers fall in line at the tap of the drum—the whole time consumed for putting grain in four of these boxes for seventy-five sheep, not being more than one minute. Then, also, the space being but from eight to ten inches wide, there is no chance for the sheep to get more than their heads through, and the box being but twenty-two inches wide, there is no need for crowding or straining to reach their feed, but each animal stands quietly and comfortably until his meal is finished. Also, every experienced sheep-man knows that sheep always crowd up to their feed instead of away from it; consequently with a good feeding box no hay or grain can be wasted.

As I said before, four of these boxes can have grain put in very quickly, as the boys often take hay enough at once for two boxes, drop part in, and the balance in the other, when, by a little shake of the fork, it is scattered evenly through the box. The same also with roots, as the feeder, when he gets to the first box, can put them in so quick, that, let the sheep come as fast as they can, they cannot catch him before he is through.

These boxes have only to be turned over and back again, and they are clean. No dirt can get in from the sides, as the space between the upper and lower board is too narrow, and the box being from twenty-eight to thirty inches high, no dirt can get in from the top, consequently when the box is turned over and back again, it is always clean.

As to feed, water, litter, salt, etc., I must first and most particularly urge the feeder to have plenty of them, of a good quality, and have it *right there.* It is not very good economy to depend upon your neighbors, when you buy your feed or any part of it, to bring it to you from day to day, but you should always have at least two weeks or more feed on hand, when you will be all right, come fair weather or foul. I have seen a case of that kind, where a lot of fat sheep were obliged to go without their grain a whole day, on account of a disappointment, which could not be made good again in three days' feeding. Water, too, should be looked after regularly. I have a rule that the boys shall go around and fill up the troughs with water twice in the morning after feeding, and twice in the afternoon, always commencing everything in the shape of feed, water, salt, etc., with No. 1, and always ending with the last yard or stable.

Littering cannot under any circumstances be neglected. I have often stood in the yard or stable, and noticed when the bedding was becoming wet or dirty, how careful the sheep were to keep out of it, and how reluctantly they would lie down. As soon as they get a good nice clean bedding, they would drop down upon it, and lie there as contented and happy, to all appearances, as an exhausted and worn-out person would on a bed of down; and here I shall take the liberty to say, that in my humble opinion, this is the time and the only time they accumulate flesh. Salt, ashes, etc., should also never be forgotten; no, not for a single day.

Quietness, also, is of the greatest importance, and, in order to secure it, I have a rule never to allow strangers in the yard, unless accompanied by the feeder. The sight of a stranger in the yard will send the sheep pell-mell in every direction, and the effect will be perceived for a whole day afterward; and no other reason can I assign for the forty sheep in the upper part of shed No. 1, doing better than the rest, but that we never go there except to feed, water, litter, etc., and there is no passing or re-passing through them as through other pens.

The question is frequently asked, "What kind of grain is best for fattening sheep?" I answer, for me, corn is the best for the main feed, although I like a few oats mixed to start with, and have no objections to beans, peas and oil-meal if they do not cost too much. Whenever they cost as much or more than corn, I dispense with them, as a sheep-feeder must count his cost as well as his reputation, if he intends to succeed. Another question arises: "Do you find whole or ground feed best?" For horses, cattle and pigs I prefer ground feed, but for sheep, especially fattening sheep, I choose whole or unground feed. I find that the sheep will grind it just as well as the mill to which we must give every tenth bushel, besides having the trouble of hauling the grain to and from it. I also find that fat sheep will hold up to their feed much better, especially in soft weather, on whole than on ground feed; consequently drawing grain to and from the mill, and paying toll, is, in my estimation, labor and money lost.

A person to succeed in sheep-feeding, must do it because he likes to do it—because he prefers to feed sheep and see them eat, to any other business done in winter; and although he may not be able or willing to do the work himself, still he must take delight in seeing it well attended to, if he expects to prosper. He should be sure to see every sheep he has, at least once a day, when, if he understands his business, he can tell at a glance whether they have been properly cared for.

It is asked, "What kind of hay is best for sheep?" Emphatically I say clover, but it should be cut early and cured nice and green. Timothy is probably best for horses, but for cattle and sheep I prefer clover, and would rather have a ton of nice green fine clover than a ton of timothy, although in market one ton of timothy will bring as much as two of clover. I have sometimes fed some timothy hay to my sheep, but always found that it was not the kind for them; they would grow lank and thin upon it—not a very good sign that a fattening animal is thriving well. As soon as they got the clover again they would plump up and look full and nice, and I can assure you unless your sheep look full and plump, they are not fattening very fast.

Is straw good for feeding sheep? One feed at noon of nice bright oat, barley or pea straw, I prefer to hay, as they not only relish it, but it is a change for them. Sheep are very fond of variety, and will eat daisies, weeds, thistles or almost anything of the kind that is cut and cured green. Nice green corn-stalks are not very bad for sheep, and when I have plenty of them I always feed the sheep with them, at least once a day, and I consider them as good as hay. I prefer, however, feeding them the fore part of the winter, as towards spring they will sometimes contract dampness, and then the sheep do not eat them so well.

I am asked to answer this question: "Shall we cultivate roots for fattening sheep, and what is their value compared with grain?" I have often thought I would experiment a little on this subject, but as the trial is attended with considerable pains and trouble to have it accurate, without which it is of no use, I have put it off from winter to winter, and now have no figures to give. I intend yet to test this question thoroughly. However, I will answer as well as I can, and as I have used more or less roots every year since I commenced feeding sheep, I think that I have a pretty good idea about them. I will say then, cultivate roots by all means, if you have plenty of manure and intend to put your land in proper condition; if not, you may better leave it alone, as you will surely get more grass and weeds than roots. I was successful in raising about eighteen hundred bushels of flat turnips last season on about two and a half acres of land, and with very little labor. Early in the spring we covered the ground with about fifty loads of manure from one of the sheep sheds, and plowed it in about seven inches deep. Just before the time arrived to put in ruta baga seed, the ground was harrowed, another light dressing of fine manure put on and worked in with a gang plow about three inches deep. It was then harrowed, and the seed immediately sown. The seed proving bad, I gang-plowed the land again and sowed new seed. This time the seed came up beautifully, but was soon destroyed by the turnip fly, when as a last resort, I gang-plowed it again, sowed the common purple-top turnip, and had the result stated. On account of the frequent gang-plowing by which the weeds were destroyed, we had no trouble but to thin out the plants. Part of the seed was put in with a large seed planter, and part sowed broadcast, and in thinning the plants where the seed was put in with the planter, the work could be done in one-half the time that was required where the seed was sown broadcast.

With regard to the value of roots for feeding, my experience is that whenever they are worth at home more than seventy-five cents per barrel, and corn not over from one dollar to one dollar and twenty-five cents per bushel, the corn is the cheapest, and I would use only a few roots as a substitute for green food. I consider carrots and ruta bagas better than common turnips; still, by feeding a little more of the latter than the former, I think the sheep do just as well on them.

Another inquiry is, "How often do you clean out your yards and stables in winter?" Not at all, unless I perceive danger to the buildings from the weight of the sheep and manure on these upper floors; then we remove a quantity sufficient to make the building safe, and leave all the rest until the sheep are sold, when we find the manure so hard and solid that it must often be cut with an axe or hay-knife into blocks before it can be handled—thus showing that no decomposition has taken place during the feeding season.

Feeding with me is always commenced about half-past five in the morning, when I always endeavor to be there; and see that everything is right, and give special orders, if necessary, for the day. The best help will sometimes put off for to-morrow what should be done to-day, and this is worse in stock-feeding than in any other business.

I hold that the noses of the sheep should be smeared with tar, at least four times through the feeding season; first, when they are brought home in the fall; second, when they go into their winter quarters, and then twice during the winter. By doing this, we prevent all trouble with colds and foul noses. The old method of catching and holding the sheep to perform this operation made it a laborious task, and I now practice a new and easier way of doing it. We simply take two or three of the sheep-boxes which I have already described, which are loose and can be set anywhere, and make a small yard under the shed, and drive the sheep in, and pack them closely; one man holds the bucket of tar, and two or three, each with a wooden tar ladle, jump right in among the sheep, and without catching or holding the sheep, put the tar on, commencing at one end and coming out at the other; and this job, for six or eight hundred sheep that used, in the old way, to take us almost all day, can now be done in less than two hours, besides being so much less injurious to the sheep.

When I went into the sheep-feeding business years ago, it was more with a view to the consequent improvement of the land (it would hardly grow a crop of beans then), than to make the ready dollar. In this I have fully succeeded. I wanted to make two spears of grass grow where but one grew before, and I am sure I am getting three, some of my neighbors say four; however, I call it three. The meadows that used to cut from one-half to one ton of hay per acre, now yield on an average over two. Raising rye was then out of the question; last year I got from about sixteen acres, four hundred bushels of rye, and straw enough to have amounted to near nine hundred dollars, if I had sold it (which I never do, unless I replace it by hay for bedding, as I have done this year, getting three tons of hay to one of straw). This year I got from forty-five bushels sowing, fifty loads.

For fear of misleading you, I must say, with all the experience and precaution in buying, good fixtures, plenty of feed, litter, care, etc., you will not always succeed. For though I have for the last twelve years studied the thing closely, and carried it out carefully, in spite of all my efforts I have not always made money, and would almost guarantee that out of every ten new sheep-feeders, eight will probably feed but one year. When a friend asks my advice on the subject, I always say to him, try twenty-five or fifty, and then if you like it, get more the next year. Some have looked upon this advice as selfish, and given to keep others out, and have rushed into the business, and not only the first year made no money, but actually lost nearly half their investment. We used to have several sheep-feeders in this and adjoining counties, and as the principal feeders have all left the business except myself, I think this is pretty conclusive evidence that what I now say is about right.

In regard to the profit of the different breeds of sheep for fattening, allow me to say, that in my twelve years' experience in feeding, I have found the breed of sheep to have much to do with their early maturity, weight and fattening qualities. I have had Leicesters and their grades, Cotswold grades, South Down grades, Merinos and their grades, and have always found that whenever the Leicester blood predominated, I had an animal that would fatten quick at an early age, and make good weight, and have had no trouble when the animal has been half or more of Leicester blood, with good keeping, to make him dress one hundred pounds of mutton at twenty months' age.

SUGGESTIONS TO DAIRYMEN.

From an address before the American Dairyman's Association, Jan. 12, 1870,

BY X. A. WILLARD, A. M., OF NEW YORK.

WHAT THE PAST SEASON HAS TAUGHT.

The operations for the past year have demonstrated three things of considerable importance to the cheese dairymen.

First,—That a low even temperature and a comparatively humid atmosphere in July and August, are of service in preserving cheese in flavor, and hence, that more attention must be given in the constructing of curing rooms to meet the condition of hot dry weather.

Second,—That a healthy consumptive demand for cheese does not depend upon extreme low prices, and

Third,—That there are markets and an outlet for our whole product, at a price above cost It will be of considerable importance, I think, for dairymen to bear in mind these three propositions in next year's operations.

The cheese-makers of New York, through the factory system and their conventions and discussions, have done immense service to the world, but it must be admitted, I think, that New York cheese-makers have not reaped the pecuniary advantages to which they are entitled for their efforts in this cause of improvement. Nor have they benefited themselves as much as those engaged in other branches of the dairy. The fault with us has been the constant effort to crowd upon one single stand-point—CHEESE. This one subject has occupied and absorbed our entire attention.

BUTTER-MAKING MORE IMPORTANT THAN CHEESE-MAKING.

We come together fancying that cheese is the most important dairy interest in the country, but it never has been, and never will be the great interest. Our total product of cheese this year may be put at 240,000,000 of pounds. If we assume that 15 cts. has been the average net receipts, the whole product amounts to only $36,000,000. The butter product of the country in 1860, was more than 450,000,000 of pounds. It can scarcely be less this year than 700,000,000 of pounds, for we have ten million more butter eaters to-day than in 1860.

If the price of butter be assumed at 30 cts., the butter product amounts to $210,000,000. Compare for a moment the difference, $210,000,000 against $36,000,000, and tell me which is the more important interest. And yet the butter interest is wholly and totally independent of the foreign trade. Home consumption and home prices sustain the interest.

The butter dairymen have been quiet; they have organized no societies, they have allowed you to demonstrate to the public the great advantages of the cheese factory system and have been content to pocket their profits without a word of complaint, that the American Dairymen's Association had ignored their branch of the business. It is a question for you to solve which interest has been most benefited in this operation.

Cheese-men come here, fearful of the establishment of butter factories. They insist that every particle of cream must go into the curds, when you know it cannot all be retained, while it has been proved over and over again, that the night's milk may be skimmed at certain seasons of the year, and when thus mingled with the morning's milk, the expert cannot detect the loss of cream in the cheese.

The fact was told you at the convention last winter, that certain butter dairymen, making a fancy article, received for it a dollar per pound the year round. Did it occur to you how much a good cow would yield at that rate? Some dairies make an average of 240 pounds and more per cow, per annum. That would be at the rate of $240 per cow, to say nothing of the skimmed-milk. Your best cheese dairies may have turned off perhaps $75 to $80 per cow. The question which concerns us, is not altogether what England wants, or what she does not want; but in what way can we make the most money from our dairies?

ONE WAY TO INCREASE HOME CONSUMPTION OF CHEESE.

Were I asked in what way home consumption could be rapidly promoted, I should say by the manufacture of smaller cheeses.

What our people want to-day is a cheese weighing from ten to fifteen pounds, made in the Stilton shapes. And these shapes to a moderate extent could be exported, selling abroad at a higher rate than the 60 pound Cheddars. A few have been shipped to England the past season, outselling the Cheddar shapes of the same quality nearly 2 cts. per pound. But it is for home consumption that they are mostly desired. By a strange obtuseness, we run everything to suit the English market, and neglect the demands of our own people. Our habits here are in some respects different from the habits of the British people. The cutting of cheese upon the block, and selling by the pennyworth, does not obtain with us to any extent.

We want a cheese that everybody can buy without cutting. Dealers want something that they can sell whole, without peddling it out in pieces. There are thousands of persons everywhere that would buy a ten pound cheese at 20 cts. costing only $2, that would not purchase one at 15 cts. costing $10.

Persons neglect to eat cheese because of the difficulty of getting it in convenient shape. Poor people, or those in moderate circumstances, would often be induced to take a cheese costing $2, and thus would get in the habit of eating it.

In England immense quantities of Dutch cheese are imported from Holland. The Edams are round, weighing only a few pounds, and an English dealer will tell you how popular they are with the working classes.

Wherever I go I hear this complaint among the grocers, "We don't like the business of cutting cheese. Give us something that we can sell in a lump without waste, and we can do a good trade with it."

Now it would not cost any more to box such cheese, because five or six could be put in one package. When at the west last fall, I found them making such cheeses and selling at 30 cts., and I believe if a portion of our factories and dairies would try the experiment they would find their profits in it.

MILK-FARMING—CONDENSED MILK.

There is another great branch of dairying springing up in this country—milk-farming. It is destined to assume vast proportions, and is to-day, doubtless, the most profitable branch of the dairy. Our cities and villages and manufacturing towns must be supplied with milk, and the question is every year becoming more important how to supply them.

When I was in Elgin, Illinois, last winter, I found the Elgin condensed milk establishment putting up milk for the New York and Boston markets. This seemed to be rather singular, and the first conclusion I came to was, that the milk could be furnished so much cheaper at the west than at the east, that a good profit could be made by shipping it.

I enquired into the business, and I found there *was* a profit—a profit that may surprise you as it did me.

The condensed milk business is in its infancy, but the time is coming when an immense trade will be carried on in this commodity.

But what is condensed milk? It is pure, fresh milk, from which 75 per cent. of water is taken out. It is simply retaining all the nutritive and valuable parts of the milk and expelling three-fourths of its original volume in water, which is not valuable. It is putting milk in a shape to be easily kept for months, so that it may be shipped from point to point and placed on sale without fear of deterioration, or like other long-keeping commercial products. Consumers who have used condensed milk tell me they prefer it, even at a high price, to milk furnished by the milk dealers. They are sure of getting a pure article, an article that does not sour, and in which all the valuable properties of the milk are retained.

By adding 75 per cent. of water you bring it back to the original consistency, and most people who have weak stomachs, and cannot bear pure milk, prefer watering it themselves, to suit their taste, than to have this operation performed by the milk-dealer.

Elgin condensed milk, when used for tea or coffee, is not to be readily distinguished from pure fresh milk. Then it makes a nice dressing for various kinds of food, and, on the whole, is a great boon in these days to city consumers.

Well, I looked into the manufacture, and made some figures of my own to determine the profits. The milk is put up in cans holding one pound each, and is sold at the factory at $3.50 per dozen cans, which is a little over 29 cts. per pound.

Now, if you take two quarts of milk, weighing four pounds, and expel 75 per cent. of its water, you have remaining one pound of condensed milk. That is, you turn your two quarts of milk into a product that is worth 29 cts. or 14 1-2 cts. per quart.

I do not know the cost of manufacture, but if we assume that 4 1-2 cts. per quart will cover all expenses, and this doubtless is much too large an estimate, we have 10 cts. per quart that may be realized by the dairy farmer for his milk.

In other words, the dairy farmer would realize more money by turning his product into condensed milk, than to make it into cheese at 40 cts. per pound. Thus I could see that our western friends knew what they were about.

CURING ROOMS.

There is nothing more satisfactorily established than the fact that an even temperature of about 70°, is the one best suited for curing cheese, so that clean, delicate flavor may be secured. And the best means of procuring this temperature in the curing rooms has occupied more or less attention. The result of recent experiments has demonstrated that a low, even temperature may be secured by means of subterranean ducts. By locating buildings on a side hill and by laying large tile pipe under ground, and arranging so as to communicate with the dry house or milk room; a constant supply of cool air is obtained and an even temperature maintained at a very moderate expense. In our hot, dry summers, I am satisfied we shall never be able to hold our cheese in that perfect flavor which the market demands, unless some change is made in our curing rooms.

Seasons like the one just past are exceptions, and the like may not occur again in years. It approximated more nearly to the summers in England than those common with us, and to the peculiar condition of the climate more than anything else, in my opinion, may be attributed the general fine flavor of our cheese the past season. And if there was anything more needed to establish the fact of climatic influence, reference may be had to the hot summer of 1868 in England, and the consequent depreciation that year of English cheese.

The inventive genius of the American people must be turned to this point, producing, by artificial means, a tempera-tnre and condition of atmosphere best adapted for securing delicate flavor in cheese.

THE CHEESE PRODUCT OF 1869,

FROM A COMMERCIAL POINT OF VIEW.

From an address before the American Dairymen's Association,

BY JOHN M. WEBB, Esq., OF NEW YORK.

THE SEASON IN AMERICA.

The season of 1868-69 wound up with stocks of all descriptions of cheese more completely exhausted than was ever before known, both in this country and Great Britain. There was a very eager demand for new cheese, and tempting prices were offered to induce early deliveries. The first shipments from this side did not meet with much favor; many of the dairies very badly skimmed, and none showed richness of quality. Still the scarcity was so great that even those were sold at full prices, but they gave neither profit nor satisfaction to those who handled them. Your May make of cheese was unusually fine, and found eager buyers, but at such high prices, as to involve a loss to all concerned. Your June make was not nearly so good as that of May, its great defect being its limpness or weakness of curd and want of solidity. These cheeses did not stand the passage across the Atlantic at all well. Many dairies that appeared solid and fine when inspected in New York before shipment, showed great looseness and weakness when they arrived at their destination. In fact, I never remember the cheese changing their character on the Atlantic passage to the same extent as did the make of last June. Perhaps this is partly to be accounted for by the fact, that owing to the keenness of the English demand, prices were extreme, and shippers were willing to take green and half cured cheese. Dairymen, therefore, had every inducement to produce an article which should soon be ripe and ready enough to pass muster in the New York market, without reference to its fitness to stand the test of shipment.

Your July make of cheese was also much complained of on the same grounds, of looseness and want of solidity, but the *flavor* of both the June and July cheeses was purer and cleaner than it had been for the previous three years. It was also rich and full of quality. This purity of flavor helped in some degree to atone for the want of solidity, and altogether the quality was much to be preferred to the hot, rank flavor of the July make of 1868, which so greatly disgusted English consumers, and inflicted such heavy losses on shippers. The August, September, and some of the early October cheeses were really fine. It was pure and true in flavor, much more solid and close than the two previous months' make, and of finer curd and texture than any former season. Of the latter made cheese, where the milk was not skimmed, and where proper attention was paid to the temperature of the cheese-room, some dairies turned out a quality equal to the best of the whole season; but even at its best, this sort is not very desirable for shipment. It does not stand the deteriorating influence of the English climate nearly so well as the earlier make. To sum up, I would say that the whole season's make shows a *decided improvement in the average quality* and a *larger* proportion of *really choice* cheese than in any former year.

I have already said that the price of American cheese rated very high at the opening of the season. There was an eager competition among English dealers for the earliest arrivals. Prices were consequently forced up beyond their legitimate level, and in the reaction that inevitably followed, were correspondingly depressed. The excellent quality of your May make somewhat checked the downward tendency, but when poor June cheese reached the market, values fell rapidly, and for two months the trade was most unprofitable for all concerned in the buying and shipping of your product. At last the price touched a point that brought on a larger consumption of American cheese. The heavy shipments of June and July makes were cleared off almost as soon as landed, which gives this season's hot weather cheese that quick sale they so imperatively required, preventing the usual accumulation of ill-flavored, badly-keeping stocks that in former years have been hanging over the market for months. As soon as the English dealers had a taste of your August and September make—cheese that could be handled, if needful *held*, with perfect safety—they bought freely, and prices advanced instead of declining, as usual in September. It scarcely falls within my province to speak of the home cheese trade, as there are so many here who can do so with much greater authority than I can; but I think that it will be generally conceded that the consumption of cheese in this country is steadily increasing, and in the south very largely so. Indeed, the smart rise of price in October was mainly caused by the unusually active domestic demand, for the heavy decline in gold, at that time, put a serious check on the operations of shippers. This activity of the home trade slackened very considerably during the month of November, and the price of cheese has since dropped in sympathy with the rapid fall in the premium of gold. In the English markets during the months of November and December prices gave way slightly on medium sorts of American cheese, but the rate for really choice quality has been steadily maintained, the stock being light and very firmly held. Shipments during these two months were moderate, for the reason that the decline in gold was heavier than the decline in cheese, so that the sterling cost of the latter was enhanced in spite of the dull market on both sides of the Atlantic.

THE SEASON IN ENGLAND.

We shall take a survey of the passing *English* cheese season, for the position occupied by your chief and indeed *only* competitors, the English dairymen, cannot be a matter of indifference to you. An unusually mild and wet winter was followed by an early spring. In Somersetshire, and other southern counties, the cows were turned out a month earlier than usual; but scarcely were they on the grass when the weather changed.

Through April, May and half of June there was a full average make in all the cheese producing districts of England, but the quality was not so fine or the flavor so good as in former years. This is attributable to a cold, damp season, very unfavorable to the production of fine, or to the proper maturing of any sort of cheese. During the latter half of June and all through July, the weather was fine and clear, with a full summer temperature. The heat was, in fact, at times excessive, and coming on the unprotected roots of the grass, just as the hay crop was removed, combined with an almost total absence of rain for some weeks, resulted in a very serious failure of the aftergrass, and a great scarcity of food for cows for the time. As a consequence, the make fell off about one-third in quantity, but showed a great improvement in quality and flavor. Early in August came the long looked for rains, soon restoring the feed in the pastures, and up to the end of October there was a fair, but not excessive, make of average quality. In the beginning of November, a few sharp frosts tended to put an early stop to English cheese-making. In the districts around London, and some other large towns, the foot and mouth disease has been very prevalent among the cows. Coming at the fall of the year, this has necessitated the drawing of the daily supplies of milk for those cities from the nearest cheese-making districts, and has to some extent curtailed the making of late cheese.

By the end of last March, the stocks of English cheese were more closely cleard out of dealers' hands than was ever before known at that date. Prices for the first delivery of new cheese were very high, in spite of which, the demand all over the country has been unprecedentedly large the season through, and the best qualities have ruled much dearer in proportion than American. The price of the very finest sorts of English cheese has varied very little since the opening of the season. In the months of August and September the arrivals of Dutch and American cheeses were very heavy, and, as we have seen, went rapidly into consumption. But lower qualities of the home (English) make began to accumulate, but in no part of the country so rapidly as in Cheshire and the adjoining county of Shropshire, where a good deal of the so-called Cheshire cheese is made. But makers of these secondary and inferior qualities held for full prices, therefore when compelled to sell, had quite an accumulation on hand, and were forced to accept much lower rates than they might have obtained had they freely met the market. At every September fair and market in the Cheshire district there was a large pitch of medium and low quality cheese, which was sold at from 48s. to 60s. These sorts, being lower than even the commonest kind of American cheese attracted the attention of dealers, and for a month or six weeks, in October and November, engrossed a large share of the consumption. The bulk of it has now been disposed of, and for what remains, greatly increased prices are asked. These facts seem to me to convey at once a warning and an encouragement to you, the cheese-makers of America. This county of Cheshire, which for very many years boasted, and boasted truly, of making the finest cheese in the world, has now become notorious for the badness of the quality and flavor of the bulk of its make, and for an absolute scarcity of really choice dairies. It is true that the cattle plague fell upon this county, with its most desolating force, but that trouble has now been got over. The cows have now all been replaced, and I fear this deterioration in the quality of Cheshire's staple productions, must be attributed, rather to the carelessness of her cheese-makers, and to their want of system and application, than to any local or temporary cause. A most competent authority writes me as follows: "For all the other districts of England, including Somerset, Wilts, Derby, Leicester and the smaller cheese-making counties, I do not find any one knowing anything about the business, who can say, that the dairy farmers are making *any* progress towards improvement."

The conviction of some of the best judges of these matters, appears to be, that the energy, intelligence and perseverance, which have been combined with and partly grown out of your factory system of cheese-making, is fast putting you in a position to completely distance the English dairymen in the production of *fine* cheese in *large* quantities, and unless the cheese-makers of the old country speedily rouse themselves to the emergency, applying to their busines, a like spirit of inquiry, and a like determination to excel, they must very soon surrender the foremost position on their own markets to their American competitors, and content themselves, if they can, with the second place.

SEASON IN OTHER COUNTRIES.

The cheese of Canada is improving yearly in flavor and quality and is coming to be much sought after by both Lancaster and Liverpool dealers.

The season for Dutch cheese opened, as for all other sorts, with a bare market and full prices. The weather in Holland, throughout the season, was favorable for dairy products. But producers showed a disposition to realize on their stocks as soon as ready. The particular size and shape of Dutch cheese limits their use to certain districts, and they can never become a formidable competitor to you.

Scotland is said to be increasing her production of cheese, as well as improving its quality.

Sweden sends little or no cheese to the English market.

Our receipts of cheese in New York city for the current season, that is from the first of May last, (1869), to the first day of the present year, were about 1,292,000 boxes. The receipts from now till the first day of May next, which completes the year, will, I think, bring the total of 1869—70 fully up to the heavy one of 1867—68, which so frightened some of your members. It is true that the cheese do not now average so much in weight as they did that year, but against this I offset the largely increased quantity that has this season gone to Chicago, Cincinnati and other cities, direct from the western part of this state. From these figures we can fairly infer a largely increased make over last season. Now, let us see how the consumption has kept pace with this great production. Our stock of cheese in New York city, Jan. 1, 1870, was liberally estimated at about 30,000 or 40,000 boxes in excess of that held at the same date last year, while the receipts to that date showed an excess of 250,000 boxes over the previous year. This gives us, since the first of last May an increased consumption of 210,000 or 220,000 boxes, of which Great Britain took about 150,000 boxes. Looking at the total shipments since May 1st, and taking into account the stocks in London and Liverpool and the quantity in transit for those markets on the first day of January for the last three years, I arrive at the conclusion that the consumption of American cheese in Great Britain has for this season been 140,000 boxes, or 20 per cent. in excess of what it was last season to same date, and nearly 100,000 boxes, or 17 1-3 per cent. more than what it was in the corresponding period of the year before that, namely 1867—68. Now comes the inquiry—What effect has this increased make and consumption had upon the price of cheese? The quotations in New York city for choice dairies on January 1st, for the past three years, are as follows: 1868, 15c. currency, with gold at 134 1-3; 1869, 19 1-2c., with gold at 133 1-3, and 1870, 17 1-2c., with gold at 120 1-3. So that equalizing the gold basis, the price this year is equal to that of last year, and is four cents per pound, in currency, higher than it was January 1st, 1868. If these figures have any value, they are ample warrant for my opening statement as to the increased make, consumption and price of American cheese.

Last year was an exceptional one. The make of cheese being everywhere short, prices of course ruled high; but still not so high, by an average of 2s. 6d. per cwt.—or 1-2c. per pound in gold—as they have been this season, with a heavy production in all cheese-making countries of the world. In fact, the high range of prices is a striking proof of the extent of the consumption, as, with only an ordinary one of cheese in England and this country, the market must have completely broken down and a very low average value prevailed. It becomes, then, a matter of general interest for us to ascertain, if possible, the cause of this increased consumption. The moderate price of bread in the old country, leaving the working classes a much larger surplus of their wages to spend in other articles of food, has, no doubt, had a great deal to do with it;

but other and more potent causes have been, I think, 1st, the great improvement in the average quality of American cheese; 2d, the sound judgement you dairymen have shown in judiciously meeting the English demands by free sales all the summer, and thus retaining your hold on that market.

And now what is the conclusion of the whole matter? Chiefly, I think, that you never need be afraid of making too much fine cheese. This year, with the largest shipments to England ever known, we have the highest average price. A very short time ago one of the largest dealers in the old country assured me that in the course of forty years' experience he had never been burdened with more fine cheese than he knew where to sell at good prices. Of course, as the gold premium declines, the currency value of your product must more or less sympathize with it, but in the general shrinkage of values, rendered inevitable by the improving financial condition of the country, your interest appears to be one of those which will suffer least.

There is every prospect that by the first of May next, stocks of American cheese will everywhere be closely used up, and we shall enter on the new season with a good demand at remunerative prices to the producer. I have done my best to make clear the promising future that lies open before you. If you would insure success in that future you must continue to *deserve* it. What you *have* gained must move you to redoubled effort and not serve as an excuse for relaxation; only in this way can you maintain the position you have so far reached. Only in this way can you hope to advance your product to the first place in the English market, and when that crowning point has at last been achieved, sleepless vigilance alone can insure you in its permanent occupation.

CHEESE AS AN ARTICLE OF FOOD.

From a Prize Essay read at the meeting of the American Dairymens' Association, in January, 1870.

BY L. B. ARNOLD, OF ITHECA, N. Y.

An objection sometimes made to the use of cheese, is, that it does not fairly represent the good qualities of the milk out of which it was made; that it leaves out a part of the elements of milk, and those that it takes in are so altered in the process of manufacturing and curing, that they make the cheese a very different thing from the original milk.

That cheese does not take in all the elements of milk is true. It leaves out nothing, however, that is worthy of notice but the milk sugar, and this is so easily and abundantly supplied by the saccharine matter and starch in the food with which cheese is eaten, that its loss can hardly be held to have any weight in disturbing the just proportions of its aliment.

In respect to the idea that cheese, on account of changes made in manufacturing and curing does not represent the milk it was made from, let us look at the facts. They do not look alike to be sure, but appearances are sometimes deceitful and cannot always be relied on to determine important points.

That milk must undergo many changes in appearance before it can be assimilated, is evident. Milk in the cow's udder, and milk two hours in the stomach of a calf, differ as much in appearance as milk in a dairyman's pail and milk in the form of a cheese; and yet, that the curd in the former case is uninjured and identical with the milk it was made from, will not be questioned. Nor will it be questioned that the solid condition of the curd in the calf's stomach is necessary to prepare it for assimilation, for it is one of the steps in nature's own method of converting it into blood. I hold that the conversion of milk into cheese involves the same changes that occur in the stomach of the calf, and that is is only carrying out a part of the process of digestion. Let us compare what happens to the milk in the two cases and see. But first, let me remark, that the active agent in rennet is now known to reside in minute globular bodies called cells, which float in the gastric juice by myriads: that they are the cause of coagulation and digestion when applied to warm milk, whether in the stomach or out of it; and that they are, like the globules of cream which they somewhat resemble, mechanically inclosed in the coagulum they have formed, and remain there to continue the process of digestion they have begun.

Let us now suppose a gallon of milk to be taken into the stomach of a calf, and a quantity also placed in your cheese tub; gastric juice, containing an abundance of digestive cells, is applied to each, the one naturally, the other artificially; but with this difference, the quantity which the calf applies to one gallon of milk we apply to 300 or 400 gallons, and consequently one coagulates in ten minutes and the other in an hour. In one case the curd is broken up and kept stirred by the peristaltic motions of the stomach, in the other, with the curd knife and the hand of the dairymaid. The whey separates in each alike, but in one case it is absorbed away and carried into the circulation, and in the other it is carried away artificially. The curds in each case, at first soft, gradually harden till the whey is nearly all separated and they become firm and solid, one rapidly, the other slowly. We may now suppose that the curd in the stomach has assumed its most compact form, and the artificial curd a corresponding condition; that it has been through the press and now lies on the shelf in the curing room. The curd in the stomach full of digestive cells, with new ones in multiplied thousands poured out upon it with the increased supply of gastric juice, is kept at 98°. The curd in the curing room, containing only the cells employed to coagulate it, is kept at 70°, or below. In the former the digestive process is rapidly hurried on, and in a few hours the hard and tenacious structure of the curd begins to be broken down and appear soft and salvy, and to assume a cheesy texture, as well as cheesy flavor and odor. In the latter, the process is slow. In a few weeks, instead of a few hours, its firm and tenacious structure, begins to yield to the digestive agency, and also begins to soften and to assume the same salvy and disintegrated appearance, and the same cheesy flavor and odor of the former, but unaccompanied with its strong animal odor. In the former, the process of disintegrating and softening goes on rapidly, till the whole becomes liquid and is carried away to serve the purposes of life. In the latter it is checked by drying and cooling, so that little change will be noticed for a long time. We now consider our cheese ready for use. It will be seen that all we have done is to carry the digestive process up to a certain point, and there to check it. We have digested the curd till it is just ready to dissolve, and there we hold it. We have the solid elements of the milk in our cheese tub in a good state of preservation, and yet so nearly digested as to require but little aid from the human stomach to dissolve it, and make it ready for the work of assimilation. Is it not plain, from the foregoing, that cheese is a fair representative of the milk from which it is made, and that it is entitled to the reputation we are in the habit of ascribing to that perfectly wholesome and nutritious luxury?

The last objection I shall notice is the one most commonly raised, viz: that cheese is a food in a state too concentrated for the human stomach. I shall not dispute this point, for I believe the human stomach was not made to hold food that contained nothing but pure nutriment, like cheese and meat. It is too large for such a purpose. Our food must have bulk enough to distend the stomach and bowels, so as to afford a sufficient substance for them to act upon. Cheese will not do this when taken alone, and hence such people would have us reject it altogether. But the same objection lies against beef, and pork, and mutton, and all similar food. Shall we reject them also? We do not, and should not, object to meat because of its being too concentrated to eat alone. We remedy its defective bulk by using with it some less nutritious food, as bread, potatoes or roots; and the remedy is perfectly efficacious. We should do the same with cheese, and the objection would lose all its force. And this we do instinctively. We use it in connection with farina and fruit, with bread, pastry and the like, and we do so with the happiest effects. The practice which prevails generally in selecting food to use with cheese, is as much in accordance with reason as with taste. A little chemistry will illustrate this, and show us that we might, with profit, consume much more cheese than we now do. Chemistry divides our food into two classes; those which go to make up flesh and the framework of the body, and are called flesh-forming or albuminoids; and those which furnish the material for fat and animal heat, and are called fat-forming, or supporters of respiration. We do not use these two kinds of food in equal quantities; we take only one of the former to two and a fourth of the latter. They are found in just this proportion in milk. That it may be seen at a glance in what relative proportions the two classes of elements exist in some of the common articles of food, I have prepared a table, by selecting from some of the latest and best authors, to show what per cent. of albuminoids and fat-forming elements are contained, on an average, in the kinds of food named:

	Albuminoids. Per cent.	Fat--forming. Per cent.
Milk	3.8	8.2
Butchers' meat	14.4	29.9
Cheese	24.0	31.0
Wheat flower	11.8	74.1
Wheat meal	13.0	67.6
Rye Flour	10.5	72.5
Corn	10.0	68.0
Buckwheat	9.0	59.6
Peas	22.4	52.3
Beans	22.5	45.5
Rice	7.5	76.5
Fruits, of all kinds	0.5	11.8
Potatoes	2.0	21.0

I have said that we consume, on an average, about 2 1-4 parts of fat-forming to one of flesh-forming material, and this is all we can consume. Whatever is in excess of these proportions is of no value. Wheat contains over 6 to 1, while cheese, it will be seen, contains an excess of albuminoids, that is, it has only 1 1-4 of the respiratory matter to one of flesh-forming, whereas it should have 2 1-4. This disproportion comes in consequence of its loss of milk sugar. If eaten alone it would not be consumed to the best advantage. Wheat flour stands in the opposite relation. It has nearly three times as much starch, &c., as is necessary for, or that can be used with its albuminoids; and hence, if used alone, is used to a great loss, besides the liability to disturb the healthful conditions of the body by its great excess of starch, &c. A moment's thought will enable any one to understand, that to use cheese with any preparation of wheat flour, would tend to balance both their excesses, and make them both more valuable and nutritious than they could be alone. And the same is true with all the cereal grains, corn, buckwheat, rice and fruit. The use of cheese, therefore, with every variety of bread, pastry, fruit &c., is not only proper, but earnestly to be recommended, as a positive aid in preserving a proper equilibrium in the elements of food. Cheese used in connection with the bread grains, &c., as suggested above, has an economical value that it is well-worth while for purchasers of food to consider.

Cheese is an animal food, and may, with advantage, be substituted for meat. At the current prices, it is cheaper food than butchers' meat. The average retail price of the latter for the past season, at our markets, after divesting it of bone, has been twenty cents per pound, and cheese the same. But cheese contains more nutriment than meat when equal weights are taken. Meat, it is true, is perfect nutrition, and is all consumed. Assuming no waste, a pound of flesh may make a pound of flesh again. It cannot do more; while a pound of cheese, simply by absorbing water, will furnish the material for more than a pound of flesh. It is, therefore, the cheaper food of the two, and may be profitably substituted for it. But its highest economical value arises from its enhancing the value of other food with which it is consumed. By the figures in the table, it may be seen that if half a pound of flour, that will cost only four or five cents, is converted into bread, and consumed with a pound of cheese, the two together will furnish a little more nutriment than two pounds of meat. The figures which represent their value stand thus:

	Flesh-forming.	Fat-forming.
One pound cheese	24.0	31.0
One-half pound flour	5.9	36.0
	29.9	67.0
Two pounds meat	28.8	59.8

The pound of cheese and the one-half pound of flour will cost 25 cents, and two pounds of meat 40 cents. Cheese sustains a similar relation to all the cereal grains, and in fact to almost all the food derived from the vegetable kingdom, and is therefore used with that class of foods with great advantage. Thus consumed, it has an economical value that pertains to no other animal food. We cannot use butchers' meat, for instance, with wheat flour and produce any increased value over using them singly; for meat, as a rule, contains just the right proportions of flesh and fat (1 to 2 1-4). It has nothing, therefore, to offset with the excessive starch in the flour. Hence, when meat is consumed with bread, potatoes, roots, &c., all the excess of starch or sugar they contain is wasted. The only valuable purpose they can serve is to supply the deficient bulk in the meat. It cannot possibly utilize them. This relation of cheese to food containing an excess of the supporters of respiration ought to be better appreciated by our people than it now appears to be. We live mostly upon food that contains an excess of fat, starch, or sugar, which we pay for at a heavy expense, without its contributing anything toward the support of life. By a better understanding of the relation that the use of cheese sustains to such food, so much of that excess might be utilized as to be sensibly felt in the cost of living. A large amount of food now consumed without any benefit, might be rendered available.

There is another consideration connected with the use of cheese, as above suggested, that I would not have overlooked. I refer to its influence upon health. That a food in which the elements of nutrition are in the same proportions that they are used in sustaining life, is more healthful than a food in which they are in great disproportion, is a fact too evident to need argument or illustration. The nearer we approach to the perfect proportions in the elements of our food, the better must it be for our health. That cheese may be so used as to promote a better relation in the elements of food has been sufficiently shown, and hence the bearing which a more liberal consumption of it would have in promoting health may be inferred.

There is still another peculiarity in the use of cheese that I may notice in this connection. It has been previously stated that the coagulation of milk was effected by the aid of minute globular bodies, called cells, that float in the rennet, and that they are enclosed in the coagulum they have formed, and remain there during the process of manufacturing and curing the cheese. All this is true, *and more.* Unless they are destroyed by some unusual treatment, they remain in the cheese until it is consumed, and retain their power unimpaired. This may seem a strange assertion, but it is nevertheless true, and may be easily verified. If any one desires to do so, let him take a piece of rich old cheese and dissolve it in tepid water. When it is desolved, or so softened as to mix readily with the water, apply it to a little sweet milk and keep it warm, and in due time it will coagulate in the same way as by the use of rennet. If a microscope is at hand, he may see the cells floating about in the water in which the cheese was dissolved.

When cheese is dissolved in the stomach the cells are set free and resume their former efficiency, and become a positive aid in digesting other food. The opinion that cheese will digest other food quite commonly prevails, and here we may see, that it is founded in fact. This peculiarity which belongs to cheese may justly claim some weight while we are considering its merits.

Enough has been said, I think, to show that there are good and substantial reasons for regarding cheese as a wholesome and valuable food; and that it is worthy of a more liberal consumption than it now receives. This opinion is not only verified by the argument offered, but is sustained by experience.

MARKETING BUTTER.

Remarks made at the last annual meeting of American Dairymens' Association,
BY J. B. LYMAN, OF PENNSYLVANIA.

For at least four months out of the twelve, every cheese-maker is interested in the butter market. Thousands of large dairies throughout the state sell butter only, and the question is a mooted one, whether, all things considered, there is more permanent thrift and substantial success from the butter firkin or from the cheese hoop. In disposing of the product of a butter farm more sagacity and vigilance are required than in selling cheese. The demand is more capricious, the choice nicer. There is a difference, and a great one, between good cheese and inferior. But when the best butter is contrasted with the worst, the difference is as wide as the sky—as great as in Jeremiah's figs—

Those that were good,
  Were excellent figs;
Those that were bad,
  Were not fit for the pigs.

But in prime butters, and by prime I mean a firm, yellow product, with no buttermilk, no flavor of rank food, no taint from the decomposed milk, and salted with not more than an ounce to the pound—in *good* butter there is a difference of one hundred per cent. in market price. There are on this tray two specimens of butter. I bought them on Saturday last at the Farmers' Market in Philadelphia. For this, so nicely put up in fragrant golden balls, daintily wrapped and elegantly stamped, I paid 90 cents. It was the last of a tub of 60 pounds, the rest of which had sold at $1. The small piece is common firkin butter, selling by the small quantity in the same market, at 50 cents. How does this marketman, whose name you see so tastefully written on his wrapper, how does Isaac A. Calvert, of stall 555, contrive to get such a price?

By attention to three points:—1. The food of his cows. 2. Temperature. 3. Neatness and dainty refinement at every step from the moment when the milk flows from the udder till the dollar in currency is paid for the pound of butter.

I. *Food of Cows.*—I speak of this not on theory, nor chemically, as did our learned and able friend of yesterday, but I repeat simply the words of the Philadelphia butter-maker. "I have found," he says, "that I make my best butter when I feed on clover or early mown meadow hay. I cut fine, moisten, and mix in both corn meal and wheat shorts. Indian meal I regard as important in every butter dairy. Next to meal I regard shorts, and prefer to mix them. I feed often and not much at a time. I do not use roots unless it be carrots. My pastures and meadows are quite free of weeds. I cannot make this grade of butter from foul pastures or a low grade of hay. The sweet-scented vernal grass, for which our pastures west of Philadelphia have some fame, I do not regard as important. I would just as soon feed my cows cut corn and let them range on clover. When my cows are changed from green grass or fescue to clover, I perceive no falling off in the grain or in the flavor."

II. *Temperature.*—"This I regard as a matter of prime importance in making butter that commands a high price. Summer and winter I do not want my milk room to vary much from 58°. In summer I secure the requisite coolness by spring water of the temperature of 55° flowing over a stone or gravel floor in the milk-house. Yet it is accomplished without water in a shaded cellar ten feet deep. As good butter can be made without water as with, but the milk and cream should be kept all the time a little below 60°.

"We skim very clean, stir the cream pot when a skimming is poured in, and churn but once a week, summer and winter.

Just before the butter gathers *we throw into the churn a bucket of ice-cold water. This hardens the butter in small particles and makes a firm grain.* In the hot months this practice is unvarying."

III. *The Handling.*—"In working we get out all the buttermilk, but do not apply the hand. A better way is to absorb the drops with a linen cloth wrung from cold water. The first working takes out all the milk, at the second we handle delicately with fingers as cool as may be. The salt is less than an ounce to the pound, but generally not much less. The balls all weigh one pound and receive a uniform stamp. On packing for market each ball is wrapped in a linen cloth with the name and stall of the marketman written upon it. Our tubs are made of cedar plank one and one-half or two inches thick and lined with tin. On the inner face are little projections on which the shelves rest. The balls are not bruised or pressed at all and pass into the hands of the consumer as firm, as perfect in outline and as spotless as when they left the spring-house. We find *uniformity* to be a prime virtue in the butter maker. We produce the same article, whether the cows stand knee deep in clover blooms, or sun themselves on the lea of the barn in February. There is a small ice chamber at the ends of the oblong tub which we use in summer, so that in dog days the heat within the tub does not get higher than 60°. I need not add that we observe a scrupulous, a religious neatness in every act and in every utensil of the dairy. Milk which upon leaving the udder, flies through an atmosphere loaded with stable fumes, will never make butter for which we can get a dollar. No milk sours upon the floor of the milk room, none is permitted to decompose in the crevices of the milk-pan. The churn is scoured and scalded till no smell can be detected but the smell of white cedar. Our customers take the napkins with the pound prints, wash and iron them and return when they come to the stands on butter days; these are generally Wednesdays and Saturdays. With these prices we have no difficulty in making a cow pay for herself twice a year. If she costs $60, we sell $120 worth of butter from her in a twelve-month."

I show this butter and make this statement before the Dairymen's Association of New York, not because it describes novel methods, not because a thousand farmers' wives in Orange and Saratoga, in Dutchess, in Herkimer, Oneida and St. Lawrence cannot make butter just as good as this; but in order that a knowledge of the thrift of Quaker dairymen may stir you to a generous rivalry. Scores of house-keepers in and near New York send across the state of New Jersey and pay over seventy-five cents for every pound of butter they use. They would not do it if you who drive your herds over these breezy and sweet-scented hills would roll your butter into just such balls, stamp them as handsomely, wrap them as daintily, and supply your customers with a regularity and a certainty as uncommon as it is praiseworthy.

We have in New York city at least a thousand families who would consume five pounds each—5,000 pounds a week—of just such butter as this; and a price above seventy-five cents would not for a moment check their eagerness to buy. I take it that I speak your sentiments when I say that the dairymen of Central New York would be only too happy to furnish 5,000 pounds of butter a week at prices so enticing.

THE SUGAR-BEET AND BEET SUGAR.

From the Reports on the Paris Exposition of 1867, published by the U. S. Government.

BY HENRY F. Q. D. D'ALIGNY, OF MICHIGAN,

Late U. S. Commissioner.

HISTORY OF THE CULTIVATION OF THE BEET FOR SUGAR.

In 1747, Margraff, a Prussian chemist, read before the Academy of Berlin his memoir on the existence of a sugar in the beet identical with that in the cane. It was not, however, until fourteen years after this that this discovery found its first application. Achard, another chemist of Berlin, republished the discoveries of Margraff, and it is to his indefatigable industry and perseverance that we owe the first practical methods used in the manufacture of beet sugar.

From 1789 to 1796 Achard devoted himself to the culture of the beet and experiments in sugar-making at his farm at Caulsdorff, near Berlin, at the end of which time, with the assistance of the government, he founded at Kunern, in Silesia, a manufactory which proved to be successful, and was soon followed by the erection of two other similar establishments. This was the origin of the manufacture, which is to-day represented by so many establishments in France and in various parts of Europe.

The results of the labors of Achard were published in 1797. The *Annales de Chimie* in 1799 contained a letter from him in which he described the processes used by him in the manufacture of beet sugar, and the cost of the manufactured article; in the same letter he also forcibly presented the advantages which would result to agriculture by the introduction of this new industry.

The political situation in Europe was at this time singularly favorable to the discoveries of Achard. France desired to be freed from the commercial monopoly of England, and to reduce the high price of sugar which the war with that power had caused.

Experience in France did not, however, confirm the brilliant results which had been announced. The commission appointed by the institute to inquire into this matter reported the cost of the new product at one franc eighty centimes instead of sixty centimes, the price announced by Achard. Two manufactories which had been establishnd near Paris suspended operations, and by their failure threw great discredit upon this industry, which has achieved its present success only after many years of patient and persistent endeavor.

In 1810 the report of Mr. Deyeux, which was read before the Academy of Sciences, again called the attention of the public to the advantages which would result from the manufacture of beet sugar. Cane sugar had at this time reached an exorbitant price, being three francs per half kilogram, equal to about sixty cents per pound. The attention of the French government was also called to this subject, and some specimens of sugar were presented to the Emperor Napoleon.

The feasibility of the manufacture of sugar from the beet having been established, there needed to be but a favorable opportunity to secure to France the possession of this industry.

By the decree of March 25, 1811, the Emperor ordered that thirty-two thousand hectares of land should be devoted to the culture of the beet, and one million francs were placed at the disposal of the minister of interior for encouraging this industry. Instructions were sent to all the departments, and a new decree, under the date of January 15, 1812, established five schools of chemistry, where the processes used in this manufacture were taught. Two million kilograms of raw sugar were also produced in the four imperial factories from the harvest of 1812.

The manufacture was further encouraged by granting five hundred manufacturer's licenses, and by decreeing that all indigenous sugar should be exempt from taxation for four years.

The political crisis of 1814 was a terrible blow to this new industry, and caused the failure of all the manufacturers but one. In December of 1814, however, under an impost of about three and one-third cents per pound, while that of foreign sugar was five cents per pound, the industry revived. New and more effective methods of manufacture were introduced, and sixty or seventy per cent. of juice was realized, instead of fifty or sixty per cent., the amount obtained by the older processes. The yield of sugar at this time was from three to four per cent., the yield of molasses five per cent., and the cost of manufacture about seven cents per pound. From this time till 1830 the progress made was as rapid as it was great. In 1822 the yield of sugar was about five per cent., and the cost of manufacture five and a half cents per pound. The amount produced at this time in one hundred different establishments was about five thousand tons.

The introduction of steam power had a marked effect upon this industry. In 1836 the number of manufactories was one hundred and thirty-six. Since 1840, though there has been a constant struggle between the cane-growers of the French colonies and the beet-growers of France, the amount of beet sugar produced in France has doubled every ten years.

In 1865–'66 the production of beet sugar had reached two hundred and seventy-four millions of kilograms, an amount more than sufficient to supply home consumption without recourse to the French colonies.

In 1830 the average annual consumption of sugar in France per each person was about two pounds, of which, the beet-sugar manufacture produced about nine per cent.

In 1865 the average consumption was fourteen pounds per each person, the beet-sugar manufacture supplying sufficient for that amount.

The rapid growth and development of this industry throughout Europe forms one of the most interesting spectacles of the present century, and the economic, social, and industrial questions to which it has given rise have attracted the attention and monopolized the labors of the leading minds of the countries in which it has been established. The beet has found its supporters and adherents in the cabinets of kings, the academies of science, in agricultural societies and farmers' clubs, in the machine shop, and in the peasant's cottage. No other industry of modern times has so successfully harmonized the agricultural and manufacturing interests which have heretofore been regarded as inimical to each other, or has originated and supported so many subservient and minor interests. The manufacture of sugar has been established and successfully carried on in Prussia, Austria, Russia, Holland, the Zollverein, Belgium, Poland, and Sweden. The total amount of sugar produced in these countries, and in France, is six hundred and thirty thousand tons per annum. Except in the seaboard towns of France, none other than beet sugar is used ; the same is true also of Germany, none but beet sugar is consumed in Paris, Vienna, Berlin, Dresden, Leipsic, or Munich.

The average yield of sugar for the past eight years has been over eight per cent., and of molasses about 2.40 per cent.

The reduction of the price of sugar effected by means of the substitution of power for hand labor, and the introduction of new and useful machines and processes is illustrated by the following table,* shewing the average prices, exclusive of duties of No. 12 raw sugar in Paris from 1816 to 1865 inclusive, omitting the period from 1828 to 1854, during which time the price gradually fell :

Table showing the gradual reduction of the price of beet sugar.

1816	12.5 cents.	1854	5.8 cents.
1817	11.6 "	1855	6.0 "
1818	12.1 "	1856	6.4 "
1819	11.6 "	1857	7.6 "
1820	10.8 "	1858	5.6 "
1821	10.8 "	1859	6.1 "
1822	7.8 "	1860	6.1 "
1823	8.6 "	1861	5.9 "
1824	10.3 "	1862	5.2 "
1825	9.9 "	1863	5.2 "
1826	10.3 "	1864	5.2 "
1827	9.9 "	1865	5.0 "
1828	9.9 "	1866	4.75 "

* *Vide* Beet-root sugar and cultivation of the beet, by E. B. Grant, Boston, 1867, p. 19.

According to the same authority the total production of sugar in the world is not far from two millions eight hundred thousand tons in the following proportions:

Total production of sugar from all sources.

Kind of sugar.	Percentage	Amount.
		Tons.
Sugar cane	71.42	2,000,000
Beet	22.50	630,000
Palm	5.00	140,000
Maple	1.08	30,000
	100.00	2,800,000

Thus it will be seen that the beet furnishes nearly one quarter of the sugar produced in the world.

A recent French writer thus observes:*

"This industry has not failed to perform the promises of its youth, and has justified by its rapid development the most enthusiastic hopes of its founders. France in the possession of the beet has become the fortunate rival of the most flourishing sugar colonies, which she has not only surpassed by the progress made in manufacture, but also in production, which is not inferior in importance to that of the island of Cuba."

The same author remarks that in the large increase in the consumption of sugar is to be seen a solution of the difficulties which have existed so long between the cane and the beet-sugar manufacturer, and the eventful harmonizing of these discordant interests. This increase also betokens an advanced degree of comfort and a higher scale of living throughout the entire population.

Political economists recommend the liberal use of this article, and by so doing throw their influence on the side of the consumers, whose interest it is to effect the abolition or great diminution of the imposts and duties at present in force, the

* M. Dureau, Rapports du Jury International Exposition Universelle de 1867, Vol. XI, p. 284.

proper adjustment of which presents so many difficulties to the statesman.

PRESENT CONDITION OF THE BEET-SUGAR INDUSTRY.

Since the establishment of the beet-sugar industry in 1812, it has spread very rapidly over all continental Europe, and at the present time in most of those countries is placed on a permanent and secure footing. It is to be found in Austria, Russia, Prussia, Germany, Belgium, and Holland, and its introduction into England is seriously discussed. This shows a remarkable change of feeling in that country in regard to this industry, for no other nation was so strongly opposed to the introduction of the manufacture of sugar into France as England, or contributed so much to defeat this object, and bring this industry, then in its infancy, into ridicule.

It is proposed to give a brief account of the present condition of this industry in the different countries of Europe, and to enumerate some of the benefits which have resulted from its introduction.

We will commence with France, for in that country the manufacture of beet sugar is carried on more scientifically and successfully than in any other part of Europe.

France.—Although the discovery of the existence of a crystallizable sugar in the beet is due to Prussian invention and intellect, yet the successful application of the discovery is due to the genius and perseverance of French manufacturers, stimulated by the assistance and approval of the government, and by that feeling of patriotic pride which finds its expression in the workshop as well as in the battalion. The varied fortunes which beset this new industry have been already noticed. It had spread since its foundation to many places in France, and in 1836 was to be found in active operation in thirty-seven departments, the number of factories being 436, although the production did not exceed 40,000,000 kilograms. The law of 1837 by which a duty of fifteen francs per one hundred kilograms was imposed upon indigenous sugar, caused sixty-six manufactories to suspend work, and drove the cultivation of the beet from seventeen departments. It was with the utmost difficulty that this industry could be maintained in the northern departments, a country, where agriculture flourished, labor was abundant and fuel cheap. Subsequently the improvements in agriculture, the establishment of canals and railroads, and the consequent decrease in the cost of transportation caused this industry to be again established in many localities, although the north still remains the principal seat of its manufacture.

The following table from the report of M. Dureau shows the number of factories in each department of France and their production for the year 1866–'67:*

Production of beet sugar in France for the year 1866–'67.

Department.	No. of factories.	Production in kilograms.
Aisne	80	39,172,464
Nord	160	77,922,287
Oise	32	16,813,646
Pas-de Calais	76	35,446,974
Somme	55	24,731,431
Other departments	38	22,767,875
Total	441	216,854,677

"In the department of the Aisne this industry is centered, particularly in the arrondissement of St. Quentins Laon, and Soissons. In the department of the Nord, the arrondissements of Valenciennes, Lille, Douai, and Cambrai contain the greatest number of manufactories, particularly the first two mentioned. In the Pas-de-Calais there are the factories of Arras and Bethune; in the Somme, those of Peronne and Montdidier; in the Oise, those of Compiegne and Senlis. Although the amount of beet sugar manufactured as largely increased since 1837, the number of factories is less, and but twenty-four departments, instead of thirty-seven, as then, enjoy the benefits of this industry. In the department of the Nord alone can it be said that,

*Rapports du Jury International, Vol. XI, p. 287.

with but few exceptions, this industry has attained all that can be attained. The manufactories are numerous throughout the whole department; each commune has three or four establishments, and in some places the smoke from the chimneys of sixteen or seventeen factories can be seen on the horizon."

The following abstract from an article published during the exhibition shows in a striking manner the importance which this industry has attained in some of the districts of France: *

"Official returns show that the arrondissement of Valenciennes produced from 1864 to 1866, 151,096,670 kilograms of molasses, and from 1853 to 1866, 953,520 hectoliters of alcohol. During the same period the sugar factories consumed nearly six millards of kilograms of beets, a large part of which was produced in the neighboring districts and sent here to be manufactured. The immense plantations of this arrondissement, which formerly sent the whole crop to the sugar factories, now send a large part of it to the distilleries, and the great factories and refineries are forced to call upon the neighboring arrondissements for the supply necessary to keep their works in operation. This, however, does not seem to have affected the manufacture of sugar, for the arrondissement of Valenciennes has exported during the last eight years nearly fifteen millions of raw sugar.

"This district contains sixty-four factories which furnish occupation during the winter season, when no other employment can be obtained, to 7,000 men, 2,750 women, and 2,670 children of both sexes. The wages paid to these operatives for the one hundred and twenty days' work, which is the length of the sugar-making season, amounts to 3,250,000 francs. If to this amount is added the sum of 800,000 francs paid for agricultural labor, the sum of four million francs is reached, which is paid as wages in this industry annually. The sugar factories produce annually 6,261,000 kilograms of molasses, and 24,990,000 kilograms of pulp. They make use of numerous steam engines whose aggregate power amounts to one thousand horses. Finally, this industry has, during the last ten years, paid for local taxes the sum of 80,000 francs, while all the other industries of the arrondissement combined have contributed less than 90,000 francs."

In those departments into which the cultivation of the beet and the manufacture of sugar have been lately introduced, the newest processes and best machinery are to be seen. The size and productive power of the factories have generally been increased, and the average production, which in 1836 was 90,000 kilograms per each factory, at the present time has reached as high as 500,000 kilograms, and in some cases, that of the largest establishments, 1,500,000 kilograms. The amount of

*Exposition Illustree, Vol. II, p. 28.

sugar usually extracted is from 5.60 to 6 per cent. An establishment therefore producing 1,500,000 kilograms of sugar would work up from 25,000 to 30,000 tons of beets, which, basing the production at forty kilograms per hectare, would require from 650 to 750 hectares under cultivation. The average amount of land under cultivation for each factory is from 250 to 300 hectares, which is as much as can be economically worked, owing to the difficulty of transporting the beets to the factory.

The aggregate amount of steam power employed in this industry is 88,000 horses, estimating a 200 horse power engine to each factory.

The amount of land under beet cultivation in France at the present time is estimated to be 110,000 hectares. In 1857, ten years ago, it was only 52,000 hectares.

The price of raw sugar at the present time in France is from sixty-one to seventy francs per one hundred kilograms. To this must be added the duty, which, on beet-root sugar, is forty-two francs per hundred kilograms, and on French colonial sugar thirty-seven and a half francs. After being refined this sugar sells for one hundred and twenty-five to one hundred francs per one hundred kilograms, which includes the duty. The production of beet-root sugar in France is over two hundred million kilograms; about the same amount is imported. The consumption is two hundred and fifty million kilograms, and the difference is exported in the form of refined sugar to England, Switzerland, America, Algiers, and other countries.

It will be seen that France nearly supplies her own consumption of sugar, although (as has been before shown) that consumption has increased steadily every year.

Germany.—The development of this industry in Germany has been as remarkable as in France, and its progress has been marked with the same success.

While under the direction of the founder, Achard, who was assisted by government patronage, it was represented by two or three establishments, and subsisted until 1814. From that time till 1830 there was very little or no sugar manufactured in Germany. In 1830, measures were taken to establish this industry, for its development in France proved that the manufacture of sugar could be profitably carried on in Europe.

Since the establishment of the Zollverein this manufacture has been greatly extended, but within the last eight years, particularly, it has increased to such an extent as to completely drive foreign sugar from the market. The factories are unequally distributed among the different countries of the confederation. The greatest number is to be found in Prussia, and particularly in Silesia and Saxony, the soil of which is admirably adapted to the cultivation of the beet. The increase of the number of factories in Prussia is very marked. In 1840 there were only one hundred and two establishments; in 1865, two hundred and thirty-four.

In the Zollverein, as in France, the average amount of sugar produced by each factory has largely increased within the last twenty years, and the German manufacturers are enabled not only to work up more beets per day than formerly, but to extract a much larger percentage of sugar, the average being from five to eight per cent.

This large average yield of sugar, which is so much larger than it is in France, is one of the results of the different system of agriculture pursued in Germany, which system, in its turn, is due to the manner in which the tax on the production of sugar is collected. In France the duty is collected on the amount of sugar produced, and amounts to nearly forty-four francs per every hundred kilograms. In some instances, however, the duty is collected on the juice, with the understanding that if more sugar is produced than estimated it shall also be liable to the tax. In other words, the duty is collected on the manufactured article.

In the Zollverein a different system exists. The tax is levied on the beet before it is rasped, at the rate of 1.87 francs per each hundred kilograms of roots. When the yield of sugar is eight per cent. this amounts to a tax of 23.43 francs per every one hundred kilograms of the manufactured article. If the German manufacturer can extract more than eight per cent. of sugar from the beet this increase is not taxed. With this system it is easily seen that it is to the interest of the manufacturer to have only those beets produced which contain the greatest amount of sugar. It is the custom also to cut off from the root before it passes into the rasp all those parts, such as the neck, which contain the smallest amount of sugar, and in which the salts and nitrogenous matters are more abundant. Such a system as this does not tend to encourage the agriculture of the country. The manufacturers in many cases insist that certain manures shall not be used on the land at all, and the land is never manured previous to raising a crop of beets. The production per hectare is consequently very much less than it is in France, the average being only from 20,000 to 25,000 kilograms. Beets raised in this manner contain, it is true, much more sugar, but produce a smaller amount of waste pulp, which is used in other countries to so great an extent for fodder and manure. In the Zollverein the beet is cultivated for its sugar alone, the object being to produce the greatest amount of sugar by raising beets of the maximum sweetness. In France, on the other hand, the beet industry is thoroughly agricultural, and has for its object, not only the production of sugar, but also the improvement and fertilization of the soil; and upon the successful cultivation of this plant the agriculture of many districts depends.

The states of the Zollverein have quadrupled their production during the last fifteen years—180,000 tons of sugar having been produced in 1865–'66 against 52,586 tons in 1850.

The quantity of imported sugar has fallen during the same time from 52,568 tons to 12,562, showing that the foreign article has been nearly driven from the market.

In 1865–'66 there were thirty new establishments built and many old ones enlarged. The average yield of sugar is eight per cent.; of molasses, 2.40 per cent. This includes the returns from poorly managed factories, and those worked under the old processes. The sugar production of the Zollverein is at the present time 190,000,000 kilograms. Much of the sugar is obtained from the infusion of dried beet, the beets being sliced and dried and sent in this condition to the manufactory. As an illustration of the proportions which a manufactory may assume when conducted under this system, we may cite the establishment at Waghausel, near Carlsruhe, in the Duchy of Baden, in which 3,000 people are employed, a capital of 80,000,000 francs ($16,000,000) invested, and twelve acres of land covered with buildings.

The consumption of sugar in the Zollverein for the year 1867 was 160,000 tons.

Austria.—The beneficial results produced by the introduction of this new industry into Austria are shown by the fact that the amount of sugar consumed by each person has largely increased; that the manufacture supplies entirely the home market; that large quantities of sugar are annually exported, while at the same time the tax on the beets used in this manufacture is the source of a large revenue to the state.

The following information in regard to the introduction and development of the manufacture of beet sugar in Austria was communicated to the department of state by P. Sidney Post, United States consul at Vienna:*

"There is no industry of Austria which ought to interest the United States so much as the production of sugar from the beet root. The United States appears to be in every respect as well, and in many respects much better, adapted for its production than this country.

"Beets containing a large amount of saccharine matter can be abundantly and cheaply raised in all the northern states, and especially in the northwest; and if the great profit of converting them into sugar was fully understood, there would be plenty of capital for the supply of the necessary machinery.

"The machinery is expensive, and it requires a large amount of capital to commence operations, but it is doubtful whether there is any branch of industry which would so well repay capital and enterprise. The business cannot well be conducted on a small scale, and this disadvantage has, doubtless, hitherto prevented its being generally adopted in the United States. But when it shall have been given a fair trial, it must become a very important interest.

* *Vide* Report on Commercial Relations, &c., for 1867, p. 510.

"The growth of the manufacture of sugar is as wonderful as the history of the legislation on this subject in Europe is interesting. The embargo of Napoleon which forced on France the production of sugar, proved to Austria how beneficial the industry would be to this empire; but the first factories were not built until 1830.

"In 1830 there were two factories; in 1851, 100; in 1861, 125; in 1862, 130; in 1864, 136; in 1866, 140.

"There is a tax levied upon the beets before they are manufactured into sugar, and by this means the exact quantity consumed is known.

Quantity of beets converted into sugar during the years named.

	Cwt.
1851	5,411,770
1853	6,387,319
1855	7,989,390
1857	11,892,941
1858	15,681,114
1859	21,017,574
1860	18,511,909
1861	17,682,594
1862	17,112,066
1863	21,080,121
1864	18,288,911
1865	24,197,127
1866	21,081,368

"The decrease of 1862 and 1864 is explained by bad harvests; that of 1860 and 1866 was occasioned by the wars progressing in those years.

"In 1866 the 140 sugar manufactories used—machines for cutting beets, 223; cylinders for maceration, 44; juice centrifugals, 82; juice presses, 966; refining kettles, &c., 757; evaporation apparatus, 267; pans, 175, spodumene filters, 1,567.

"During the last sugar campaign there were consumed:

Coal, cwt	10,664,614
Coke, cwt	64,235
Peat, cwt	1,123
Wood, cords	6,041
Spodumene for filtering, cwt	678,290

"During the campaign and part of the time during the rest of the year, there were employed in the sugar manufactories 25,027 males and 14,478 females. The daily wages of the laborers vary from twenty kreutzers to one florin per day, and there were paid during the year over 3,500,000 florins on account of wages. While in 1851 but five per cent. of sugar was obtained from beets, in 1861, by the improvement in machinery, the manufacturers were enabled to obtain six and a-half per cent., and in 1866 they succeeded in obtaining seven and a-half per cent. The pure sugar obtained from these beets equaled, in 1851, 27,058,850 pounds; in 1861, 115,059,636 pounds; in 1866, 158,109,887 pounds. At an average value of thirty florins per centner, the amount realized from the last campaign equals 36,407,000 florins; or if we take the Austrian florin at its present value, and reduce the quantity to American measures, the sugar will be worth $9 75 in gold per hundredweight, and the whole yield will be worth, in gold, $14,562,800."

Russia and Holland.—The present production of sugar in Russia, including Poland, is from one hundred and fifteen to one hundred and twenty millions of kilograms annually.

This country is destined to become one of the most important sugar-producing countries in Europe. The soil, which is a rich dark loam, produces excellent beets without manure, and is acknowledged to be the best for that purpose in Europe. The number of kilograms of beets per acre is generally very small, (twenty thousand,) but the richness of the beet is remarkable, nine and frequently ten per cent. of sugar being obtained. The number of factories in Russia at the present time is four hundred and forty, most of them, however, being of small size.

In Holland, into which the beet has been recently introduced, the cultivation and manufacture appear in the most flourishing condition. This is owing to the fertility of the soil, in which the beet grows to its full size, and retains at the same time its full saccharine properties.

The present production of sugar in Holland is about seventy-five thousand kilograms. The number of manufactories is ten.

United States.—Attempts have been made at different times in this country to establish the manufacture of beet-root sugar, with, however, but moderate success. All of these attempts have, with but one exception, been on a small scale, while the industry was still in its infancy, and the prices of foreign sugar were much lower than they are now, or are likely to be again.

In 1838–'39 the "Northampton Beet Sugar Company," of Northampton, Massachusetts, made several hundred pounds of this sugar, and succeeded in raising beets of excellent quality and weight, but the enterprise did not prove financially successful. The most complete published account this attempt is that given by Mr. David Lee Child.*

This enterprise is also referred to by Mr. E. B. Grant. Of the more recent endeavors he thus speaks: †

"In 1863–'64 the brothers Gennert of New York, conceived the idea of manufacturing beet sugar. Mr. Thomas Gennert visited Europe for the purpose of studying the methods there employed. Upon his return the firm selected the prairie lands in the town of Chatsworth, Livingston county, Illinois; purchased twenty-three hundred acres, erected buildings, and commenced the cultivation of beets. In the process of time, they gathered their crop, which, owing to the drouth, and also to the unfavorable method of planting, yielded only ten to twelve tons to the acre. The beets were of excellent saccharine properties, containing twelve and a half per cent. of sugar. The heavy outlay required exhausted their means; or, to use their own words: 'We started on too large a scale for our purse, which gave out too soon before the machinery required for successful working was finished; but experience has shown us sufficiently that sugar enough is contained in the beets, and that it can be got out. With our imperfect, or rather incomplete, machinery we extracted seven per cent. in melada. Those beets would average, with complete machinery, nine per cent.' "

The testimony of the best authorities on this subject, and the attempts themselves, prove that the beet may be grown successfully on our soil, and that when capital and enterprise are brought to the aid of this industry, success in sugar-making will be assured beyond doubt.

NEW PROCESSES AND MACHINERY.

Before giving a detailed account of the machinery and apparatus used in the manufacture of beet-root sugar, it has been thought advisable to briefly enumerate the processes, and report the machinery employed at the present time. This notice is condensed from an article by Mr. Basset, published in *Etudes sur l'Exposition.*

* The culture of the beet, and the manufacture of beet sugar, 1840.

† Beet-root sugar and cultivation of the beet, by E. B. Grant. Boston, 1867.

The manufacture of beet sugar, cane sugar, and any sugar extracted from a vegetable juice or sap containing saccharine matter, depends upon the following operations: 1st. The extraction of the sweet juice from the plant or part of the plant which contains it. 2d. This juice, which is never pure enough to produce good crystallized sugar, by simple evaporation, must be purified. 3d. The juice must then be concentrated, in order to allow crystallization to take place. 4th. It must then be crystallized. 5th. The crystals must then be purified. 6th. The sugar must then be refined.

The following are the principal methods used in the manufacture of beet sugar at the present time.

The beet from which the juice is to be extracted must be first cut up. The beets are sometimes cooked previous to this operation, but the more common way is to use them raw. For this operation, cutters are used which cut the beets into ribbons or slices, or the root is submitted to the action of a rasp, and a pulp of the proper degree of fineness obtained. The last method is the one generally used.

The pulp is then submitted to pressure, an operation which is performed in various ways. The more common way is to put the pulp into sacks of a coarse woolen material, which are piled in layers upon a frame, each layer being separated by a plate of iron, perforated with holes, or by a grating of the same material, with narrow spaces between the bars. These sacks are submitted to pressure, which is done by an ordinary screw press, or by a hydraulic press, or by both. The sacks, after being used, are washed and soaked in a weak solution of tannin.

The pressure, no matter how effectively performed, fails to extract more than seventy-five or eighty per cent. of the juice. As the beet contains ninety-eight per cent. of water, sugar and soluble matter, and only two per cent. of residuum, there is a loss by this process of from eighteen to twenty per cent. of juice. To prevent this loss, the extraction of the juice by maceration, or the use of water instead of pressure, has been attempted. Various machines and processes have been used generally with excellent success, but this method has not as yet superseded the more common method of pressure.

The name given to the process of purification of the juice is *defecation.* The object is to remove, as far as possible, the foreign matters remaining in the juice after pressure. These are principally nitrogenous matter, mineral substances, coloring matter, and the coagulable albumen. The coagulable albumen is removed by the action of heat, which causes it to become insoluble. To remove the other matters lime is added. These form, with the lime, insoluble compounds which are easily eliminated, but as an excess of lime combines with the sugar and forms saccharate of lime, which causes a loss of sugar by its becoming dissolved, and as this saccharate is injurious to the manufacture of good sugar, being one of the most active causes of discoloration in cooking, and its presence producing *sucre gras*, it is necessary to eliminate this access of lime. This was formerly done by passing the juice through animal charcoal. Mr. Basset* observes that he is ignorant what have been the motives which have induced manufacturers to make use of this operation, and remarks that the animal charcoal has no effect on the lime; that it does not act upon the saccharine alkalies; and that its decolorizing power—the only one it possesses—is of no value when the liquid is not free from the ulterior causes of the color, *i. e.*, the alkaline basis. The use of lime in large quantities for the purpose of eliminating the foreign matters contained in the juice has therefore been proposed. A solution of saccharate of lime is thereby obtained, which is cleared of the lime by passing a current of carbonic acid gas, obtained by the combustion of coal through it. This is in principle the process which is known to-day under the name of *carbonation.* The carbonic acid acts upon the lime, but has no permanent effect upon the alkalies. It is true that the saccharate alkalies are decomposed by the carbonic acid, but as the alkaline carbonates are not removed, the saccharates are again brought together by the heat, and are an active cause of coloring and loss. M. Basset recommends the

* Etudes sur l'Exposition de 1867, 3° Fascicule, 30 juin, 1867.

use of super-phosphate of lime in defecation, it being a cheap substitute and a more effective agent than carbonic acid, eliminating the lime, and at the same time destroying the effect of the alkaline salts which the juice contains. By some manufacturers sulphate of alumina is used to eliminate the lime. This, also, is an effective agent, and prevents coloring, but by its use deposits are left in the juice which are difficult to remove, and a sulphate of lime is produced, which must be removed by filtering at twenty-six or twenty-eight degrees Beaume.

The different processes used in purifying the juice are briefly described by Basset as follows: *

Ordinary Process.—Elevation of the juice to the temperature of seventy-five or eighty degrees centigrade; introduction and mixture of milk of lime; elevation of the temperature to the boiling point; time to allow the liquid to settle; decantation of the clear juice; pressure of the foam and insoluble deposits; filtration of the juice through animal charcoal.

Barnuel Process.—This is the same as the above, with the following modifications: an excess of lime is introduced so as to turn the sugar into saccharate of lime. The liquor is then decanted and submitted to a current of carbonic acid. The juice is then allowed to settle and filtered as above described.

The sulphate of alumina process has been before referred to.

Double Carbonation.—This is similar to Barnuel's process, with this exception, that after the first action of the carbonic acid a new quantity of lime is introduced, and the juice is again subjected to the carbonic acid. Decantation and filtration the same as above described.

Troubled Defecation.—Elevation of the juice to the temperature of seventy-five or eighty degrees centigrade; introduction of lime; then, without decantation, the introduction of carbonic acid. Decantation, pressure of the deposits, and filtration of the juice through animal charcoal, as before described.

* Etudes sur l'Exposition de 1867.

Concentration.—The purified, filtered, and decolorized juice is concentrated by the action of heat, which causes it to lose its excess of water, and brings it gradually to the density necessary for crystallization. This operation is divided into two parts: concentration, properly so called, and cooking or baking. It is well known that the boiling point of a liquid in a vacuum is at very much lower temperature than it is when exposed to atmospheric pressure. Upon this principle the application of the vacuum concentrating and cooking the juice rests.

The introduction of vacuum boilers is almost the only improvement, in reality, which has been made in the manufacture of sugar for thirty years, for the elements of all the other improvements which have been made were contained in the old processes. With the apparatus now used, it is impossible to caramelize the sirup, and the cooking or baking may be pushed to crystallization—an operation which is called baking in grains, and which is described at length in the accompanying report; finally, the heat is not sufficient to cause the saccharate alkalies, which have been left in the juice, to produce any reaction of importance. The machines for concentration which have produced the best results are manufactured by M. M. Cail & Co., and are known as machines of triple effect.

Crystallization.—This is usually done in vats. The sirup is exposed to a temperature of from thirty to thirty-five degrees centigrade, which is maintained as uniform as possible till the crystallization is complete.

The turbine, by means of which the sirup is separated from the crysallized sugar, is a great improvement over the ordinary and older methods. By the use of this machine the purification of the crystals of the sugar is reduced to an almost instantaneous mechanical operation.

The other operations and processes connected with the manufacture of sugar, some of which are recent and some of older date, will be described at length in the accompanying report. At the present time the machinery for a complete and well-arranged sugar factory consists of washing machines, rasps, presses—mechanical and hydraulic—boilers of defecation, carbonic-acid boilers, carbonic-acid generators, foam presses, animal charcoal filters, machines for concentrating and cooking the sugar, crystallizing vats, turbines and furnaces for revivifying the animal charcoal. To this must be added the engines and generators, the size and cost of which depend necessarily upon the extent of the factory.

Of the improvements which have been made of late years in the methods and processes of manufacturing sugar, M. Constant Say makes the following observations:

"Since 1857 the manufacture and refining of sugar has made great progress, the result of which is the production of sugar at a lower cost than formerly. The principal improvements in the manufacture are in the process of double carbonation, the apparatus of triple effect, of roasting *in vacuo*, and the use of centrifugal machines."

The Diffusion Process.—Mr. Post, consul of the United States at Vienna, Austria, writes as follows concerning the new diffusion process:

"The new process recently invented by Mr. Julius Robert, a sugar manufacturer of Seelowitz, Austria, is working a complete change in the manufactories here, and will doubtless exert a great influence on an extended introduction into the United States, and it is adapted to extracting the crystalline sugar from either sugar cane or beet root.

"Without entering into an extended description of this invention I may say that the process differs radically from the old methods, their leading principle being to obtain the juice contained in the cane or beet root, and to this end they employed repeated grinding, or maceration, or powerful pressure.

"Mr. Roberts's diffusion process' does not aim at obtaining the juice contained in the cells of the cane or beet root, but to extract only the crystallizable sugar contained in that juice, and to leave whatever else it contains in the cells. To accomplish this purpose, the sugar cane or beet roots are cut into small slices and put into a number of vats, which are connected by pipes running from the bottom of one vat to the top of the next succeeding. Water of a certain temperature, and of a quantity proportioned to the weight of the cane or beet roots in the vats, is mixed with the material in the first vat, and allowed to remain until it takes up a portion of the saccharine matter, or, so to speak, until the sugar in the vat is equalized between the water and the cane or beet root. That is to say, if the beet root contains eight per cent. of saccharine matter, the water will take up four per cent. This water is then forced by hydraulic pressure into the second vat, filled with beets.

"It already contains four per cent. of sugar; but the beets having eight per cent., it will again equalize itself, and when forced into the third vat will contain six per cent. of saccharine matter. In this way the water becomes more and more impregnated with saccharine matter, until it contains almost as much as the beet itself. To return to the first vat, we find that the first application of water extracted one-half, or four per cent. of the sugar. When this water was forced into the second vat the fresh water which forced it out and supplied its place extracted two per cent. more before the saccharine matter became equalized between the water and the beets. This water is then forced into the second vat, and the fresh water which supplies its place finds the beets containing but two per cent. of saccharine matter, and the next filling finds but one per cent., and in this way the sugar is extracted to within one-half of one per cent.

"It is said that by this process the raw material is much purer than when extracted by any other method—that from the same beets one-half per cent. more crystalline sugar is obtained than by the application of pressure. The expenses for cloth, and the cleaning and renewing it, are entirely done away with; the expense for motive power and machinery is considerably reduced, and the expense of manual labor is much less, requiring but one-quarter of the number of laborers necessary for the pressing purpose.

"In the United States, where labor is so expensive, this innovation must prove of incalculable importance. The only thing required in this new process, not necessary in the old, is an additional supply of water, an article tolerably plenty and cheap wherever this manufacture is likely to be introduced in our country.

"That this process is really the great improvement claimed no longer admits of dispute. Mr. Roberts has thoroughly tested it in his factory, and has adopted it, as have also six other factories, two in Austria, two in Prussia, one in Russia, and one in Bavaria."

VARIETIES OF THE BEET.

The beet, which is a native of Turkey, is a half-hardy biennial plant. Its roots attain their full size during the first year. The seeds are produced from transplanted roots, after which the plant dies.

According to an analysis of the beet by Professor Payen, it contains—

	Per cent.
Water	83.5
Sugar in solution	10.5
Cellulose and pectose	.8
Albumen, caseine, and nitrogenous matters	1.5
Malic acid; pectine; gummy substances; fatty, aromatic and coloring matters; phosphate of lime; phosphate of magnesia; silicate, nitrate, sulphate, and oxalate of potash, &c	3.7
	100.0

Among the many varieties of the beet the following may be enumerated as best adapted for agricultural and manufacturing purposes: The long red mangel-wurzel, the German red mangel-wurzel, the long white green-top mangel-wurzel, the long white red-top mangel-wurzel, the yellow globe mangel-wurzel, the Imperial, the Magdeburg, and the white sugar or white Silesian. The white or sweet turnip variety is the most desirable for general cultivation. Of this variety there are two kinds, viz: the white beet root with a rosy collar, which contains the largest amount of sugar; and the Silesian, a white beet root, with a green collar, containing less sugar. The roots of the Silesian variety grow almost entirely below the surface of the ground, and owing to their compact and firm texture, resist both frosts and spontaneous alterations better than any other variety.

Those who are not only distillers, but who are at the same time growers of the beet root, and who endeavor to obtain not only an abundant crop of saccharine matter, but also a large crop in weight of roots per acre, may advantageously raise beets which yield even less sugar than the Silesian variety, and which contain extraneous substances prejudicial in the manufacture of sugar, but not in the distillation of alcohol. Among these varieties may be named the yellow beet of Germany, an oblong root, with a yellow pulp, the beet with a pale yellow skin and white pulp, only slightly elongated—a variety which has been found in some countries nearly as rich in sugar as the sweet turnip. It is customary in Europe for sugar factories and distilleries to supply the growers with seed, at the same time contracting for the crop when grown. The French factories generally furnish the Silesian beet root seed.

To maintain the quality of the beet unimpaired it is necessary from time to time to renew the seeds, and select them with care. The simplest means which can be employed for this purpose is a salt bath, into which the beets are plunged, and their density ascertained. The sweetest beets sink to the bottom, and are preserved for seed. By careful selection in this way, M. Villenorman has obtained plants which contain fourteen or fifteen per cent. of sugar. The richness in sugar is ordinarily in inverse ratio to the size of the beet, and in direct ratio to the density.

Grant considers the white Silesian variety to unite the most of the desirable qualities for manufacturers. He says:

"For the use of sugar manufacturers the kind of beet that can be cultivated with the most advantage is that which is richest in sugar and contains the smallest amount of alkaline salts. It is distinguished by the following characteristics:

"First. Its roots must have neither the form of a carrot, nor of a tuber, but are shaped more like a Bartlett pear. It must be long and slender, gradually tapering and free from large lateral roots.

"Second. It must not grow above the surface of the soil.

"Third. It must have a smooth white surface, and the flesh be white and hard

"Fourth. Its size must not be too large, and its weight not exceeding five to eight pounds.

"The white Silesian beet, which is the one in general cultivation for manufacturers, unites most of these qualities; and of other kinds those are most preferred whose foliage is not upright, but broad, spreading, and lying upon the surface of the ground. The roots of beets possessing this peculiarity grow entirely beneath the surface."

SOILS ADAPTED TO THE CULTIVATION OF THE BEET.

The most productive soils are those composed of clay and sand, being at the same time somewhat calcareous, deep and easily ploughed. Sandy soils which contain clay and carbonate of lime also yield good crops, if they do not suffer from prolonged drought. On soils almost entirely argillaceous or calcareous the beet root attains but moderate size, and is liable to suffer from drought as well as from wet. Argillaceous soils, in order to be fitted for the cultivation of the beet, must be improved by draining. It is impossible to raise a good crop on gravelly soil, whatever may be its chemical constituents, inasmuch as the roots bifurcate and divide into several smaller roots which are apt to retain gravel and small stones, which are afterwards very injurious to the machinery when the roots are cut.

Grant, in his treatise before quoted, says:

"Ground that is mellow, warm and fertile, free from saline and alkaline constituents, not sour, and of a nature little liable to suffer from drought, easy to work late in autumn and early in spring, with a comparatively permeable subsoil, penetrable by the tap-root of the beet, that affords natural drainage, so that it may be worked soon after rains, is suitable for the crop in question."

Count Chaptal, a great cultivator as well as a sugar manufacturer, says:

"All grain fields are more or less suitable for beets, but especially those having a depth of twelve or fifteen inches of rich vegetable mould. Fine sandy alluvial bottom lands, everflowed in winter or early in spring, are favorable for the beet, and they need no artificial manure, as they are enriched by the inundations. Beets require to be planted on thoroughly cultivated land in which the sods are entirely rotted."

The beet is generally cultivated in rotation with other crops, the same ground being successively sown with beets the first and second years, wheat the third, clover the fourth, and oats the fifth. When manure is more sparingly used, a rotation of crops every four years is practiced; the yearly order being beets, wheat, clover and oats.

METHODS OF CULTIVATION.

Beets are grown in two principal ways, in drills and in hills. The latter method has of late years been much practiced in Europe, and is attended with highly satisfactory results. In drill cultivation the Dombasle plough, drawn by ten oxen on heavy and by eight oxen on light soils, is used. The depth of the furrow is never less than twenty-eight or thirty centimeters, and frequently thirty and thirty-five when the soil is of such a character as to permit of it. A furrow of this depth allows the root to strike deeply; and though the formation of the furrow requires the exercise of considerable power, yet it brings to the surface in places where good soil is scarce the argillaceous subsoil, which on coming in contact with the air is fertilized and improved by mixing with the vegetable soil and manure, the depth of the fertile ground at the same time being increased.

Argillaceous soils are all twice ploughed before winter, and must be ready before the heavy frosts. It has been noticed that, after thawing, these soils become very friable, and that part of a field which is ploughed before the frost yields a crop far superior to that part of the same field ploughed in the spring. Light soils are ploughed in the spring, when manure can be more freely used, large quantities being produced during factory work, which lasts from September 15, till January 31, during which time the largest number of oxen are fattened. The same methods of tillage are employed on soils on which oats have been sown the year before, and on which a crop of beets is to be grown, as on those which have grown one crop of beets and are to be again planted for a second crop.

Manuring.—As soon as harvest is over manure is hauled from the stables to the fields, at the rate of from fifty to sixty cubic meters to the hectare, on soils on which oats have been grown, and which are to be planted with beets. On soils on which a second crop of beets is to be raised the same amount of manure should be used, although growers are often obliged to content themselves with less. Stiff and clayey soils are first manured and ploughed, and the ploughing should commence as soon as the manure is spread over the ground, the weather permitting, in order to have it perfectly mixed with the whole mass of earth.

Cultivation in Drills.—When the ground is suitably prepared by ploughing, the sowing is done in drills, about sixty-five or seventy-five centimeters apart, by means of a wheelbarrow drill or horse machine, which facilitates the subsequent operations of hoeing and digging. Hoeing is very important, for if the weeds are not torn out in time the tender beet will be evergrown and killed. Digging must be done also without delay, although the operation is seldom so urgent as that of hoeing. After hoeing, all the places where the seed has failed to take root are carefully replanted. For this purpose the plants, thinned out from the places where the lines are too close, are made use of. Another object of replanting is to preserve a regular distance of twent-five to thirty centimeters between the plants, with the drills from sixty-five to seventy-five centimeters apart. From 46,000 to 53,000 plants (without counting failures,) having an average weight of eight hundred grams each, can be grown per hectare, a total from thirty-two to forty tons.

In average years the crop raised on good soils in the Aisne, Oise, and Ardennes departments, where there are a great number of sugar factories and distilleries, amounts to from thirty to forty tons per hectare.

Cultivation in Hills.—This system of cultivation is fast superseding the older methods, as much more abundant crops can in this way be produced, some growers succeeding in obtaining sixty tons of roots per hectare, where under the old system from thirty-five to forty tons only were raised. This method of cultivation requires much more care and labor than cultivation in drills, but the roots produced are much more dense and rich in sugar.

The soil is thrown either with a common or double plow into two bands or furrows, one against the other; soil so prepared presents conditions more favorable for development of the roots in length and density, and at the same time diminishes the size of the collar, which portion of the beet contains the smallest amount of sugar. Plowing and manuring are done as in the other method of cultivation, with the exception that the manure is buried in the middle of the hills, where, from greater contact with the air, it more readily decomposes.

With heavy soils it will be found convenient to prepare the hills in the fall, so that the soil by contact with the air and winter frosts may be rendered more porous and friable. As the hills, so prepared, settle a little, it will be necessary before planting to run the double plow between the furrows. Where fields are not manured until spring, the hills should be formed as early as March, the ground being first harrowed, then ploughed, then rolled with a heavy roller. The hills are made a second and even a third time, each of the operations being followed by rolling, so that all the hills may have an equal height, and that the summits of the hills in which the beet is to take root may be firm and not so liable to be dried up by the wind which prevails at that season of the year. During preparation of the hills from two hundred to five hundred kilograms of Peruvian guano is sprinkled over them, according to the quality of the soil.

The distance between the hills is important, as it affects in more than one way the growth and culture of the beet. The inclination of the sides of the hills being about forty-five degrees, the greater the distance between the hills the higher their summits will be, and the greater will be the length of the beet. The soil also with high hills is better drained, better permeated by the air, and easier influenced by the first heats, a circumstance which will facilitate early sowing and prolong the time of vegetation for the beet, increasing also the amount of sugar.

The distance between the hills contributes also to the facility of cultivation. The leaves readily develop in the space allowed them, and are at a sufficient distance from the ground so as not to be affected by the radiation of heat, which always destroys some of the leaves in flat cultivation.

The practice now is to make the hills fifteen centimeters high and eighty centimeters from the top of one to the top of the other. The hills are made flat on the top in order that the beet in its first stages may develop freely and penetrate the whole depth of the soil. A thorough rolling always precedes sowing.

Sowing.—Sowing is done either by machines or by hand. In the first method an ordinary sowing machine is used, whose wheels have been exchanged for movable gorged rollers, which round off the edge of the hill, and are capable of being adjusted at the same time so as to correspond to the irregularities in size of the different hills. Sowing by hand is, however, more easy, more economical, and insures a better crop.

In hand-sowing two or three seeds are planted in holes two or three centimeters deep and fifteen centimeters apart, when the hills are eighty centimeters from each other. They are covered with earth to the depth of two centimeters, which is afterwards lightly pressed to make the earth solid about them. The tool used in hand-sowing is a small fork with two prongs fifteen centimeters apart, corresponding to the distance of the holes from each other.

In machine-sowing from twelve to fifteen kilograms of seed is required per hectare, while hand-sowing requires only from six to ten kilograms of seed. There is also a marked economy in the amount of labor required in hoeing and digging, as the plants come up more regularly and are more uniform in size. The yield of roots by hill cultivation may be estimated as at least one-fifth greater than that obtained by cultivation in drills. A field of ordinary fertility, cultivated and sown as above described and well manured, will yield fifty tons of beets per hectare, and eighty tons per hectare may be raised if there are no failures, and if each root weighs one kilogram, there being 85,000 plants per hectare.

Hoeing and Weeding.—About the first of April, when the roots have attained sufficient size, the first hoeing is done by hand; the earth is gently raised on both sides of the hill without touching the summit where the beet root is planted. This operation is done with a tool made for this purpose, the effect of it being to scratch the soil lightly, as if with a gardener's rake.

This tool is formed by two small harrows, about sixty or eighty centimeters long, connected together. These harrows are provided with teeth three or four centimeters long, and this tool is pushed backward and forward by a handle, with more or less force according to the nature of the soil.

The first weeding is done ten or fifteen days after this operation of harrowing, when the plants have acquired sufficient strength, and the first leaves are sufficiently developed. The workmen use a small and light hoe, and must be particular to destroy the weeds without injuring the young and tender plants. About the last of April and the beginning of May, the plants are weeded out. They are still small, but it is important not to delay the operation, because immediately after weeding they increase rapidly in size and strength, and are prepared to resist the injurious effects of heat and drought. If, on the contrary, the weeding should be delayed till the beets have become strong they would grow up with only two leaves, and their future growth would be retarded.

Only the strongest plants of each cluster are permitted to grow up. When the weeding has been once thoroughly done it will be seldom necessary to repeat it; the growth will be sufficiently active to cause the leaves of the young plants to cover the summit of the hills. Toward the end of May the plants are hoed a second time, the grounds on the sides of the hills and between them being loosened by a light plow from which the share and coulter have been removed. A plow is preferred to a cultivator, for the hill is cut by it on both of its declivities and the weeds are buried and made to rot in the middle of the small furrow. By this treatment the soil is also aired and fertilized, and the summit of the hill remains to be hoed by hand. A cultivator scratches up the soil without fully tearing up the weeds and necessitates a liberal use of the hoe to complete the work.

Hilling Up.—Toward the middle of June, when the beet roots have acquired a strong growth, earthing up or hilling is done. This is an important operation in which care must be exercised if a large crop is desired. It is of as much importance as deep plowing, without which a good harvest is impossible. The plow used to prepare the ground for hoeing is also used for this operation, but the coulter and share are not removed. At the time of sowing, the hills being made very flat, the roots strike into the earth to the entire depth of the loosened soil. In this second plowing the earth is thrown up above the collar of the beet root, and thus allows it to develop toward the summit of the hill, while at the same time it penetrates into the soil and acquires often a length of from forty to fifty centimeters. Care must be taken not to leave the collar of the beet uncovered, in which case it would contain far less saccharine matter than the rest of the root.

The Bodin heaper may be employed for hilling, but it has the disadvantage of not throwing the earth to a sufficient height above the collar of the beet.

Harvesting.—Toward the 15th of September the beet crop is harvested. The beets are known to be ripe when the leaves become yellow and fall off. In spite of its length the root can easily be torn out by the hand by inclining it toward the side of the hill. The plow is also used for this purpose, the share and coulter having been first removed. It is directed into the middle of the hills under the roots which fall on either side partially covered by the earth, which protects them from the early frosts. The roots are now cleaned, the collar removed, and heaped together. Should a frost be apprehended, the heaps are covered with leaves until they are collected in carts and placed in the pits.

The use of the plow in harvesting effects a notable saving in time and labor; nor is any of the labor lost, inasmuch as the plowing is useful for the succeeding crop, whether of wheat or beet roots.

When two crops of beet roots are to be raised successively, every movement of the soil is beneficial, and it is not unusual to see the second year's crop much better than the first. The soil which has been assiduously cultivated and exposed in hills for a year to atmospheric influences is well adapted to the growth of a second crop. The cost of cultivating the beet in hills is no greater than in drills, all things being considered; the plow takes the place of the hoe to a great extent, a larger surface of ground is exposed to the influence of the air, and the cultivation is deeper than that possible under any other system of cultivation.

PRESERVATION OF THE BEET.

The proper conservation of the beet root plays an important part in the manufacture of sugar or alcohol. Many manufacturers lose large sums of money annually by the roots being attacked by the frost, which renders them useless for manufacture, or by their becoming blighted, which causes the root to sprout, and eventually deprives it of the best part of the sugar and renders the extraction of what remains extremely difficult. The beet should be preserved so as to be in exactly the same condition when worked up as it was when taken from the ground.

In France, and other countries, where the climate will permit, the roots are usually stored in heaps in the field or open air, and are protected by a covering of straw and earth, provision at the same time being made for drainage and ventilation. In making one of these places, or root houses, (*silos*), for the storage of the beet, a trench is first cut in the ground, over which the beets are afterwards placed in piles. The trench is made eighty centimeters wide and from sixty-five to seventy centimeters deep. The length varies according to the quantity of beets to be stored; it must be, however, at each end about one meter longer than the pile of beets. This trench is then covered with branches of trees or shrubs sufficiently thick to prevent the beet from falling through, but not too thick to prevent the air from freely circulating upward through the roots. In the middle of the pit a triangular chimney, made roughly of pine boards three centimeters thick, twenty centimeters broad, and one and a half centimeter long, is set up. The beets are then piled up over this trench so as to form heaps with sloping sides about three meters wide at the base, and from twenty to twenty-five meters long, according to the length of the trench. No special care need be taken to make the piles regular in appearance, the beets thrown roughly together will naturally arrange themselves to the required shape. The height of the pile is usually one meter and a half, corresponding to the height of the chimney. The upper part of the pile should be regular, so that the roof with which it is covered may fit evenly. The cover or roof is made out of three pine boards, so arranged as to fit the top of the pile. The sides are braced together at certain distances by grooved tie-pieces, the groove of which is .08 centimeters square. The width of the boards which form the gutter is from two hundred and twenty to two hundred and fifty millimeters. The length is of less importance, as the gutters or roofs can be placed one after the other according to the length of the pile. The most convenient length, however, is from three to four meters, which enables them to be handled with ease. At the end of the season they are stored away, and may be used until entirely worn out.

As soon as the pits are ready they must be covered with straw and a layer of earth, from ten to twelve centimeters in depth. This may be done on any day, not rainy, whether warm or cold. The straw spread between the roots is quite necessary, for, being a non-conductor of heat, it prevents the roots from being injured by the heavy frosts, and supports the earth from which the pile is covered, leaving a free space between the beets themselves for the circulation of air. Near the chimney a triangular box about one meter long is placed, made of thin boards and extending into the pile. It opens at the top into the gutter or roof and is intended for the thermometer.

The preservation of the beet is divided into two operations: 1. Storing away the beet. 2. Superintendence of the pits.

The beets when stored must be well cleaned; that is to say, freed from the dirt attached to them, and the collar cut away, for any portion of the leaves remaining on the roots will become rotten in a few days and produce fermentation in the pits. Care must be taken not to put into the pits any roots damaged during loading the carts by the horses' feet or by the wheels. This rule is easy to observe, as such damaged beets may be worked up immediately.

It is easy to see that the good preservation of beet roots depends upon their being kept cool yet free from frost, and dry and well ventilated. The root-houses are constructed in the manner described, in order to secure these essential conditions. A continuous current of air entering at each end of the trench passes upwards through the floor of branches or brush, penetrates the pile of beets and finally passes out of the chimney at the top and at the ends of the roof or covering.

The temperature of the pit should never exceed three, four, or at the most five degrees above the freezing point.

The following are the methods adopted for maintaining the equable temperature.

Let us suppose that when the beet pits were made the weather was moderately warm, about eight degrees above the freezing point. The temperature in such a case should be lowered to three or four degrees. This is done by closing the ends of the canal and gutters with straw stoppers during the heat of the day, when the temperature is above eight degrees, and by opening them in the evening and during the night when the temperature has fallen below that point. By introducing the cool air in this way during the night and excluding the warm air during the day, in the course of a week the proper temperature will be obtained.

To maintain the temperature of the pits at this height, it will be only necessary to stop up the openings completely whenever the outside temperature is higher than four degrees, or lower than the freezing point.

That the difference of temperature may be ascertained a thermometer is introduced, which indicates the temperature of the air passing into the lower canal, while another is placed in the triangular box above referred to, which will indicate the temperature of the mass of roots.

The whole superintendence then consists in stopping and opening the gutters as occasion requires. In this way, with proper care, the beets can be preserved till the end of March, without sensible alteration.

The pits are usually from twenty to twenty-five meters in length. When placed in a line there is about three meters between them. When placed, however, in parallel lines, the canals are dug five meters from each other, in order that there may be between the pits room enough to take the earth intended to cover them. One thermometer will be sufficient for every five or ten pits. A pit twenty-five meters long and made as above described, will hold from forty to forty-five tons of beets; and if they are at the above-mentioned distances from each other, two million and a half of beets can be stored in pits on a single hectare.

Another method, which is more economical and generally used, consists in placing the beets in longitudinal heaps, about two meters wide at the base.

At harvesting, a thin layer of earth spread over the sides only is sufficient.

This allows the whole mass to become cool, and when the temperature of the air falls below the temperature of the beet, which is often the case in the fall of the year, the air permeating the interstices of the mass, and being necessarily at the same temperature as the beet itself, has a tendency to rise. The thin layer of earth covering the sides allows a sufficient circulation of air, which takes the place of the warm air escaping at the top. The proper temperature is thus obtained, which prevents the beets from heating to such a degree as to cause their decomposition, which would take place were they entirely covered. The precaution of covering the beets with a thin layer of earth at harvesting is of great service, as it insures them against the hoar frost. As the season advances, to protect them from the heavier frosts, it will be necessary only to add more earth to the whole surface.

This method of conservation answers all purposes, provided proper care is taken. The great surface of the walls of the piles, and the large amount of earth to be heaped up, render this method, nevertheless quite an expensive one.

Still another method has been devised, less expensive than the two preceding ones. The beets are placed in heaps from six to eight meters wide at the base, and from two to three meters in height, with gently sloping sides covered with earth. The heap, which extends as far as the supply of beets and the surface of the ground permits, is flat on top and covered with straw alone.

The only precaution to be taken is to admit the air to the heaps from below, so that it may freely penetrate the whole mass. In order to effect this, air drafts are established by digging channels in the earth, before storing the roots, to the depth and width of forty centimeters, running transversely to the heaps, and of sufficient length to extend beyond the pile when covered with earth, in order that the openings may be free. This being done, the piles are covered with earth on the sides, and with straw on the top, and the air channels left open from the outside. The circulation of air will be free and in proportion to the difference between the temperature of the pile and that of the outside atmosphere, and by this means good ventilation will be effected. The only care required is to tend the air drafts, and not open them unless the temperature of the outside air is above the freezing point. For this purpose small heaps of dung are kept ready near each opening, with which they are to be stopped when the nights are too cold. In order to ascertain the temperature of the mass, so that it can, when desired, be maintained at a fixed point, there are set, at different places in the mass, channels made of small boards jointed together, so as to form an open-work frame, extending into the pile about half its height, in which a thermometer can be placed, which may be inspected from day to day, in order that the progress of cooling may be watched. It is thought that the temperature is sufficiently low at three or four degrees above freezing point, at which time the cooling process is stopped and the openings closed. The straw on the top of the heap will be sufficient to protect the beets from ordinary frosts. Should heavy frosts be apprehended, it will be well to cover the straw with a thin layer of fresh manure or earth.

Where it is intended to preserve the beets for a long time, the first method of conservation should be adopted, as the results obtained are more satisfactory, and as this method requires less attention.

When beets are to be worked up during the first month of fabrication, the second method will suffice.

The third method is less costly than the first, but nearly an equal amount of care is required for the superintendence of the pits.

[The manufacture of beet sugar involves a necessity for a large amount of machinery and apparatus for conducting the processes of washing, rasping, pressing, refining, filtration, evaporation, crystallization, purifying and discolorizing; for a full description of which, parties interested are referred to the report itself from which the foregoing extracts have been taken.]

CAUSES OF ABORTION IN COWS.

From a Report to the New York State Agricultural Society,
BY WM. H. CARMALT, M. D., COMMISSIONER.

[Although abortion in cows has not become an epidemic disease in Wisconsin, the great losses occassioned by it in some of the western states, taken in connection with the fact that it is said to have shown itself in that form in Illinois, warrant the republication of the following, taken from the report of the New York commissioners, on that subject—especially as the extracts embrace a view of many important facts and principles which are habitually disregarded by a large majority of farmers everywhere—*Secretary.*]

There, is then, no evidence of any active disease in operation on the part of the dam, as shown by the careful post mortem and miscroscopical examination of every organ in the body having a probable influence to produce this disease.

What is the evidence of disease on the part of the fœtus? Of 4,163 abortions reported in 1867 and 1868, in 3,597, or 86 per cent., the fœtus was reported dead, or diseased looking.

There have been but few opportunities afforded to the inspectors, in which to make actual examinations of the fœtus as expelled, but their limited investigations, and the general observations of farmers, unite in describing nothing inflammatory, or otherwise abnormal in the external appearance of the fœtus;—but it is usually dead.

The microscopical report by Dr. Dalton states that there was evidence of an abundant fatty degeneration of both fœtal and maternal cotyledons, but that they were otherwise natural.

As a fatty degeneration is the natural change occuring in the placenta, after the cessation of the circulation, the inference is plain that circulation had stopped before the abortion took place; for the changes noted could not have occurred in the twenty-four hours between the abortion and the time the autopsy was made, but they had probably been going on for some days previously.

If the fact be established, that the uterus and its appendages, and the fœtus and its products, are both healthy, the natural changes incident to a stoppage of circulation being all that occurs, an important point is arrived at. And aside from the absence of any traces of pre-existing disease, to be detected by the microscope, symptoms are wanting on the part of the cow to point to anything other than an approaching labor, the evidences of which are, perhaps, unusually marked.

The introduction of a deleterious substance into the food, to effect so large a number of cows, with such uniformity of action, over a large extent of country, besides being in the first place improbable, in the second place has been investigated sufficiently to show that no article, or even variety of articles, occur having properties that would produce these extensive effects.

The existence of microscopic vegetations, or animalculæ, in the tissues of the cow, has been disproved by the microscopical examination by Dr. Dalton of almost every solid organ, and of all of the important fluids.

It is very difficult, and in this investigation unnecessary, to draw an absolute line between forces operating upon bodies so intimately applied, as the fœtus and its dam; or to say that in one case the fœtus is primarily affected, and in the other it is the dam. In either case, after the death of the fœtus occurred, the changes referred to in the microscopical examination would follow, and by the amount of fatty degeneration, an estimate may be formed as to whether the fœtus has been dead for some time or not.

The microscopical examinations in cases examined in each year, indicate that this fatty degeneration had progressed sufficiently, to warrant the belief that the fœtus had been dead some days.

To what source, then, must we look for the causes to produce the death of the fœtus-in-utero, after excluding those already referred to? It plainly can not be external violence in all the cases over so wide an extent of country.

Is it mal-nutrition? the blood of the dam or sire being impure: The evidence is all to the contrary; the cows are well nourished, so far as can be judged from external appearances by persons accustomed to this method of examination, and those skilled in pathological investigation agree that there are no pre-existing abnormal appearances in the internal organs. The bulls are healthy, with the exceptions of a few instances in which the trouble is entirely local; and as has already been said, the descriptions received from farmers uniformly state that there is no appearance of disease in the external aspect of the fœtus.

If, then, there is no fault in the quality of the nutritive materials furnished to the fœtus, does it receive a sufficient supply during the whole period of utero-gestation?

It has already been pointed out that the average yield of milk in all the cows in the state is 2,571 pounds per cow, while the average yield of cows on the non-affected farms examined in Herkimer county this year, is 4,386 pounds per cow, an excess of 70 per cent. more milk than the average natural yield of cows, subjected to the same circumstances in other respects, than those herein referred to. That this excess is supplied at the expense of the fœtus is respectfully submitted; but in order to show how, the more important particulars of the reproductive process should be fully understood, and a brief description is therefore introduced.

The essential features in the generative function are, in all cases, *the formation of a germ, which living for a certain period at the expense of the parent, is afterwards detached therefrom and takes on a separate existence.* The forms under which this series of phenomena occur, are as various as there are species of animals and plants; but it is absolutely necessary, for its proper performance, that each step of the process should be performed, and in itself complete, before the next takes place.

That the performance of this function makes great demands upon the nutrition of the parent, is of such common knowledge that it is only necessary, here, to refer to the length of time expended in the preparation of the body of the parent, for its maturity, before the function is called into action; in other words, until it shall be capable of bearing young.

When the germ is not formed from the parent stock, the condition is that of barrenness or sterility.

If the parent is unable, from any cause, to furnish the proper materials for the maintenance of the germ, after fecundation, during the second of the reproductive processes, or that of development; or if, for any reason, either external or internal, the process furnishing the supply is interfered with, this development is arrested. This arrest may be complete or partial; if complete, the germ dies, it is cast off as a foreign substance, and an abortion is said to occur; if the arrest is partial, a so-called deformity of some part is the usual consequence.

The methods by which the germ is nourished after conception, and before its birth, differ widely in different species of animals. The oviparous animals cast off the germ with its supply of nourishment, as an egg, to depend, perhaps, upon other external sources to furnish the conditions necessary to its development; the so-called parent not necessarily supplying any of the nutritive material. The viviparous animals retain the germ, attached to the parent, during the second period of its development, and until it is able to take on an independent existence. This connection in the truly viviparous animals is most intimate, the fœtus depending entirely upon the parent for its nutritive supply; and as it increases in size and multiplicity of parts, making continuously greater demands for the materials necessary to its growth; *which in all cases are furnished more or less directly from the blood of the dam.*

Further differences exist even among viviparous animals in the arrangement of the parts concerned in the reproductive apparatus; and one very large class, the mammalia, is characterized by the presence of an organ—the udder or mammary gland—whose primary and natural function is to secrete a fluid for the nourishment of the young, immediately, and for a future variable period after birth; *which fluid is also derived from the blood of the parent.*

The uterus and mammary gland bear a certain inverse relationship to each other, with regard to their activity and function; the one, in the natural condition being comparatively quiescent when the other is active. In this condition, during the development of the embryo—in other words, the pregnancy of the dam—the uterine organs are in a state of extreme activity, all other parts of the animal economy tending to the proper performance of this function; and the mammary gland, though showing evidence of being influenced by this process, is in the early stages, inactive. But as pregnancy advances to its natural termination, and preparations are being made for the change that is about to occur, the most marked of these is the increase in the activity of the mammary gland, which either just before or very soon after delivery secretes the milk designed to be the food of the young animal, whenever the more intimate placental connection is severed. The young animal, after birth, at first depends upon the milk entirely for its nourishment, and the supply of blood, before furnished to the plancenta, is now directed to the mammary gland. But as the growth of the young animal enables it to look elsewhere for food, it makes less demand upon the dam; the supply of milk diminishes in quantity, and the uterine organs, *having had an opportunity to return to their previous condition*, are again stimulated to the performance of their natural function; and when pregnancy again occurs, *the blood is redirected to the uterus and, the mammary glands diminish in activity*, soon become quiescent, and the same series of phenomena are again repeated.

In this hasty sketch of the main points in the history of the reproductive process, as it occurs naturally, uninterfered with by habits of domestication, your attention is called to the inverse relationship between the activity of the uterine organs and the mammary glands. By means of the first of these, the young animal is nourished during the period of its development, and by the second, during the period of its early growth.

The animal economy does not, as a rule, allow both of these processes to go on for a length of time together—it cannot support both at the same time. The instances in nature in which the dam at once suckles one offspring and carries another, are rare. The reproductive process is a great demand upon the parent. Nature requires a long period for its preparation, has made certain laws for its government while it is going on, and after a certain period has been devoted to its performance, regulates its cessation. A constant violation of any of its more important laws, must bring about a failure somewhere in its proper performance.

The size and functional activity of the mammary gland differs much in different species of animals, and may be very decidedly influenced, even in the same species, by a difference in circumstances and treatment; and it is further possible, by a long continued system of breeding, *carefully regulated by laws that have been found to perpetuate differences in breeds*, to increase permanently the capacity to produce more than the previous natural quantity of milk; and it is by recognizing and acting upon these laws, that the different breeds of the domestic cow have been established, and her present milk-producing capacity reached. But it is necessary that the process should be a gradual one, *brought about by the continued repetition for generations*, of the union of two animals of opposite sexes, having the same tendency as regards this function;—the bull as shown by his descent from a line of good milkers, the cow by her own capacity and similar descent. If, however, instead of following these rules, an attempt is made to get a large increase at once, first, by forcing the uterine reproductive apparatus into activity before the animal has arrived at maturity, and afterwards by continuing the drain upon the mammary secretion at the same time that a second fœtus is demanding its supply by the placenta—*by the first practice the uterine reproductive apparatus is weakened, and liability to abortion established; and by the second, the natural supply of blood, which should go during pregnancy to the uterus to nourish the fœtus, is continued to be drawn in the other direction towards the mammary gland, arrest of development from inanition is endangered, and when it occurs, the fœtus is expelled as a foreign body.*

Now, it is respectfully submitted, that the reports to this commission from the dairy districts of New York, and to a more limited extent those in Massachusetts, during the last two years, show an habitual violation of both the laws governing the time at which the reproductive process should begin, and those regulating the nourishment of the fœtus-in-utero.

In the first place, in the year 1867, from the reports of 1,453 farms, it appears that on 1,047, or 72 per cent. of farms, the habit is to impregnate the heifers at from one to one and a half years of age. The reports of this year state that out of 11,549 cows raised by the farmers reporting them, 9,591, or 83 per cent. of cows, first calved at under three years of age.

If an animal be allowed to bear young much before it has arrived at maturity, *the process of reproduction being essentially antagonistic to that of nutrition*, must interfere to a greater or less degree with its full growth, which of course depends upon its nutrition. An animal cannot be said to have arrived at maturity, simply because it is able to be fecundated; the phenomenon of ovulation, or heat, is but a part of the reproductive process; for the successful carrying out of the whole, the rest of the animal system should have acquired strength of constitution and vigor, sufficient to bear the tax of having a part of its nutritive material taken by the fœtus, and this requires that nearly the full growth of its organs should be attained.

Now, a heifer at two years old is not full grown, and yet it is shown that 83 per cent. of those raised in the districts where abortions prevail, have been, for from the six to nine months preceding this age, subjected to a process in opposition to that of growth. And although it cannot be said that any one heifer, impregnated with a view to have her calve at two years old, will not carry to term, there is danger that the effect may, by reason of the strain upon the constitution thus produced, be felt in the subsequent pregnancies; and a table previously given shows, that while five per cent. of those which calved under three years of age aborted, in some of the subsequent pregnancies, the abortions of those which first calved at three years old or over, was but three per cent.

In the second place, the amount of milk demanded per cow, in the districts examined this year, as has been shown, is 70 per cent. greater than the amount determined, by the yield of 1,195,000 cows, to be the natural yield. It is respectfully submitted, that this constitutes a violation of the rule that an animal very seldom naturally suckles one offspring at the same time she is pregnant with another; in other words, that the milk-secreting organs shall be in a condition of comparative quiesence during the period of gestation.

Now, the excessive yield here indicated, is brought about by first getting all the milk possible during the height of the season, and secondly, by continuing the process as long as possible—as long as the mammary gland can, by any means, be stimulated to activity—and yet, during the latter part of this time, the cow is pregnant; the fœtus is demanding an unusual supply of blood to the placenta for its nourishment, and the farmer is demanding a supply to the mammary gland for milk, forgetful entirely, apparently, *that the original design of the whole reproductive apparatus is to perpetuate the species, not to get milk, simply.* Under the circumstances of this drain, either the cow must refuse to give the milk, and be dried off, or the development of the fœtus, which is now the lowest in order of vitality, is checked from lack of nourishment. In a certain number of cases the latter occurs, and an abortion is the result.

In further confirmation of this view, of the arrest of development from lack of nourishment, attention is called to the table indicating the period of pregnancy at which abortions most frequently occur, and it will be seen that of 1,320 abortions, 939, or 71 per cent., occur during the last three months of utero-gestation, at the time the fœtus must be considered as making the greatest demand upon the dam for its nutrition; and yet, the reports of 1867 indicate a habit of milking cows to as late a period of pregnancy as they will give milk. The expressions not infrequently occured in reply to the question: What month of pregnancy are the cows dried off from milking? "As long as it will pay." "I milk for a pint." "As long as possible." And in but few instances were farmers able to give reliable answers as to the exact period of pregnancy at which any individual cows were dried off. Further evidence on this point would be desirable, but the report of every inspector, derived from the general statements of farmers, has been, that the habit almost universally exists of milking the cows to the last paying drop.

Besides the arrest of development from inanition, thus brought about, the persistent dragging at the mammary gland for milk during the latter months of pregnancy, is a source of irritation to the uterus, by reason of the intimate physiological connection between these organs, and tends very materially to excite contractions in the uterus.

That irritation of this kind to the mammary gland in the pregnant human female will occasion contractions in the uterus, and abortion, is well known to, and practiced by physicians when that object is to be attained. And if, in the domestic cow, a liability to abortion by too early breeding is established, and a tendency to arrest the fœtal development endangered by inanition, it is not improbable that so constant an irritation as this will account for many cases of abortion.

The rule in the human female is very positive against the two processes of lactation and pregnancy going on, for a length of time, together, and its continuned violation is there followed by directly the consequences here complained of in the domestic cow. If, during lactation, pregnancy occurs, the former process must be stopped, or the mother is liable to a miscarriage; or *vice versa*, if lactation is stopped, the phenomenon of ovulation, theretofore in abeyance, now begins again.

And although it cannot be stated that in the cow, as also among other of the domestic animals, these processes cannot go on safely for a limited period together, still, natural historians and physiologists, when speaking of the periods at which wild animals reproduce their young, assume the rule in general terms. For, they say, "the duration of lactation being, in general, equal in duration to that of gestation,"* therefore such or such an animal produces young once in so often, making the time, at least, double that of the known length of pregnancy. They also, however, state as a law, that habits of domestication tend to increase the power of reproduction within certain limits, both as regards frequency of occurence, and the number produced at a birth, and so far, indirectly, acknowledge that a yield of milk in excess of that required by the animal, may be brought about by following correct principles in breeding. But we may also be allowed to reason, that a sudden demand of 70 per cent. more milk from one set of cows, over others of the same breeds, subjected in all other respects to the same care and treatment, is too great a variation from the natural law, to be permitted without a check somewhere; and it is seen that where this excess is demanded abortions occur.

The affirmative results obtained by the commission, this year, may therefore be briefly stated as follows, viz:

1st. That cows, which have first calved at under three years of age, are more liable to abort during their subsequent pregnancies, than those who first calved at three years old or over, in the proportion of five to three; and that 83 per cent. of the cows raised on the farms reporting them, do first calve at under three years of age.

2d. That cows, subjected to removals at any time, are liable to abort, over those raised on the farms, in the proportion of 7 to $4\frac{1}{2}$; and that 63 per cent. are thus removed.

3d. That cows, subjected to removals during pregnancy, are liable to abort, over those moved while not pregnant, in

* Flourens; Phisioligie comparee. Paris, 1856, p. 32.

the proportion of nine to two; and that 70 per cent. of those moved yearly are pregnant, and 17 per cent. are moved yearly.

4th. That arrest of development is the condition immediately preceding the abortion; that an excessive drain upon the secretion of milk during pregnancy, has a tendency to produce arrest of development in the fœtus from inanition; and that an excess of 70 per cent. of milk is demanded from the cows in this district where abortions prevail.

In submitting these views for the consideration of the society, it must be understood that no claim is made that these are all the causes that produce the abortion complained of, or that any one of them has by itself given rise to this trouble. The points desired to be shown are, that the practices of breeding from stock at the very early age indicated, and exacting from the dam the excessive amount of milk shown to be drawn, have each injurious influences upon the reproductive process, tending to produce abortions; and that, acting together, they in many cases do produce this result. And if it be allowed that these practices are markedly prejudicial, then various extraneous circumstances, impracticable to enumerate, which, under other conditions, would have little or no effect, now exert an active influence to bring about the disease.

To so general an extent do these practices prevail, that it has been found practically impossible to separate the farms in which they exist from those that do not; for some farmers breed one part of their heifers at two years old, and another at three years old, and the farm must thus be included in both classes. And the irregularities heretofore referred to, with regard to the appearance or disappearance of the disease in towns, or farms, or cows, may be accounted for, in part, by the changes made in the herds between different farms.

LIEBIG'S ARTIFICIAL MILK FOR CHILDREN.

From the Official Report of
W. E. JOHNSTON, M. D.,
Commissioner to the Paris Exposition, 1867.

This new important compound, invented by the learned German chemist, is not on exhibition, only because it does not preserve well. It has nevertheless been discussed on the outside as one of the new ideas which takes its place in the grand competition of the Champ de Mars, and therefore naturally forms a part of this report. In this compound Professor Liebig pretends to have found a chemical substitute for mother's milk; his analytical mind, and his profound knowledge of chemistry, are in some sort a guarantee of its perfection.

But most persons will call to mind the discussion provoked by this imitated milk in the learned academies of Paris, and the condemnations that were passed upon it. The weighty name of Liebig, and the natural desire of men of science to add a new element of life and comfort to those already known, were powerful stimulants towards an unreserved acceptation of the new compound. The astounding developments of mortality among children in France, lately made to the Academy of Medicine of Paris, a mortality which reached the frightful figure of 90 per cent. in certain communes, made men turn their eyes eagerly in every direction for new aids in arresting the destruction. So that in this apparently insignificant question of infantile food we see a grave question of humanity and political ecomomy, for the increase or decrease of population is a question of primary importance to both statesmen and philanthropists. As communities grow older and become more compact the number of children to be fed by hand increases, and the necessity of new modes of nutrition becomes more apparent.

Of what does Professor Liebig's famous substitute for human milk consist? The following is his process: A half an ounce of wheat flour is boiled with five ounces of skimmed milk until the mixture is transformed into a homogeneous mass; it is then taken from the fire and to it is added half an ounce of cross-spired barley, which must first have been ground in a coffee mill and mixed with an ounce of cold water and a drachm of a solution of bi-carbonate of potash, the latter in turn made with eleven parts of water to two of potash. After having added the barley the vessel is placed in warm water or in a warm place until the mixture has lost its consistency and has become liquid like cream. It is allowed to repose for fifteen or twenty minutes and is then replaced on the fire and made to boil for a few seconds, when it is removed and poured through a strainer of hair or thread, so as to eliminate the fibrous parts of the barley. Before giving the milk to the child it is allowed to settle in order that all the fine fibres of the barley that may remain in suspension may be percipitated.

The artificial milk thus prepared contains, according to Professor Liebig, the plastic and respiratory elements essential to respiration and the nutrition of the body in about the proportion of from 10 to 38 on the 100; and this, still according to Professor Liebig, is the same as human milk. The French professors do not find this statement correct, especially as regards the quantity of life-giving principles in human milk, and they think that M. Liebig took his milk for experimentation from a woman in a low state of health. They think that normal human milk contains more than from 10 to 38 per cent. of the essential elements of reparation, and that, admitting M. Liebig's idea to be a good one, his compound is still unequal in force to the fluid it is intended to replace. This artificial milk has already acquired considerable extension in Germany, England and other countries, and in many localities it is the food furnished by charitable societies to the children of poor mothers, to such as are either obliged to abandon their children or place them in the nursing establishments by the day. No official reports on the success of this new system of alimentation have yet come to my knowledge; nevertheless, here in France the milk has been tried by Dr. Depaul, professor of medicine of Paris, on four children of the foundling hospital, and they all four died, two in two days, and one in three days, and one in four days, and all alike with bilious evacuations.

I do not pretend to know whether M. Depaul's experiments were faithfully made or not; M. Liebig says they were not. But certainly no man is more competent than Professor Depaul to make such an experiment, and there is no reason for doubting his good faith. This fatal experiment, however, has been sufficient to destroy the confidence of men of science in France in this new article of food, and it is probable that it will acquire no great extension in this country.

In France the people are satisfied in this emergency with cow's milk. The milk of the cow, with the addition of one-fifth of water and a little sugar, is not only a nearer approximation to human milk, it is the nearest approximation of all. Why then fly to a doubtful chemical combination, when we have at hand so natural and safe an aliment as diluted and sweetened cow's milk?

Liebig's much vaunted artificial milk must therefore take rank after human milk and after properly diluted animal milk. But like the same professor's concentrated beef, which is highly useful where the natural beef is not to be obtained, so, too, this chemical milk may be usefnl in the absence of the natural human or animal milk.

We do not, however, hesitate to give it rank before the numerous class of farinaceous preparations, which are increasing every day. The chemical composition of wheat flour is such, in fact, that it is not difficult to understand its injurious effects on infantile life. It possesses an acid reaction, and after incineration leaves phosphatic acids, which do not furnish in the process of digestion the quantity of alkali necessary for the formation of blood.

COUNTRY ROADS.

From Report of Department of Agriculture for 1868.

THE MACADAMIZED OR BROKEN STONE ROAD.

The mode of preparing the foundation of a Macadam road should be modified according to the character of the soil of which it is to be made. It may, however, be premised that one essential condition to be secured in the use of every character of material is that of dryness. This secured, almost every variety of soil will form a suitable substructure for a macadamized road. It would be difficult to furnish specifications for the great variety of cases that may be presented, but we shall endeavor to give such general instructions as will meet all probable cases intelligibly, and will commence with the most difficult circumstances likely to be presented, viz: an extensive plain, level, or nearly so, with a tenacious clay soil.

To effect drainage under such circumstances there are but two modes known to the writer: First, by surface drainage, by the use of open ditches, or gutters, excavated on both sides of the road in the manner described. If practicable, the fall should be made both ways, from a point as nearly central as may be, and each gutter be extended to a point of discharge lower than the plane. The advantage of draining both ways is, that with the same depth at their discharge end, the fall will be doubled. In case the distance is great, and the labor of producing sufficent fall in the ditches is considered too expensive, it will then be judicious to test the practicability of the other method. This consists in what we call pit-drainage. Its practicability can always be ascertained by digging a well, or by boring with a pile or post auger. If a stratum of sand or gravel, which will absorb water, is reached at a reasonable depth, say not more than forty feet, this plan may be adopted. Three or four wells, equally distributed as to distance will be ample to drain a mile of road. If the wells are to be stoned with rough stones, they should be excavated six feet in diameter, and the depth continued three feet below the surface of the stratum which is found to absorb water. The rough stone wall may be laid dry, but the stones should extend from the inner face to the bank, the smaller ends forming the inner face, thus forming a complete arch of every layer of stones. The wells may all be on one side of the road, or a portion of them on each side, and they should be covered with a strong lattice of cast iron, with meshes about two inches square.

The gutters should fall each way toward the wells, and the low places in the gutters on the other side of the road should be opposite the wells. At each of these low points a well a foot or two in depth should be excavated and stoned up. A tile, or a stone drain, with good fall should connect the shallow with the deep well. The greater the fall in these cross drains, the smaller may the conduit be, and the less the liability to clog. A slight circular depression should be made in the bottom of the surface gutters around the wells, in which the sediment in the drainage water may be deposited before it flows into the wells. It sometimes occurs that the water, not being carried off rapidly enough, will rise up to, and even above, the top of the well; but this is rare, and the foregoing mode will generally provide satisfactory drainage under the circumstances described. When practicable, the surface gutters conveying the water to streams, or to ravines, may be of more simple and of preferable construction. Where the water is to be conveyed a long distance, say half a mile in one direction, a fall of three inches to one hundred feet will answer. This will require the gutter to be six feet eight inches in depth at the discharge end. The bottom of the gutters must be smooth and graded with accuracy. The angle of the slope of the banks should not exceed thirty-five degrees.

In tenacious clay soils the margin of the surface of the substructure, on which to place a Macadam road-bed, shonld be at least one foot above the bottom of the gutters. It should be made smooth and solid, and have an underdrain at each margin of the macadamizing from six to twelve inches in depth, and an average of twelve inches in width. These drains may have a fall each way for five to seven rods, to a low point from which a lateral drain should extend under the side road to the gutter into which they are to discharge. The longitudinal under-drains are to be made of broken stones, and are to be filled up to the level of the surface upon which the macadamizing is to rest. The earth-banks on each side of the macadamized portion of the road should be twelve inches in height, and be sufficiently sloped to be self-sustaining until the broken stone has been applied, which will render them perfectly secure. The stone should be so broken that all, or nearly all, the pieces will pass through a two-inch ring. This is the rule adopted in England, where this kind of road has reached the greatest perfection.

We say "nearly all," for of course there will occasionally be stones which, unless too much time is spent in breaking them, will not come up to the standard. This subject is one of the utmost importance; and, if we are to be governed by the opinion of Macadam himself, we find him declaring that cubes of one and a quarter inch are better than any larger; and he affirmed before a committee of the House of Commons, that his experience went to prove that the expense of keeping roads in repair was almost in the exact ratio of the size of stone used in each instance. Thus, a road constructed of metal broken down to cubes of one and a quarter inch would require to keep in repair but one-half the outlay necessary for one constructed of cubes of two and a half inches; so that the increased cost of construction in using the smaller broken metal will be fully compensated for by the saving in repairs and greater durability. In speaking of the metal as being in the form of cubes, it is not intended to convey the idea that each piece of stone must be a perfect cube, and all of equal size;

practical men will of course understand that the term is figurative, and that the metal must of necessity be more or less irregular, and vary in size considerably. The broken stone for a new road should be applied to the depth of twelve inches and twenty feet in width to produce a first-class road. The lateral slope either way from the center of the road should correspond with that of the surface of the foundation; this slope should be about one-quarter of an inch to a foot. There should be an earth side track on either side of the macadamized portion of the road. The earth road, when dry and in good order, is more desirable than the Macadam, and materially saves the wear upon it. The foregoing specification, although referring more particularly to a road nearly level longitudinally, is equally applicable as a direction for macadamizing any road of the width mentioned.

The preparation and application of broken stone in road-making have hitherto been very expensive, thus presenting great discouragement to those desiring to improve roads upon this system, which we have no hesitation in pronouncing the best of all things considered, as yet discovered. The cost, however, has of late been greatly reduced by the introduction of the "Blake stone-breaker," a machine of great strength and efficiency, which has been satisfactorily tested in practical use. Thirty perches (twenty-five cubic feet to a perch) of the hardest trap boulders can be broken into the best road metal in ten hours by this machine. It requires about nine horse power to perform this amount of work in the time given. In a single hour it has been known to break four perches, or one hundred cubic feet, of stone of the foregoing character. With this machine the cost of breaking is reduced to thirty cents per perch, using coal at $5.50 per ton, and labor at $1.50 per diem, and an engineer at $2.50 per diem, who assists the two laborers employed in feeding the machine. The average day's work for a good hand in the spring, summer, or autumn is less than one perch, and in winter still less. The average price of such labor is about $1.50 per day at present, so that the reduction of expense by the use of the machine is not less than eighty per cent.

The stone-breaker referred to has elevators connected with it, which carry the stone to a considerable height above the machine, where they are deposited upon a sieve, through which the fine sand produced in breaking the stone passes, and is deposited by means of a chute in a tight compartment on the ground; while the stones running over the sieve are deposited in a kind of hopper, from which they are loaded upon wagons or carts by simply opening a slide or trap. In this manner the cost of loading is reduced to a nominal figure, being done almost instantaneously; while, if done by hand by shoveling from the heap, the cost of loading would be nearly half as much as breaking.

After what has been said with regard to the sand being carried down through a chute into a tight compartment, we will explain why the trouble is taken to separate the sand from the broken stones at all, or care taken to deposit it in a tight compartment. It was found that this sand, produced by the trituration of stones of this quality, in the process of breaking, is the very best material yet discovered for manufacturing "concrete stone" under the Ransom patent of England, which is rapidly coming into use in this country. About one hundred pounds of sand are made for each perch of stones broken, and all yet made by the machine in question has found ready sale to the "Ransom Concrete Stone Company of Maryland," at one cent per pound. It will be seen that in the neighborhood of cities, where the concrete stone is being manufactured to any considerable extent, a road may be macadamized at a very low cost, if indeed it is not found that the stones can be broken and applied at a cost which shall be less than the proceeds of the sale of sand produced from the amount of broken stone required, thus preparing the road metal free of cost, and leaving a profit to the constructors besides.

In the application of the broke stone to form a road-bed, although the process is simple, it is important that the surface of the earth substructure be kept free from ruts and tracks, as any depressions will fill with water, and soften the foundation at these points, thus causing the road to settle unevenly. Depressions in the stoned surface cannot be well repaired without "picking up" the metal to the depth of several inches. The material used in repair should be somewhat smaller or finer than that of which the road is formed. The portion repaired is to be thoroughly rammed with a "paver's rammer," and, when finished, should be slightly above the surface around it, which remains undisturbed. When the metal has been properly graded on a new road, the surface should have a slight dressing of clay, and a heavy roller should be passed over it until the metal comes to its bearing, before vehicles are allowed to pass over it. A road-bed twenty feet in width and twelve inches in thickness will require 4,224 perches of broken stone to the mile. The surface grade of the earth side tracks should correspond with, and be a continuation of, the grade of the macadamized portion. The side tracks should not be more than nine feet in width, as unnecessary width increases the difficulty of surface drainage.

Many professional road makers will take exception to the clay surface dressing, but it has been thoroughly tested in practice, and always with success. The effect is to bring the metal to a bearing at once, and to prevent the action of the wheels from destroying the angularity of the surface metal, a very important quality, as it is almost impossible, after the surface stones have become rounded, to get them to bind one with another, and form a first-class road surface. The quantity of clay applied should be sufficient only to fill the interstices between the stones, on the immediate surface, when the metal has come to its bearing. Another advantage of such an application is to render the superstructure of macadamizing waterproof, almost from the first, the importance of which, in assisting to maintain a dry foundation, is almost self-evident.

THE GRAVEL AND OTHER ROAD-BEDS.

When the natural soil of a road consists of gravel of proper texture, in its natural state, the process of procuring a very desirable road, for all except very heavy traffic, is simple and inexpensive. It only requires to have the surface of the road-bed raised by repeated plowings, the furrows all being turned toward the center of the road. In case the natural surface has a slope to one side, the execution can still be mainly and most economically performed by the use of the plow, by turning the furrows in one direction. The plow should be what is called a "double right and left-hand plow," which may be used with great advantage. When the desired grade of the surface of the road and gutters shall have been produced, as nearly as practicable, by the use of the plow, it should then receive repeated harrowings. The remainder of the work may be most economically and efficiently performed by means of the grading machine, except the removal of considerable hills, or the filling of corresponding depressions, which, if the distance is short, may be best performed by the use of the common scraper; but, if it exceeds five or six rods, wheelbarrows, carts, or dump-wagons will be necessary. No hand grading is necessary, as the grader, propelled by a pair of active horses, will perform more of this character of work than fifty men, and at the same time do it better.

The width of such gravel road will, of course, be controlled by circumstances, the amount of travel and the character of it being the most important considerations. It may be remarked, however—and it is equally applicable to all roads, of whatever material—that they should not be made wider than is really necessary, otherwise the cost is greatly increased, as well as the difficulty of surface drainage, which, as was remarked, in connection with Macadam road, is of great importance. A rod constructed of natural gravel, and having a gravel subsoil, will require to be raised less in the center, and the side gutters may be made more shallow than would be admissible with any other material.

Rotten Rock.—This material is frequently found, in a natural state, quite well adapted to forming a road that will serve all the purposes for which earth and gravel roads are adapted. It rarely has a proper degree of tenacity, however, to enable it to bind, or retain desirable compactness.

When this material lacks tenacity the defect is easily corrected by adding a due proportion of clay, but the proper proportion of each can be ascertained only by experiment. When prepared, as they should be, a good road for ordinary country travel can be made from these substances.

Loam.—By the term loam we mean clay with an admixture of fine sand and generally a liberal proportion of vegetable matter.

When the proportions of clay and sand are such that the soil will not bake, nor incrust when dry, nor become very adhesive when wet, it may properly be called loam. When the soil of a road-bed consists of loam, or the best soil obtainable, the directions for the use of clay are applicable, with the exception that loam does not require the extreme degree of surface slope recommended for clay.

The natural soil of the bed may be either clay or sand. The application of the other by hauling it on the bed and incorporating it by means of the plow and harrow, will enable the engineer to produce from these two materials (each ill adapted alone) an artificial soil, which will answer the purpose of a road-bed quite satisfactorily. Gravel, consisting of water-worn pebbles, without an admixture of clay by which to cement them, is a poor road material, as it rolls from under the feet of the animals and from beneath the wheels, making the labor of teams on such a road very severe. A proper amount of clay added to, and well mixed with gravel, will greatly improve it as road material. The characteristics of all these materials are so various in different localities that the proportions need to be modified according to circumstances; and the proper proportions in each respective case will be most readily and satisfactorily determined by experimenting with a number of samples, say a cart load of each, in different proportions, which should be carefully noted, all being placed contiguously on the road-bed where they will be equally exposed to wet and to use. A few months' experience, under such test of the various mixtures, will give the road-maker data which theory cannot furnish.

In some sections of great area no other material than clay can be obtained; hence it must be used as road material in its natural state. The general principles involved in the construction of gravel, loam, and other roads, and described under those heads, are to be observed in constructing a road exclusively of clay; the gutters, however, should be made as deep as is practicable, and the road-bed as narrow as the travel will admit, and be as highly crowned as is admissible, thus guarding against absorption of water from the gutters, and effectually shedding the rain-fall from the bed. There is no material in the catalogue treated that forms so perfect and delightful a road for pleasure-driving as clay, when in a certain condition; but it is so difficult to be maintained in the desired state that it is judicious to incorporate sand or gravel with it, wherever practicable.

There are districts of country many miles in extent, where nothing but drifting sand can be obtained for making roads. Where the depth of sand is great before reaching a tenacious sub-soil, a road-bed of sand will be more compact and better, if made lower than the surface of the land on either margin, so that water may flow on to, instead of being drained off from, the road. Like clay, pure sand is not a desirable road material, and quicksands, not unfrequently found in extensive sandy regions, are dangerous. Where drainage of quicksands is impracticable, two thicknesses of plank laid over the place to be crossed, the lower planks running in the direction of the road, and the upper ones crossing it, have been found to answer very well as a sort of a floating-road. A contractor on the Knox and Lincoln railroad in Maine has recently encountered a quicksand into which he has sunk pile upon pile to the depth of one hundred and forty feet, and no indications of a hard substratum are yet apparent.

PLANKROADS.

Plankroads have been so universally unsatisfactory that valuable space need not be occupied with directions for their construction.

A plankroad is a good road when in proper condition, and may be a necessary kind in some districts of the country; hence it may be well to state that it is claimed that, by steaming the plank, and charging them with creosote, costing about eight dollars per thousand feet, board measure, their durability will be doubled.

THE LONGITUDINAL GRADE FOR A ROAD.

There is perhapse no branch of the subject under consideration which demands more attention by the engineer than that of the reduction of road grades to the minimum under all practicable circumstances. We can better afford to increase the length of a road considerably than to retain grades, in places, so heavy that a team is unable to haul more than half, or perhaps one-quarter, the load it can on all the remainder of it. Roads which are steep in the line of their axes are not only more severe on teams, but they are dangerous, and much more expensive to keep in repair. Various opinions have been expressed by engineers and essayists on this cubject. Mr. H. F. French of Boston, Massachusetts, in a very able paper on roads, contained in the report of this department for 1866, says: "In view of every consideration, except drainage, the level line is probably the best; but, as drainage is essential, and, as will be seen when we come to consider the construction of roads, it is desirable to make them as flat as possibly transversley, a slight slope in the length of them is found expedient. This slope should be one in two hundred, which is sufficient for drainage without injury by washing, and adds little to the draught."

A grade of one in two hundred is a very desirable one, so far as draught is concerned, but it is nearer level than is practicable on any considerable proportion of our country roads; and, as regards drainage, it will be of little service. Much lateral slope is objectionable, but we do not consider that a slope of one-quarter of an inch to one foot is so, while it is sufficient to provide lateral drainage, which is more efficient than longitudinal drainage. The widest track of country wagons does not exceed five feet, and, with a slope of one-quarter of an inch to one foot, the difference in the height of the wheels when the vehicle is on the side of the road, is but one and a quarter inch, and this is reversed in returning. It often occurs in rural districts that it is practicable to drive a large proportion of the distance on the summit of the road bed, where the vehicles will be on a level. It is next to impossible to prevent road surfaces from rutting to some extent, and a "slope of one in two hundred" only, while it is so gentle that there will be no tendency to wash, will certainly keep surface water on the road-bed so long that much of it will be absorbed, which may be avoided in lateral drainage, without injury to vehicles, displacement of lading, or inconvenience to passengers. It is not practicable to give a rule for the exact amount of longitudinal grade of roads, as they are affected by so many circumstances. Primarily the best provision for business traffic should be considered paramount to all else, yet this has often to be modified by local circumstrnces, whether in regarding old roads or in locating new ones. In the latter, if the locality is mainly unsettled, and the probabilities are that the building sites will be most popular near the summits along the line of the projected road, the engineer should prospect contiguous lands, and so modify the route that the necessary laterals may connect with the road by grades that will be easy, safe, and inexpensive.

There has been a very general and striking change in the taste evinced in lccating rural homes, country seats, and farm buildings, of late, to provide for which a corresponding change in the roads by which they are to be reached has become indispensible. Formerly, the popular site for rural buildings was under the lee of elevated ranges of land, near the streams, or springs at the base of the hills, to accommodate which, the public roads generally traversed the banks of streams, in which position the drainage of all the high lands must pass under or over them. The advantages of the modern system are numerous, and the disadvantages few. The salubrity of the high sites, the more extensive and pleasant view secured from the buildings, as well as from the summit or the hill-side road by which the builhings are reached, the reduction of cost of construction and maintenance of such roads, the superiority of the grade generally obtainable, as compared with those along the streams, and the greater feasibility of securing dryness about the buildings, as well as for beautifying the landscape in their vicinity, are among the most prominent advantages of the modern selection over the primitive. Some have urged as objections to the high sites, that they are bleak and cold, and that water is not convenient. The former objection is fully met in the modern improved methods of building, and of economically generating and circulating heat; while, by the use of improved hydraulic apparatus, the supply of water is made ample, and luxuries unknown in the old system are fully enjoyed.

Where objectionable grades, say of ten feet to one hundred, the heaviest that should ever be tolerated, are unavoidable, the following instructions for construction and repair should be observed: Avoid short curves in the road; make the bed wider on the hills than on the plains, and especially in the curves. If the road runs along the side of a slope, grade the surface of the bed, so that all water falling on it shall be cast to the gutter on the upper side, as there is great danger of accident in icy times, if any portion of the bed has a lateral slope with the hill side. On such roads provide low water bars across the road at intervals of thirty or forty feet. These bars should be placed obliquely, and should discharge all the water in the gutter on the upper side. If the gutter is disposed to wash, it should be paved, and the curb of the pavement on the road side set so low that water from the road-bed may flow into the gutter the entire distance from bar to bar, instead of being required, as is frequently the case, to flow in the ruts of the road-bed until it reaches the bar, which it often overflows and washes away, continuing to flow on the road until dangerous gullies are cut, requiring much expense to repair them. If the hill is long, say one-fourth to half a mile, the water should be carried across the road in culverts, one hundred to one hundred and fifty feet apart. The best and cheapest common road culvert may be made of hard-burned terra cotta pipes. On hilly roads they are rarely required of more than eight to ten inches caliber. These pipes need no sleeves, or bells, nor any cementing at the joints; and are less expensive than the common stone culvert, even where stones are at hand. The capacity of the pipes, owing to the smoothness of their interior surface, is much greater than that of a stone culvert of the same area of cross section. The pipes should be burned like hard, red brick, and are then as durable as granite. The pipe culvert should receive the water from a shallow well, walled up with stones or bricks. This well should be in the line of the gutter on the upper side of the road. The water from the gutter should fall into the well over a flag on the wall of the well, and between two side walls, carried up with the other walls to a height sufficient for a proper opening, when the well and the opening in the upper side should be covered with a strong flag. This flag should overlap the inner face of the wall of the well at the opening, at least one foot, that animals may not step into the well. This arrangement makes the upper end of the culvert sightly, secure, and free from all dangerous effects. The trench in which the pipes are laid should have a fall, so that the water from the culvert may be discharged upon a natural surface, as it will be less liable to gully it than an artificial bank.

STONES ON EARTH AND GRAVEL ROADS.

In preparing earth and gravel road-beds, all small stones, down to half the size of a hen's egg, should be removed from the surface soil, as the tendency is for them constantly to work up to the surface, where they are injurious to the feet of horses and to vehicles, wear and break the lading, and destroy the road. The wheel of a loaded vehicle, falling from a stone over which it has rolled, even if it is not more than two inches in height, will injure a road surface more than the natural rolling wear on a smooth surface in running a mile. The same may be said of the effect of loose stones on a macadamized road, only that the damage to the latter is more serious than to the earth-road surfaces, which will in some degree repair themselves; but the displaced, macadamizing material is strewed upon the surface of the road, greatly increasing the evil. Next in importance to drainage is the removal of loose stones from the surface of the road, and the best and cheapest mode in thus clearing earth and gravel roads is to run the rut scraper or grader over the road, commencing at each margin with the scraper, so set that the surplus earth, stones, &c., will be continually deposited toward the center of the road. Having passed the scraper over the entire surface, by passing up one side and down the other, all the small stones to be removed will be deposited in a narrow row on the middle of the road-bed, from which they may be rapidly gathered by use of the malleable cast-iron coal-scoop, which being latticed, allows the earth and gravel to fall through. Loose stones may thus be removed from the surface of the earth and gravel roads at perhaps one-tenth of the cost of hand-picking, and all ruts filled at the same time. The loose stones on macadamized roads should be frequently picked off, and the side tracks kept in order by the use of the grader, as above described.

Great advantage and economy result from passing the rut scraper over earth and gravel roads as soon after every rainfall as the soil becomes dry enough to flow before the scraper, and readily fall into the ruts and depressions in the road surface. Where the water is allowed to stand until evaporated from the ruts, large and frequently dangerous mud-holes are the consequence; and as they are generally repaired by casting in stones, small and large, the road is made worse, instead of better. Mud-holes in roads are striking examples of a verification of the adage that "prevention is better than cure;" and prevention can be effected in the most simple and economical manner, by the use of the rut scraper. If taken in time, it is rarely necessary to haul soil for repairs, that removed by the scraper from the margins of the ruts generally being all that is requisite to raise the depressions to the proper grade.

The objectionable course of conveying surface water across roads on the surface, instead of by the use of a proper culvert, is common in all parts of the country, even on macadamized roads charging heavy tolls. The damage annually done to teams in such cases is more than the cost of a culvert. These water crossings are often, in winter, a sheet of ice ten to twenty feet in length as wide as the road, in crossing which teams are often seriously injured by slipping.

WATER FOR TEAMS.

It is a matter of so great importance that a full supply of water by the roadside be provided for teams, at intervals of at least an average of five miles, that the subject should no longer be neglected, but a provision for securing a supply should be made in the county road laws. Except in very flat dry countries, it is generally practicable at trifling cost to arrange water troughs at proper intervals, so that the water will flow in and out perpetually. The supply-pipe should always be inserted into the bottom of the trough, and not rise much above the surface of the water when the trough is full; for, if it does, the water is apt to be blown about and to freeze, so as to make the approach to the trough dangerous. If the water is received at the bottom of the trough, and the overflow is taken from near the supply, in a pipe to a culvert, there will be no ice about the trough. The supply-pipe should rise about half an inch above the level of the water in the trough, so as to form a drinking fountain for teamsters and travelers. In the heat of summer, teams will instinctively hurry their pace as they approach these grateful thirst-slacking stations, and their comfort will be promoted to a degree that will well compensate for the outlay. The temperature of water standing in a trough exposed to the sun is more wholesome for working teams than that from cold wells.

WATER BARS.

The purpose of the bar is to cast the surface water from the road to the side or sides before it has accumulated in such amount as to cut the ruts into gullies. When the surface of the road has a slope to both sides, the bars should be placed opposite to each other in the form of an obtuse V. The bottom of the V should be up the grade. There should be no gutter excavated in the road surface on the upper side of the bars, but the bar should be raised slightly above the road surface. No stones or timbers should be used in the bars; good gravel, where obtainable, is the best material. If the bars are placed as near each other as they should be on the heavy grades, the highest portion of the bars, that is, at the margins of the road, need not be more than three inches above the level of the surface of the road. On newly constructed roads, whether of broken stone, earth or gravel, the water bars need frequent and particular attention until they become firm; in fact there is no portion of the road that will give a better return for the required outlay of labor than the water bars.

SHELL ROADS.

A pleasant and durable road for ordinary light country travel may be made on a properly drained foundation, by applying shells to the depth of about eight inches, with a lateral surface grade of a quarter of an inch to the foot, but not sufficiently durable to be profitable for heavy traffic. A few years since, one of the main macadamized turnpikes leading out of Baltimore was repaired over a section of about half a mile in length, by dressing the stoned road with shells, applied about six inches in thickness. The solid bed of stones underneath and the heavy traffic on the surface soon ground the shells to powder, and when wet it became a bed of thin lime mortar, two to four inches in depth, which was so objectionable that the company were obliged to scrape up and haul off the whole mass in less than two years after the shells were applied. The circumstances described were particularly unfavorable for shells, as a test of their durability. The wear upon an ordinary carriage road in private grounds is not usually sufficient to reduce the shells to a good road in many years; hence they are not adapted for that use. A shell surface is inclined to rut, and work to the margins, and the shells are very difficult to move so as to repair the road by any hand process; while by the use of the grader, they may be readily and rapidly leveled in the construction of a new road, or regraded when displaced by water. An active man with a pair of horses, with this implement, will repair two or three miles of shell road in a day, which would require the labor of at least twenty-five men to perform in the same time.

ROAD GUTTERS.

So much depends on the proper condition of the side gutters for the thorough maintenance and protection of the road, that the writer has been induced to give this branch of the subject special attention, and to test a variety of plans, in the hope of arriving at valuable and permanent impovement. Having realized his fullest hopes in one direction, a detailed description of the aim and its results may be given. Finding that the gutters, from the perpetual moisture maintained in them, were inclined to clog with rank, aquatic grasses, he sought to devise a plan to prevent the difficulty. The course pursued was to pave the gutters with boulders, set in about eight inches of washed gravel, and when they were all rammed in place, the gravel was swept from the interstices between the stones, to the depth of an inch, and its place supplied with heated, clean sand, which was saturated as it was applied, with a hot mixture of coal-tar and coal-tar pitch, two parts of the former and one of the latter, filling the interstices level with the surface of the pavement, producing a smooth uniform surface. The first experiment was made about twelve years ago, and has proved a perfect success, the effect being to prevent the growth of all vegetation, while the surface being smooth prevents any clogging with leaves, dead wood, and the like. Another valuable result attained was that the pavement, being made water-proof, is hardly effected at all by frost, keeping its place much better than when the stones are set in gravel alone, in the ordinary manner. This concrete dressing is not adapted to use in gutters where vehicles are allowed to run over it, particularly in cold weather; but it is admirably adapted to use in side gutters for country roads, and is greatly superior to any other gutter for carriage roads and walks in private grounds. The cost is about two cents per superficial foot more than the ordinary stone-paved gutter.

COUNTRY ROAD ENGINEERING.

Road engineering, as a profession, has not been sufficiently in demand in this country hitherto, to enlist the attention of those possessing experience, skill, and a thorough, scientific knowledge of the subject. The engineering of new roads and the alteration of old ones have generally been done by a land surveyor, or some student in railroad engineering, each deficient in a knowledge of the important work he attempts to execute; hence the defective character of most of these roads throughout the country. Not until the professional engineer shall receive greater encouragement to make common road engineering, in all its details, more a specialty, will it be more skillfully executed, and this encouragement will not be afforded until the masses are made more familiar with the importance of the subject.

There is one important principle in road engineering that should always control the grade of the road as far as practicable, and yet it is observed and acted upon only as the exception instead of the rule. It is that when a road is to connect two points, whether terminal or intermediate, and one is higher than the other, the inclination of the road should, if practicable, continually tend upward in one direction, and the reverse in the opposite. Instead of this we have examples all over the country where there is a descent, a fall in the grade, made up of a number of smaller or larger hills, from the low to the high point, that is really greater than the actual elevation of the high above the low point. A trifling divergence in the direction of the road, and frequently with but a slight increase in its length, if any, will almost always remedy this great defect; so that a team, in traversing the road from the low to the high point, shall have but little, if anything, more than the real difference in the altitude of the two points to overcome. This error, if corrected in all existing cases in this country, would be of incalculable advantage to the community.

WIDTH BETWEEN FENCES.

It is important that the width of a road between fences should be ample to provide the material required in construction and repair, without endangering the fences by undermining the banks, and also to leave a grade that will be self-sustaining. Greater width is necessary in snowy districts than in those not subject to blockade from this cause. In the northern portions of this country there are districts where the cost of keeping roads open in winter exceeds that of repairs in summer. Increasing the width between the fences, and keeping the gutters suitable for the use of sleighs, have proved to be the most efficient remedy. The width required by law varies in the different states from two to four rods. In the opinion of the writer the latter width is not too great to be economical for highways generally. Walls, close fences, or close belts of trees, on road margins, are also objectionable, as they tend to blockade them with snow, and prevent the surface from drying.

SHADE FOR ROADS.

On all earth roads shade is objectionable in its effects on the surface, yet it it admissible to provide a good shade with deciduous trees on the summits, where the fullest benefit of the fanning breeze may be enjoyed, and shade will be least injurious. The effect of shade on stoned roads is less injurious than on those of earth. Abrupt banks or dense thickets on the south side of a road-bed, so high and near as to exclude the sun from it in winter, are very objectionable and dangerous, as such portions of the road are generally icy, when the remainder is free.

EXISTING ROAD LAWS.

There is a great similarity in the general road laws of the different states pertaining to the maintenance of county roads, the tax being generally a poll-tax on the male inhabitants between certain ages, though in some there is a trifling levy in money. The levy for the cost of new roads and bridges is usually in money, on the taxable property in the rural districts. The system of labor-tax and of selecting road supervisors alternately throughout the districts, to direct the outlay of such tax, regardless of qualification or fitness for the work, notwithstanding it has so long and generally prevailed, is everywhere acknowledged to be very defective and unprofitable in its results.

PROPOSED SYSTEM.

All money required to construct and maintain the roads and bridges in each county should be raised by levying a tax in money. A competent county road engineer should be permently employed, who should have the entire direction of all construction and repairs of roads and bridges in his district, with the power to draw on the treasury for the necessary means to meet all reasonable requirements in defraying the cost of the work to be executed. He should be authorized to purchase all teams, vehicles and implements required, the same to be the property of the county, and to employ as many competent foremen as required for his district. They should have charge of these teams, &c., and have power to employ, control and discharge the number of laborers directed to be employed by the engineer. The foremen should each have their respective districts allotted them to be kept in repair. The engineer and his foremen and the laborers employed should be required to devote their entire time to labor on the roads. The water bars, culverts, bridges and gutters should be examined as often as once a week, and all loose stones, and other surface obstructions removed. Work for repair of surfaces should be constantly pursued, and the principal amount of material required on the earth roads should be applied in the dry season. The winter should be devoted to quarrying stones for bridges, culverts, and macadamizing, and in raising and hauling gravel, and depositing it where it may be readily applied at the proper season. With such a force in charge of the roads the amount and quality of the work executed would be more than double, and the actual tax required less than under the prevailing system.

COST OF ROADS AND EXPENSES OF REPAIRS.

According to all returns from different states, the average cost of construction of gravel roads is $2,241 per mile, and the average annual cost per mile for repairs is $103. It appears, from the reports, that only a very few of the roads are improved by a gravel bed, and neither the width of the beds so improved nor the quantity of material applied is given. We may reasonably infer, however, that neither is greater than is absolutely required, and yet we find the cost of construction per mile to range from $700 to $4,000, and to average $2,241. The annual outlay per mile varies from $4 to $200, the average being as above stated, $103.

By reference to the table showing the cost of repairs to common roads per mile throughout the country, we find it to vary from $1 to $59, and the general average is $18.11 per mile.

The returns show that the average cost of construction of macadamized roads per mile is $3,290, and it varies in the different states from $500 to $6,336. The average annual cost per mile for repairs of macadamized roads, as reported, is $40, varying from $10 to $100 per mile.

The average cost of construction of plankroads per mile is reported to be $3,000, and the average annual cost of repairs per mile is $550. * * * * *

BRIDGES.

The writer has observed in various parts of the country common errors in bridge construction, which he proposes to notice, with remedial suggestions. At the present comparative prices of wood, stone and iron in all districts, except perhaps on extensive prairies, where the former two are very scarce, wood and stone are considered so much cheaper than iron that they are generally used. Where good quarry stones and suitable sand and lime or cement are conveniently attainable, the span required not more than thirty feet, rock foundations for the abutments within reasonable depth, and the banks of a proper height, the stone arch with stone parapets is, perhaps, as economical a structure as can be adopted. Where greater spans are required, and the banks are low, stone abutments and well constructed frame covered bridges are preferable. Not a doubt exists of the economy of siding and roofing wooden bridges, and of extending both over the abutments, so as to effectually protect from rain the timbers and planking at these points, as they are known to decay first when not protected. There is a frame covered bridge in Hartford county, Maryland, which was built more than fifty years since, and is still safe.

Among the errors in bridge construction, those most common are the injudicious distribution of material, particularly of timber; the contraction of the water way, so as to expose the superstructure to liability to be swept from the abutments; neglecting to bolt the superstructure to the abutments; laying the flooring with close joints, instead of with proper openings, to prevent water from standing on the floors; using perishable varieties of timber, and even allowing the sapwood to be used in part, by which all is reduced to its ephemeral character. No errors perhaps more common, and none results in so needless and speedy destruction of the longitudinal timbers of bridges, as the want of attention to keeping them dry, where they rest on the abutments, and especially at the ends where they support the earth-filling of the road-bed.

The durability of the timbers may be increased by introducing a light back sill and short light joist about two feet in length, with a plank on edge resting against them, to support the filling independent of the main, horizontal timbers, that air may circulate around the ends; and by covering the ends of all the timbers resting on abutments and piers with several thicknesses of tarred paper, these being the points where decay often destroys when the other parts are unaffected.

THE HORSE—BREEDS, BREEDING AND TRAINING.

From a Lecture delivered at the Illinois Industrial University, January, 1869, and published in the Report of the Board of Trustees,

BY HON. N. J. COLEMAN, ST. LOUIS.

Now, in regard to horses, they are certainly very useful animals, but, let me enquire, for what do we want borses? Farmers want horses to work upon the farm; they also raise them to sell, just as they raise cattle and sheep and hogs to sell. These are the purposes for which farmers grow this stock, first for their own use, and then to sell in the towns and cities.

I do not propose, gentlemen, to give you a history of the horse, going back to the days of Pharaoh, and tracing the story of the horse all along down to this date. Nor do I propose to give you a history of the various breeds of horses. I propose to deal with the present, and take the horse as we find him.

Small horses are adapted to a hilly country, but are not suitable for the purposes of the farm, particularly on our rich fertile prairies. They cannot haul loads large enough, nor turn furrows deep enough. We want, on the farm, horses that we can use for all purposes.

The Percheron, or Norman horse, is a breed that is being largely imported into this country. It is a good breed for draft purposes. We have a horse in this country—we have them in Missouri, you have them in this state—a horse favoring the build of the Percheron. He can haul immense loads, but he is too big boned and to clumsy for other purposes. He is not adapted to riding. He is not a good buggy or carriage horse.

The farmer, as we have said, wants a horse good for all purposes. He wants a horse that can draw heavy loads; a horse that he can take from the plow and put in his carriage and take his family to church. He wants a horse also good in the saddle. Now, these large clumsy horses are not active enough for all purposes; they are admirable draft horses, but when you have said that, you have said all. [The lecturer at this point introduced the Morgan horse, and showed a picture of him as given in the Prairie Farmer.] There is no beauty about him. He is not a horse I think farmers should breed from, except it be for the single purpose of obtaining draft horses, and even then, I would not advise in favor of the Morgan horse. I would say to farmers wanting a draft team, breed from the Percheron, or Norman, horse. I will tell you what I think farmers should raise. I am, on the horse, as some others are on cattle, I want to get back to the thoroughbred race of horses. I know it is said that these horses are not large enough. I admit that all thoroughbreds are not large enough, but we have those large enough for any purpose. You have them in this great state of Illinois.

How large a horse do you want? About 16 hands high. I would say 15 1-2 hands high is large enough. But some of these horses are 17 hands high. There is Patona, 16 1-2 hands high. Do farmers want a horse larger than that? The horse Bonny Scotland is full 16 hands high. Mr. J. C. Simpson has a thoroughbred over 16 hands high. We have at St. Louis, Derby, 16 hands high and over. The imported horse Lexington is full 16 hands high. Now if we can get a thoroughbred horse of sufficient size, what better do we want? For one I would not wish to go back of that for my type to breed from. I like the thoroughbreds. Here is muscular development. Here is life and spirit adapted for any purpose. If you want a saddle-horse, nowhere will you find one that will answer the purpose so well. If you want a draft team, you can find it here. They are the most intelligent horses in the world. Treat them with kindness and they will appreciate and repay you well.

In regard to breeding horses. I say get a thoroughbred horse of good size, and then take your largest and best mares, and you will not fail to have good horses for the farm, and also good for the market. You can take them to St. Louis, Chicago, or New York, and get a big round price for them. It is a shame to use our finest specimens of thoroughbreds on the race course, when they could be used to such great advantage for breeding purposes. There is just as fine a chance for farmers here to go to raising horses, if they will give it the proper attention, as to raise cattle, sheep and hogs.

There is a prejudice against race horses, and perhaps I share somewhat in this prejudice. But allow me say, it is the race course that has developed the qualities desired in a horse. We want to get *action* in a horse. We do not and would not get the action we ought to have, without proper training. But here we get the trotting action. Having one of these horses, you have a most profitable horse from which to breed. I own two stallions. You see I value the thoroughbreds, and I have found the raising of these horses profitable. I sold last year to Mr. Loomis of Chicago, a horse for $4,000. You could not now buy that horse for $10,000.

Who can help being pleased with the appearance of a beautiful and well trained horse. God has made us to admire the beautiful in nature and in art.

Well, I must say something to you about the race course. I do not wish to recommend my farmer friends, and especially my young friends, to waste their time at the race course, or to make trotting trainers of themselves. I believe that the influence of the race course is bad. I do not recommend the raising of horses for the purposes of the race course. The influence is not only bad, but tends directly to neglect of business.

Now in regard to racing at our fairs, and here I know I am treading upon the toes of some. But for the exhibition of horses at our fairs, we could hardly sustain them. At St. Louis, at the state fair last year, we took in $100,000 in eight days. If we had not offered large premiums for fine horses we would not have taken in one-half of that amount. We have got to get money in this way in order to sustain the institution and make it a success. But really we do not, at our fairs, have racing in the legitimate sense of the term. The horses go round, and the one making the quickest time gets the premium, and if our Illinois friends would adopt this plan and allow the exhibition of speed (each horse trotting alone) they would succeed better. This is only my opinion.

Now a few words in regard to breeding. We should have a thoroughbred stallion, with trotting action. If you get one of this description he will impart himself, even to color, to the colts. Out of forty or fifty colts from a stallion owned by myself, only three have been of different color. He has simply imparted himself.

I go for color, largely on bay. I think it is best. I get a colt with fine trotting action. I do not expect to train them. I expect the rich merchants and bankers, and fast young men, will want just such a horse, and I expect to sell him to them.

There is another thing in regard to breeding. Those who keep stallions do not handle them properly. They pamper them and-over feed them, do not give them proper exercise. Hence their offspring is not what it should be. Your horse should be in the highest state of health. In order to do this you must give him plenty of exercise, plenty of light, and plenty of air. He should be brought up to a fighting condition almost. Train him as they train a man for boxing. I tell you if you want your stallion to do credit to himself you must give him muscular development, a heart and lungs in perfect health and action, else he can't impart these to his offspring. This is one of the great secrets in good breeding.

I do not believe that a pampered and grossly kept bull is capable of giving the best results. It is not, however, so important in cattle, inasmuch as they are bred for the purpose of being slaughtered. But in the horse these things are of first importance, as he is bred for a very different purpose.

Now in regard to the kind of mares to breed from. Most farmers know what kind of stock they want in a mare. Large mares, or mares with large roomy abdomens, are best. The horse may be comparatively small if the mare is large; but if you breed a large stallion to a small mare, you may expect to have a wishawashy colt.

In a stallion you want strength and power in the least possible space. It is not so with the mare. She may be, and it is better she be, large and roomy.

You will find that you can work these mares in a moderate way. I have forty brood mares, and I can work them all I wish to do. It is better they be worked or exercised a little every day. After you have the colt the work should be very moderate.

Handle the mare and colt constantly, otherwise the colt may be wild as a deer, and will not be so easily controlled at breaking time. The mares should have comfortable stables and good care in all respects. Colts handled from the first are very easily broken. I have never known one that I could not handle. Perhaps I have got too much notoriety in St. Louis in this respect. In handling horses, I treat them as animals with intelligence. I let them know that I am their friend, and treat them accordingly.

The horse can see better than you can; he can hear better than you can; he can smell and feel just as well as you can. In your treatment of them bear these facts in mind. You have all heard of the great success of Mr. Rarey in his horse-taming power. I can take a horse as wild as a deer and soon have him under my control, and it is simply because I convince him that I am not going to hurt him, and that I am his friend. You have got to approach by degrees. Let him smell of your whip. Get on his bridle. Get the bridle in your hand and you are his master, and in ten minutes you will find he will lie down completely your slave. It will require but a few lessons of this kind for him to know his place and obey your voice. I have broken hundreds of colts, a great many of which I have been able to put at once in the wagon and drive them with whip in hand.

It would be just as reasonable to take a child who had not learned his letters, and flog him because he could not read, as to take these colts and beat them into the harness. You should talk to the horse; he has intelligence that is good "horse sense," and knows when you speak kindly to him. When you want him to stop, say "whoa." Be patient with him till he gets used to the harness. Let him learn your language, your wishes, and you can do anything with him you desire. You can get him to do anything if you will only let him know what you want. You can get on him and ride him to death, when he could, if he would, dash you to death for such horrid abuse of a poor horse.

That is one of the great secrets in training a horse—let him know what you want. Talk to him just as you talk to your child, and treat him as kindly, and you will never have any trouble with him.

What a noble animal the horse is! And yet how frequently is he the subject of thoughtless and wicked abuse at the hands of his master, he has served so faithfully and so long. He is driven upon the road all day, with perhaps but little water, and upon half rations. He is taken home at night, all mud, and left in that condition, and still with hardly enough food to sustain nature.

I am here to-day to plead for the horse, and to ask for him kindlier treatment than this, noble animal that he is. On the other hand, a great many persons kill their horses by kindness. The stables are too close, too little light and air. The horse is an animal that has lungs; he consumes a great deal of oxygen. Go into the towns and you will find the horse confined in a close stall, almost forbidding him to lie down. The horse wants an abundance of air and light. One reason why we find so many horses diseased in the eyes is because they are confined in dark stables. Then let me urge the necessity of providing for an abundance of air and light in the construction of horse stables. Have windows for your horses' eyes as well as for your own. Light is necessary for perfect health. We make a great mistake when be build dark stables.

There is another subject that should be mentioned, and with this I will close these remarks, which I have made with little or no previous reflection. I refer to the importance of acquiring a knowledge, as far as possible, of *veterinary science.* Quack horse doctors are to be let alone with a vengeance. Wherever there is an intelligent veterinary surgeon it is best to consult him in all important cases. Students in agricultural colleges, and others who have to do with horses, ought to be taught this science.

CULTURE AND PRODUCTS OF THE VINE.

From a Report to the U. S. Commission at the Paris Universal Exposition of 1867, by a Special Committee, consisting of

MARSHALL P. WILDER, ALEX. THOMPSON, WM. J. FLAGG AND PATRICK BARRY.

The exhibition of wines at the Universal Exposition of eighteen hundred and sixty-seven was large. Every wine growing country in Europe, as well as Australia, Canada, California and other sections of North and South America, were represented. As there were no jurors from the United States, our American wines were not subjected to so full and fair an examination as they were entitled to, and to remedy this omission a special committee, consisting of the above named, was appointed by the board of commissioners to make an examination of the wines of our own and other countries, and report especially with reference to wine growing in America. To properly judge, however, of the different kinds, of the qualities, cost, sanitary influence and adaptability to our country—points upon which we would have been glad to report more fully—would require more thorough tasting and more time than the committee could command, or had a right to demand from the courtesies of foreign exhibitors or commissioners.

As regards French wines, full reliance cannot be placed on what is furnished to the American traveler at hotels or cafes, or even what is sold to him at the shops, no matter what price he pays. It would, however, be doing French wines a great injustice to judge them by the qualities sold in this way or exported to America. The great body of American consumers have palates as yet so unskilled, and the merchants of Bordeaux and fabricators and imitators are so adroit, that it seems impossible for the honest wine grower here to come into such relations with the wine drinkers there as shall secure to the latter the benefits, sanitary and moral, which the French people themselves derive from the pure juice of the grape so abundantly produced in this country. It is not an unusual practice for dealers to buy of producers in the back country a coarse, deep red wine for thirty cents per gallon, and a strong white wine for forty-five cents per gallon, mix and bottle them and send them abroad labelled with all the high-sounding names of "Medoc," etc., to sell at enormous profits to unsuspesting foreigners.

Further south than Bordeaux, in the country about Montpelier and Bezires, an inferior article, but perfectly pure, can be obtained of the producer at five and six cents per gallon, or one cent per bottle. Of late years, and since the abatement of the grape disease, the production of France has been very large, the four millions of acres in cultivation yielding an average of one billion two hundred millions of gallons, which would give to every man, woman and child in the country, a half bottle full every day, even after allowing two hundred millions of gallons for exportation.

Owing, perhaps, to the intimate relations between America and Germany, our wine commerce with that country is conducted in a much more satisfactory manner. A good deal of excellent German white wine now makes its way to us, and is highly appreciated.

Hungary, whose product is second to that of France only, can supply a wide range of varieties, and at prices extremely reasonable. As the Hungarian producers seem to know, as yet, but little of chemistry, we suppose their wines to be generally pure, and as they are not yet fully introduced into the markets of the world, we should think they might be advantageously purchased to a greater extent than has yet been done.

Besides the sherry, of which we consume so largely, Spain has an abundant and rich vintage with which American consumers would be better acquainted if her merchants had more of the enterprise of those of Bordeaux.

Portugal also produces plenty of excellent and pure wines, of which we know little, for hardly a drop is allowed to leave the country without being so strongly brandied as to lose its character as a wine, and become rather a spiritous liquor. Port wine is repeatedly dosed with spirits until it contains as much as twenty-four per cent. of alcohol. Fifteen years age is required before it is fit to drink, not because the wine is slow to ripen, but because the spirit needs to remain fifteen years before the disturbance it causes can subside and the antagonistic ingredients of the mixture harmonize.

Notwithstanding bold and persistent assertions to the contrary, it has been satisfactorily proven to your committee that the adulteration is made not to preserve the wine, but solely to make it sweet and stimulating.

As America is destined to become a great wine-producing country, her people ought to be better acquainted than they are with the higher grades of foreign wines; but they have as yet drank so little of these, that their standard of excellence remains comparatively low. Now, except in California, none of the European vines will grow in America, and we are compelled to search in our forests, and develop in nurseries and vineyards the varieties which are in the future to be our reliance for competing with foreign producers, and finally, it is to be hoped, emancipating ourselves from them altogether. Of course, then, the higher our standard of taste is, that is the higher our aim, the better will be our success. Our vine growers have much more to learn of the character and quality of good wines than they have of cultivation and manufacture, for really, as to the preparation of the soil, planting, cultivating, pruning and training the vines, gathering, selecting and pressing the fruit, fermenting and keeping the wine (white wine, at least), our experienced vignerons have but little to learn of European rivals.

Our American vineyards compare very well with those of France, and so do our cellars, presses and casks, so that an elaborate report on methods would be of but little benefit, and might even mislead, for there seems to be no one method in use here, in any stage of vine-raising or wine-making, concerning which there is not a confusion of practice and a conflict of theory, such as it would be hopeless to attempt to reconcile. Probably sound reasons for much of this diversity may be found in peculiarities of soil and varieties of vines that are local and special, and with which we have nothing to do. Still, a pretty thorough tour among the wine districts of France has not been wholly barren of suggestions.

SOIL AND EXPOSURE.

The soil of Medoc, where stand "Chateau Margeaux," "Chateau La Fitte" and "Chateau La Tour," is a bed of coarse gravel, among whose pebbles the eye can barely detect soil enough to support the lowest form of vegetable life. In the vicinity of Bezires, on the other hand, the land is rich and strong enough to yield any kind of a crop; yet Medoc grows wine that often sells for ten dollars a gallon, while that of Bezires sometimes sells for the half of ten cents per gallon. In Burgundy there is a long hill, on whose dark red ferruginous limestone sides a wretched thin covering of earth lies, like the coat of a beggar, revealing, not hiding, the nakedness beneath. Here stand little starvling vines, very slender and very low; yet here is the celebrated "Clos Vaugeot," and this is the hill, and these are the vines that yield a wine rivaling in excellence and value that of Medoc, and to the fortunate proprietor the *Cote d'or* is what it signifies, "a hillside of gold." At its base spreads out a wide and very fertile plain, covered with luxuriant vines, whose juice sells from ten to twenty cents per gallon.

As you go further northward and examine the hills of Champagne, you will find them to be merely hills of chalk; and these instances only illustrate the rule derived not from them alone, but abundance of others, that, for good wine, you must go to a dry and meagre soil. Yet we should be sorry to have to extend the rule, and say that the poorer the soil the better the wine, for there are certainly very few patches of ground in America that can match in poverty the mountains of Champagne, the hills of Burgundy, or the slopes of Medoc; nor would it do to conclude that manure should not be applied, for although some say that it is hurtful to the wine in its quality, it is yet an open question whether this is so or not. Meanwhile the practice is to manure, although sparingly.

PREPARING THE GROUND, PLANTING THE VINES.

This is probably as well understood in America as in France. We usually break up to the depth of two feet and drain thoroughly. In many parts of France they trench to the same depth, but in many parts this is impracticable, unnecessary or injurious. Here, the distance between the vines is from eighteen inches to two feet, according to their size. We, however, are compelled, by the greater vigor of our vines, to place them five and six feet apart.

In Burgundy, Champagne and some other districts it is the practice to renew the vigor of the vines by laying down the cane and rooting the plant in a new place, which quite breaks up the original lines so the plough cannot be used. This is doubtless a good way to renew the strength of the plant, but it is objected to by high authority, on the assumption that the older the stalk is the better the wine would be; on the other hand, Champagne wine dressers have attributed to this practice, in a great measure, their almost total exemption from the vine disease.

But then, again, others attribute that exemption to the general and long established custom of spreading over the vineyards a bituminous shale containing sulphur, a well known antidote; and here we would recommend most strongly to our countrymen a renewed and sustained effort to combat mildew with sulphur. The experience of France and other countries is entirely in its favor, and its use is still felt to be necessary and is still kept up.

We think Americans have not been thorough enough and patient enough. Let them try again, and this time let them begin early and be sure to follow carefully these rules on the subject, which have been hitherto much better promulgated than observed. On rich and level land a common plan in some districts is to set out double rows of vines at wide intervals, in fields chiefly devoted to other crops. The free exposure to sun and air thus secured seems largely to augment the yield, and this will be understood by any one who has noticed the superior productiveness of such of his vines as grow bordering on a wide alley or other open space. This is very different from planting vegetables, etc., among the vines, which is a bad practice.

WIRE TRELLIS.

These are becoming quite popular here, as we think they are in America also, notwithstanding the cheapness of wood. The size of wire preferred is number sixteen, and but two wires are used. Our large vines would need three wires. They are stretched to strong posts set twenty feet apart, passing intermediately through holes of smaller posts or stakes. On the lower line, about eighteen inches from the ground, the fruit-bearing wood is trained, while the upper line, about eighteen inches above the other, supports the new wood. Many prefer to allow the fruit-bearing cane to do service two years instead of one only, as is the practice in America. There is no doubt that with wire trellises the pruning, tying, pinching off, etc., can be much more cheaply done than where the training is to stakes, and from the way the clusters depend from the horizontal cane it is easy to see that there must be also a superior access of sun and air, and a greater ease in gathering the vintage.

It is a common practice to go through the vines with a plow every fall and throw up a good ridge of earth against the stalks. The Hungarians have a more effectual way of guaranteeing against the cold of their rigorous winters, which is to lay the vines on the ground, cover them with straw, and on the straw throw the earth; without this it is said they could produce no wine at all. Our native grapes are generally hardy, and will live wherever their fruit will ripen, but occasionally there is a severe season which seems to touch the very heart of the wood and so enfeeble it that it falls an easy prey to disease. It was noticed that the mildew set in with great destructiveness after the two hard winters of eighteen hundred and fifty-four and eighteen hundred and fifty-six.

The thorough covering employed in Hungary would secure it against such occasional risks, and also might render it possible to grow European vines in our country. By its means, too, we could, perhaps, make the "Scupper" live in our northern states, and obtain from it a sparkling wine of foam and flavor unsurpassed. From these considerations and others we recommend to the wine growers of our more northern states to lay down and thoroughly cover their vines regularly every fall; and to those in milder regions to bank up the earth against the stalks as is done in France.

We have derived most of our instruction in vine dressing from the Germans, in whose native country there are no sunbeams to spare, and the celebrated Risling grape is said to hardly ever ripen; and thus, perhaps, we have been led to attach too much importance to letting the fruit remain on the vine as long as possible before gathering. If we have been in error, it would be well worth while to know it, for besides the loss by shrinkage, the ravage of insects and birds, quadrupeds and bipeds, during the last fortnight of the vine dressers' watchings is most disheartening. Now it is contended by good authority in France that early vintages are best, and that it is important, not merely in regard to quantity but quality, also, to gather the fruit before it becomes over ripe. Possibly what is true of white wine may not be so of red wine, to which last named kind attention is so widely directed in Europe. Here the proportion of white wine to red is very small, and it may be said that the red is the rule and white the exception.

Our wine growers in America understand very well the principles to be observed in the manufacture of white wine, and many of them, as regards care and nicety, are as good models as need be desired. But it cannot be denied that the practice of selling the ripest and finest grapes for table use and converting the unsaleable into wine prevails to a great extent among American vineyardists, and the result is the manufacture of much inferior wine. This has already injured the reputation of American wines, both at home and abroad. Of the much more complicated process of making red wine, however, American manufacturers are but little informed, for the reason that until recently they have had no grapes suitable for the purpose; but now that we have discovered those excellent varieties, the Morton and Ives seedlings, our estimate of the value of which has been greatly raised by comparing wine from them with some of the highest grades of foreign productions, a few observations of methods of fermentation for red wine as practiced in France may be appropriate.

In France they will make either white or red wine from the same grape; but in America they have grapes whose pulps are so rich in coloring matter that they yield a very pretty tinted wine without any further treatment than what is given to make white wine, and a pure white wine cannot be made from them; of this kind is the Morton seedling. Yet not for beauty alone do they put them through the process of fermentation on the skin, but because that process imparts qualities which, as affecting the palate, stimulation, digestion, etc., are quite different from what the other process imparts. Many persons find red wine essential to their health who cannot use white wine, and *vice versa*.

STEMMING.

The fruit having been gathered and selected, the next thing to do is to stem it. In Medoc and all the Bordelias this is invariably done. But in Burgundy and other districts they commonly omit it, and throw stem and all into the vat. If, however, the season has been bad, and the stems remain unripe, they are of necessity excluded in whole or in part, lest they may do more harm than good. The chief reason for putting in the stems is to correct the disease called "tetter," for which the tannic acid, etc., of the stem is thought to be an antidote. Fortunately we know comparatively little, as yet, of any wine disease except acidity; but still it will remain for us to decide, upon experience, which of the two methods it is best to adopt. Probably we shall arrive at the same diversity of practice as is witnessed here. Stemming is usually done by rubbing the fruit upon a grating of iron rods; but the better way decidedly is a grating of wood. It is made of bars, two-thirds of an inch square, carved into each other where they cross so as to bring them down to an even face, leaving openings or meshes two-thirds of an inch square. This is established like a table with four legs, with a rim around it about ten inches high, and a proper receptacle beneath to receive and carry off the stemmed fruit as it falls through and the juice which escapes. The table is four feet square and four feet high. About three bushels of grapes are put on to the grating, which four men, with bare arms, soon rub through, leaving the stems behind, which are then thrown into a small circular press like our hand cider presses, which extracts the juice of the few grains remaining on them. In this way four men can stem enough to make fifty barrels of wine per day. For one who makes but a small quantity, a deep tub and a three-pronged stick will do very well.

CRUSHING.

This is next to be done, by trampling the grape with the naked foot. It is said to be a better way than to use a large mill, for the reason that the mill will crush the seed; but the seeds are not easily crushed, and a properly made grape mill need not bruise them in the least. At a well managed wine-house—that of Messrs. Averons Brothers, in Pauilliac—they put the grapes to ferment with no further crushing than what is given them in the process of stemming, which experience has satisfied those gentlemen is all that is needed.

Treading out grapes with bare feet is well enough if the feet first be made clean; but probably no American will ever adopt the plan of crushing with naked feet, either clean or unclean, but will either rely on the crushing given in the stemming process, or use a mill, or a bucket and tripod.

FERMENTATION.

The crushed mass, with or without the stems, is next thrown into vats and allowed to ferment. The vats are large casks, generally without bulge, the largest at the bottom and open at the top. In some of the large houses they are covered with loose boards; in others the boards are jointed and made hermetically close by plastering with cement or clay; in others there is merely a floating mass of stems; and in others there is no covering at all except the scum of stems, skins, seeds, etc., which rise to the surface.

After the fermentation has ceased and the wine becomes clear, it is drawn off and put away in close casks, which in France are almost uniformly of the size called "barrique," holding about fifty gallons. In Burgundy these are kept above ground and in the light until spring, and then put into cellars, while in the Bordeaux country they remain in the light in storehouses above ground until one or two years old, and then removed to dark rooms on the same level. A careful way of making red wine out of grapes not fully ripened is to allow it to remain in the vats for a sufficiently long time after fermentation to let the greenness held in suspense settle to the bottom.

At La Tour, in the vintage of eighteen hundred and sixty-six, they allowed the wine to remain in the vat a whole month, though the fermentation was probably complete in half of the time. After drawing off the remaining undissolved pomace it is pressed and made into a wine of inferior quality. It is common in France, and it would be sometimes necessary in some parts of America, to provide means of warming the wine house up to at least twenty degrees of centigrade, or about forty-nine degrees Fahrenheit, as well as to introduce steam heat into the vats themselves, which is done by means of a tin pipe, entering to the right of the faucet and a little above the bottom of the vat, bending to the bottom and rising again in the form of a letter U, and then passing out at the other side of the faucet, at the same distance from it, the steam entering at one end and the condensed vapor escaping at the other; but heat is only applied in cold seasons and when the grapes are badly ripened.

In France, the fruits of different varieties are commonly mixed together, and generally but little account is taken of *cesaye* (variety) as compared with the quality of soil. Well informed persons, however, are disposed to complain of the introduction, which has been quite general of recent years, of coarse varieties grown for quantity rather than quality.

There is one variety of vine commonly seen on rich soil and deemed unfit for poor ground, except where grown for brandy, as in Cognac, that may possibly be of value to us. It is called "la folle blanche enrage" (enraged crazy white). Except in its infancy it needs no stakes, but holds itself erect by the strength of its stalk, which is trained about one foot high, and from which the cane or branches shoot out with great vigor, like those of the osier willow pruned low. Every winter all the branches are cut back to two or three eyes, and during the season the ground is cultivated in the usual manner, but further than this it demands no attention. There is no summer pruning, nor any tying winter or summer. It is never hurt by frosts, is proof against all disease and is unfailing in its fruiting, and yields, when in good condition, 1,200 to 1,500 gallons of wine per acre. Its most favorable soil is a sandy loam, and when grown on such its wine, which is quite strong, is worth forty cents per gallon. Of that produced about Bordeaux a good deal is mixed with coarse red wine and made into claret for American consumption. Of itself, it will not make red wine. It is possible that this hardy vine or grape will stand our severe winters, and, with or without winter covering, obtain a footing in American soil. If so, every farmer, or whoever else can command a quarter of an acre of land, might raise for his own table an abundance of good sound wine at a trifling cost. Generally it is bad policy to introduce a coarse plant of any sort, but we have so vast a spread of land that is too rich for growing delicate wines, no matter what variety of plant is tried, and of late the mildew and rot have been so discouragingly fatal in many parts of our country, it might be well to give the "enrage" a trial; and, since we must drink the juice baptized with the names of St. Julien, Chateau Margeaux and all the saints of Medoc, we may as well enjoy the satisfaction and the very large profit of raising it ourselves.

Not only do the French mix different kinds of grapes in the vat and on the press, but they freely compound together different kinds of wine in every stage of maturity. This is done, of course, with great carefulness, the success of the merchant in his busines depending on his skill in concocting what will please the palate. Such combination may be agreeable to the taste of the consumer, and profitable to the merchant, but it may well be doubted if it is as good for the health as that which is simply natural and made from one variety of grape.

A French wine grower has introduced the Catawba into his vineyard, and uses its juice to mix in very small proportions with that of native grapes to give flavor. Any considerable addition of the Catawba's musky quality would be more than the French palate, trained to like only that which is negative, could very well bear.

When American wines were tested by the jury at the exposition, the French jurors, whose scale was from one to four, with a zero at the foot, generally complimented our Catawba with a zero, and they remarked that the more of the natural flavor the wine possessed, other things being equal, the lower they should estimate it. In America the very contrary is known to be the case. The German jurors, accustomed to wines of high boquet, held quite different opinions from the French, and were much pleased with the American samples.

In regard to the more delicate wines of Europe which do not bear exportation, an important discovery is said to have been made by the distinguished chemist Pasteur, of the institute, which is exciting great interest, and promises nothing less than to secure wine against diseases and deterioration for an indefinite period, to enable it to be transported with safety any distance, and kept in any sort of a storehouse. The best way to make known in America the discoveries of Mr. Pasteur would be to translate and publish his very valuable work, entitled "Etudes Sur le Vin," sold by Victor Masson & Sons, Place de l'Ecole de Medicine, Paris. Meanwhile we will give a brief synopsis of it.

After explaining at length the nature of the different diseases of the wine, acidity, bitterness, etc., tracing them all to vegetable parasites, and detailing his experiments in search of an agent to destroy the parasites, Mr. Pasteur arrives at the conclusion that they are effectually destroyed by heating the wine up to a point between fifty and sixty-five degrees of centigrade, which would be between one hundred and twenty-two degrees and one hundred and forty-nine degrees of Fahrenheit. The heating can be done in a bain marie, that is, by placing the bottle or cask in a vessel filled with water and heating the water, or by hot-air closets or steam pipes introduced into the casks. The heating should be gradually and carefully accomplished in order to enable any one to test the value of this invention, so important in its aims.

We extract the following, which gives all the author has to say on the mode he has himself followed with the wine already in bottle, whether new or old, diseased or sound:

"The bottle being corked, either with the needle or otherwise, by machine or not, and the corks tied on like those of champagne bottles, they are placed in a vessel of water; to handle them easily, they are put into an iron bottle-basket. The water should rise as high as the ring about the mouth of the bottle. I have never yet completely submerged them, but do not think there would be any inconvenience in doing so, provided there should be no partial cooling during the heating up, which might cause the admission of a little water into the bottle. One of the bottles is filled with water, into the lower part of which the bowl of a thermometer is plunged. When this marks the degree of heat desired—one hundred and forty-nine degrees of Fahrenheit for instance—the basket is withdrawn. It will not do to put in another immediately; the warm water might break the bottles. A portion of the heated water is taken out and replaced with cold, to reduce the temperature to a safe point, or, better still, the bottles of the second basket may be prepared by warming, so as to be put in as soon as the first comes out. The expansion of the wine during the heating process tends to force out the cork, but the twine or wire holds it in, and the wine finds a vent between the neck and the cork. During the cooling of the bottles, the volume of the wine having diminished, the corks are hammered in further, the tying is taken off, and the wine is put in the cellar, or the ground floor, or the second story, in the shade or in the sun. There is no fear that any of these different modes of keeping it will render it diseased; they will have no influence except on its mode of maturing, on its colors, etc. It will always be useful to keep a few bottles of the same kind without heating it, so as to compare them at long intervals with that which has been heated. The bottle may be kept in an upright position; no mould will form, but perhaps the wine will lose a little of its fineness under such condition if the cork gets dry and air is allowed to freely enter."

Mr. Pasteur affirms that he has exposed casks of wine thus heated in the open air or terrace, with a northern exposure, from April to December, without any injury resulting.

Wine in casks may be heated by introducing a tin pipe through the bunghole, which shall descend in coils nearly to the bottom and return in a straight line and through the pipe imparting steam. If, after thus being once heated, there is such an exposure to air, as by drawing off and bottling, as to admit a fresh introduction of "parasites," the disease thus introduced may be easily cured by heating a second time.

Mr. Pasteur claims also to have discovered and proved that wine can be advanced in ripening and improved by "æration" conducted in a slow and gentle manner. This is a bold assertion, but such confidence is felt in the value of suggestions coming from him, that both of his methods, cutting, as they will, a tangle of old theories, will have a fair trial by his countrymen, and that without delay.

Your committee would say, in conclusion, that from what comparison we have been able to make between the better samples of American wines, now on exhibition at the Paris exposition, with foreign wines of similar character, as well as from the experience of many European wine-tasters, we have formed a higher estimate of our own ability to produce good wines than we had heretofore; and from our investigations in wine culture we are now more confident than ever that America can and will be a great wine growing country. All that is necessary for us to rival the choicest products of other parts of the world will ere long come with practice and experience.

We have already several excellent varieties of the grape grown on American soil, and suited to it a soil extensive and varied enough for every range of quantity and quality. Who would discover a patch of ground capable of yielding a "Johannesberger," a "Tokay" or a "Margeaux," need only make diligent and careful search, and, somewhere between the lakes and the gulf and the two oceans that circumscribe our vineyard territory, will be sure to find it.

Accompanying this report is a paper from William Griffith, of Pennsylvania, on the propagation of the vine, referred to us. This is deemed of such importance us to justify its publication entire without comments on the subject by your committee.

Finally, your committee cannot close this report without acknowledging the many courtesies extended to them by European exhibitors and commissioners in facilitating the investigations incident upon the discharge of their duties.

SUPPLEMENTAL REPORT.

The committee, since making their report on the third branch of the subject given them in charge, have visited the principal vine districts of Switzerland and Germany, and deem some of the observations there made worth being embodied in the supplemental report now submitted.

The vineyards to which attention was more especially given were those of the borders of lake Geneva, those of Pfalz or Rhenish Bavaria, and of the banks of the Rhine, the Neckar, and the Main.

With regard to the quality of the soil, we have the same remark to make here as was made in the former report—namely, that the vines yielding the best wine were to be found growing on the poorest soil. Geologically, the soil throughout all the above districts is very much the same—namely, basalt and sandstone, both formations usually seen in close proximity, the basalt uppermost and resting on the other. The only exceptions were a few patches of limestone and slate.

The basalt soil is esteemed richer than the sandstone, and is often hauled on to the other to enrich it. For instance, the vine dressers of Durkheim actually manure their thin, poor, gravelly land with tens of thousands of yards of earth, brought from the neighboring town of Deidesheim, and yet the Durkheim wine is quite superior to that of their neighbors. All this was quite different from anything we noticed in France; there, calcareous rocks seem to underlie everywhere, nor could we learn of any wine of high repute in France that derived its quality from sandstone or basalt. The vine husbandry of the Swiss and Germans is of the first order. Nowhere do you see in their vineyards the straggling appearance so common in those of France (the effect of frequent layering), but the lines were always beautifully true and even. Although the intervals or rows were wide enough for the plow to pass, nearly all the cultivation was done by hand, and done most thoroughly, too. In France, as in America, they stir the ground two or three times during the season. In the Rhinegan it is done four times; but about Forst Deidesheim and Durkheim they do it as often as every two or three weeks, from the beginning to the end of the season. It is in the above neighborhood that basaltic earth is applied as a manure, as is also clay, to make the ground more retentive of manure; and this they do to such an extent that old vine fields are seen which have been raised visibly above the level of the others adjoining them.*

The expenditure of labor in a year on an acre of those fields amounts to about one hundred and forty days work. In the Pfalz, it is usual to train upon horizontal laths or lines of wire running fifteen inches above the ground, very much as is done in Medoc, only that where wire is used a second line is stretched above the other. If the plan is good in Medoc and Pfalz, it is hard to see why it would not be good everywhere, especially in countries as cold as Germany and the northern

*Some years since the vineyard of F. T. Buhl of Deidesheim, produced wine on the natural soil of a very inferior quality, selling at fifty centimes the litre, at a very great expense. The whole vineyard was covered to the depth of three feet by volcanic or basaltic earth brought from a distance of several miles. The experiment at the time was thought to be a very hazardous one, but the enhanced value of the wines after the addition proved that the owner was wiser than his neighbors.

part of the United States. Indeed, Mr. Guyot, to whose book we have already referred, argues strongly in favor of everywhere adopting the method of training the fruit-bearing vine horizontal with the ground and very close to it. We ought, however, to note here that the fields where this mode was more particularly noticed, or connected with good results, were in gravelly deposits of nearly level surface. Manure is freely used in Germany, much more so than in France, and is prepared and applied with mnch care and system. Cow manure, largely composted with straw, is the only kind thought fit to manure vines. They sprinkle the heaps almost daily to keep them moist, and allow the mass to rot at least twelve months before being used. It is applied every three years. As to quantity, it is certain that some soils, like the poor and unretentive gravel beds of the Pfalz, should receive more than those of the neighboring slopes, and that the calcareous earths of France need less than the sandstone and the basaltic earths of the Rhine valley.

Guyot, arguing strongly in favor of manure, recommends the French cultivator to put on at intervals of three years a quantity of manure that will be equivalent in weight to that of the fruit he has taken off at vintage, while Mr. Herzmansky, the steward at Johannesberg, who tills some fifty acres of vines, keeps about forty very large cows in his stables. But will not manuring hurt the quality of the wine?

In our former report we say that this is an open question as yet, and so it is in France, and Mr. Guyot treats it as such in arguing upon it. Of course, none will doubt that were a vineyard to be treated in this respect as we treat the soil of a grapery, very poor wine would be produced; and the only question is, will a moderate quantity do harm? This is precisely the question the committee put to Mr. Herzmansky, the intelligent and thorougly experienced director at Johannisberg, where the best wine in the world is made. His answer was: "No. As we apply it on this soil it does not impair the quality of the wine in any degree; on the contrary, it improves the flavor." Then he led the way to his well-ordered cow stables, and pointing to the composts heaps, remarked: "There is the beginning of Johannisberger."*

Now Johannisberger is the most delicate of wine, as it is indeed superlative in every respect. By the kind invitation of the Princess Metternich the committee were allowed to taste specimens of the best the castle cellar contained, including some that was twenty-one years old in the cask, and some from a cask that was *par excellence*, called the "bride of the cellar," and the opinion formed was that the quality of the Johannisberger is such that it cannot be described and can be communicated only to the organs of taste, nor can it be understood or even imagined, except by those who are so highly favored as to have a taste of it. But this marvellous wine is but the crowning product of the famous district of the Rhinegan, or that portion of the valley lying just north of Mayence, a strip of less than ten miles in length, whose fruit yields a juice which surpasses all others of the world, combining richness with flavor and delicacy with strength. The soil of the Rhinegau seems to be of a red sandstone mostly, if not wholly. Johannisberg hill reminds one strongly of the soil of some parts of New Jersey and Connecticut; and in the neighborhood of New Haven, in the latter state, the basalt is seen resting upon the red stone, just as it does upon the hills that skirt the Rhine. Nearly all the German and Swiss wines, and indeed nearly all the grapes grown in Germany and Switzerland, are white, for which the soil and climate of the former country seem peculiarly adapted, while at the same time unsuited for ripening colored grapes to the tint needed in a true red wine. The peculiarity of the better sort of Rhenish wines is bouquet, and of the inferior sort, acidity. Compared with them their French rivals are quite negative, and so are those of Switzerland. A French wine, white or red, must be very poor indeed

* The vineyard of P. T. Buhl, alluded to in a previous note, is fertilized by a compost made of wood ashes, stable manure and earth. This is applied in the spring in trenches dug to the depth of about ten inches and again covered with earth; the application is made in this manner to every alternate row of the vineyard. The following year the same process is gone through with in the remaining rows, by the removal of the soil as previously stated and the treatment of manure as just detailed. The vineyard now produces wine of a very superior quality, of a delicious bouquet, rich in saccharine matter and alcohol, and possessing all those excellencies that we prize in a first class wine, and is readily selling at twelve francs the litre. To which is this wine most indebted for the extraordinary change in its character, to the volcanic soil or the manure which is annually buried in the vineyard?

if it shows any acidity, and must be very fine indeed if it possesses any easily tasted bouquet. Altogether, we must award the palm of excellence to the white wines of the Rhine, as we do to the skill and industry of the vine dressers who produce them. In considering the merits of the different soils as geologically distinguished from each other, we seem drawn to the conclusion, that so far as our observation has gone, the red sandstone is the superior one; but we confess ourselves unfit to make any such sweeping generalization, and will only say that the soil in question, for aught we can see, seems as fit as any other to grow a superior wine. The difference between wine made by fermenting the bruised grapes, juice, skin, pulp and seeds altogether and called red wine, and that made by pressing immediately after gathering, and fermenting its pressed juice by itself, called white wine, is not a difference of color alone. For certain bodily temperaments and for certain conditions of health—possibly, too, for the peculiar constitution of the German people—white wine may be the best. And to that of the Rhine country Liebig attributes the virtue of being an antidote for calculus and gout. But all this being admitted, the better reasons seem to favor the production and use of the red wine in preference to the white, where it can be done. The testimony we have obtained from the best sources of knowledge on this point amount to this:

Red wine is much less heating, much more tonic, much less exciting to the nerves, much less intoxicating to the brain, and its effects are more enduring than white wine. As we of America are, by reason of our dry climate, as well as from moral causes, more excitable, both from brain and nerve, than the Europeans, and at the same time much oftener in need of tonic diet, and our summer heats are so much more intense than in the wine latitudes of Europe, all the above considerations should have peculiar weight with us. So highly, at least, do the French people appreciate them that they consume now little white wine, and it bears always a lower price in the market than red of equal quality. To the general consumption of this drink intelligent Frenchmen are apt to attribute the fine health of their peasantry, as well as their habitual gayety and habitual temperance. (The habitual use of whiskey has quite a another effect). An American gentleman, for many years a resident of France, and for a time a professor in one of the universities, affirms that the greatest longevity is among those people who take red wine three times a day and abstain from both tea and coffee. When Americans consult French physicians, three times in four, they are ordered to drink red wine as a habitual beverage; and one of the commonest daily events among the Americans residing in Paris is the cure of an obstinate dyspepsia by the same simple remedy, even in the unhealthful air of that city.

The German vineyards have hitherto escaped any very serious ravages from the "vine disease." It is met as often as it appears, and successfully combatted with sulphur. Three applications are made, the first as soon as the berries have grown to be as large as the head of a pin. Early in the day, and before the dew is dried off, the flour is sprinkled on the lower surface of the leaves, where the moisture causes it to attach. The instrument used is a tube of tin, perforated with numerous small holes at the lower end, and with a tassel of woolen yarn attached to that end. At Rheims we were shown a large vine, trained to a wall, one-half of which had been treated as above in the spring of the year before and the other half neglected. The latter had, as a consequence, lost all its fruit, and we visited the place and saw it the following season. It showed yellow and falling leaves in July, and very little fruit, while the other portion was perfectly healthy, and was loaded with a good crop of fruit. This experiment was made by a French gentleman, who had recently returned from a long sojourn in America, and visited that country for the purpose of satisfying himself if the sulphur be really a preventive or not against the vine disease, of which he had heard so many doubts expressed while in America.

PASTEBOARD FOR THE COVERING OF HOUSES.

From the Official Report of

JAMES H. BOWEN,

United States Commissioner to the Paris Exposition of 1867.

The exposition abounded with specimens of pasteboard prepared for roofing and for lining rooms. It is usually prepared with bitumen so as to be more or less waterproof. The examples were most numerous in the Prussian and Austrian sections. In the Prussian, B. Dahse exhibited bituminous "carton-pierre" and bituminous pasteboard; Engell & Co., bituminous pasteboard for roofing; E. A. Lindenberg, Dantzic, asphaltic paper for roofing; J. C. Leye, pipes of bituminous paper and roofing pasteboard. In the Austrain section, C. Haller exhibited incombustible and impermeable roofing paper, and F. Sterba, bituminous and roofing paper.

This description of material is now coming into extensive use in the United States, particularly at the west, where it is so often required to erect dwellings with expedition and economy. The Rock River Paper Company of Chicago manufacture an article which they call "sheathing and roofing board." It is a coarse, yellow pasteboard, made in rolls of various lengths, and thirty-two and forty-eight inches wide. It is made very compact and firm—the fibers being closely pressed together at first, and then subjected to an enormous pressure and calendered down until the whole is made stiff and hard almost like a piece of board. It has a straight, smooth edge, and weighs about one and a quarter pounds to the square yard.

It is used advantageously in various ways; either on the studs outside as a substitute for sheathing, or over the sheathing before siding; or on the inside of the studs before lathing, so as to form an extra dead air space. It is laid under floors and on roofs below the slates or shingles for the purpose of keeping out air and cold, and it may also be used as a substitute for inside plastering. It is found to make a very smooth, nice finish for a wall or ceiling, and to save four-fifths of the expense of ordinary plastering. It can be tacked on over the laths and then whitewashed or papered in the usual manner. In this way a wall warmer than plastering may be secured, and it will be equally as good, if used with care, for all purposes. It will not crack or fall off, and it commends itself to those who build in earthquake countries. It can be put on by almost any one, it being merely tacked on with ordinary tacks.

The cost of this sheathing-board is slight. It is sold by the pound at five cents for the bituminized, and six cents for the plain. Thus one square yard of the bituminized costs eight cents, and the plain seven cents and a half. A house twenty-two by thirty-six feet and twenty feet high can be covered with this saturated board for less than twenty dollars.

Some of the principal advantages of this sheathing-board are: First, its cheapness compared with boards or plastering. Second, the rapidity with which it can be put on, and thus render in a few hours a bare frame habitable. A house lined with this board can be safely occupied immediately, while a plastered house requires months to become dry. Third, it is warmer than boarding or plastering, for it does not conduct heat so rapidly, and a room so lined can be warmed in a few minutes by a moderate fire, while in a plastered room it takes a long time to heat up the walls.

[To the readers of this volume, it will be interesting to know that the Rock River Paper Company, to which reference is made in this report of Col. Bowen, does its manufacturing at Beloit, Wisconsin, under ths business direction of our fellow citizen, S. T. Merrill, president and chief proprietor, to whom we are indebted for the following statements concerning the business done by the company in 1869:

Cash paid for straw (at $8 per ton)	$13,856 51
Cash paid for labor of 75 to 100 hands	37,736 63
Incidental expenses at mill	8,000 00
Total paid out at Beloit, upwards of $5,000 per month, or	$61,159 14

Among other items of expenditure for material I mention the following:

Cash for soda ash	$12,840 38
bleaching powder	11,081 24
fuel	22,610 24
lime	3,323 95
acid	1,062 28
oil	1,136 40

Product of the year in building and printing paper, principally the former, about 1,500 tons.

The company is now sending this pasteboard for house covering, not only to nearly all parts of the United States, but likewise to foreign countries—of late quite extensively to the Sandwich Islands. As the process is patented, they have a monoply of the business in this country, and it seems probable that the business is to become one of great magnitude.]

CHEAP FIRE-PROOF WALLS AND FLOORS.

From the Official Report of

JAMES H. BOWEN,

United States Commissioner to the Paris Exposition of 1867.

One important subject to the interest of the citizens of the United States is, that some plan shall be adopted in the mode and manner of constructing buildings to prevent, in a measure, the burning of such an immense value of property as is annually consumed in America. No country suffers so severely, and we cannot afford it.

The reporter would respectfully suggest that all buildings shall be constructed with a view to prevent such vast destruction of property. The use of iron beams, with brick arches turned, undoubtedly are the most safe; but, as they are somewhat expensive, the following mode of building is commended to the special attention of all Americans. It is one of trifling expense compared to its advantages. It is a system that has been thoroughly tested. Lay a floor of seasoned hemlock boards upon the timbers, or floor-joists, and then lay a coat of cement, a large proportion of which may be sand, entirely over this floor, from wall to wall, of one inch thick; then let the cement become thoroughly dried, over which lay a floor of matched boards, nailed with forty-penny nails. If there are wood partitions, there should be laid two courses of bricks between the studs, and plastered to the base-board, to prevent all circulation of air. A floor laid as above will resist an immense volume of flame in the room for one hour before breaking through the cemented floor above; and the expense of cement is only ten to twelve cents per square yard—a trifling matter compared to its value.

This has been tested by actual experiment, and found to require one hour before the fire ignites with the next story; and also has been tested when the combustible material of a large druggist's shop was wholly on fire, creating an immense volume of flame, (the floor timbers above burning nearly through,) and the carpets above were not even smoked or caused to be taken up. Therefore, any system adopted whereby the fire is confined to one room for an hour, gives abundant time for an engine to be present, or to apply all other means at our command; which certainly is of great advantage towards extinguishing a fire.

The above plan of construction has many advantages. It deafens the floor, prevents all insects and odors from passing from story to story, and water in small quantities from above to the ceiling below; it makes the house warmer, and, above all, is considered the cheapest and one of the best modes of construction to diminish the annual loss by fire in the United States.

Many builders deafen floors between the timbers, which plan is not as beneficial or as safe, because all timbers season, and thus leave a space between the cement and beam for circulation of air; and when the timber burns off, the fire ignites at once with the story above. Attention has been called more particularly to this subject from the fact that insurance on property in France is of minor consideration. For instance, in an insurance upon one hundred and fifty thousand francs for six months, upon a house and furniture, the charge was only fifty francs. The very modest price of insurance in France is because they have comparatively no buildings burned. Their buildings are vastly more safely constructed than those in the United States, and they have more floors of brick, tile, and cement. Even their stairs are often covered with tile and bricks, and in the better class of buildings their stairs are of stone or marble; their walls are mostly of stone and much thicker, and they have less wood-finish in the interior.

IMPROVFD MACHINERY.

From the Government Repcrt of
F. A. P. BARNARD, LL. D.,
United States Commissioner to the Paris Expositiou of 1867.

ARMSTRONG'S DOVETAILING MACHINE.

The exposition contained four or five machines, all more or less ingenious, for performing the rather difficult work of making dovetail joints. Of these, the most expeditious in its operation, and as satisfactory as any in performance, was the American machine bearing the name of the patentee, Armstrong of New York. Without complete drawings it would be impossible to convey an idea of the action of the machine in all respects; but the essential and most important part is shown in the figure annexed. It will be seen that there are two disks mounted on axes inclined to each other, as well as to the main driving-shaft, and revolving at the same speed, the one being inclined to the right and the other to the left, the motion being transmitted from the first to the second disk by means of bevel wheels cast on their inner surfaces. Each disk has on its outer circumference a spiral groove making one complete turn, into which is fitted a saw composed of segments, so arranged as in one complete revolution to give both the longitudinal and transeverse cut necessary to finish a dovetail, one-half being made by one disk and the other half by the other. The leading portion of the saw is composed of segments similar to those that could be cut from an ordinary fine-pitched circular saw, while to produce the transeverse cut, after the longitudinal one is finished, the segments assume the form shown in the engraving, from an inspection of which the arrangement will be better understood than it could be from description. The saw which makes the cross-cut will be seen, in fact, to be placed like a belt or hoop on the circumference of the plane circular saw plate which forms the direct cut, and to widen gradually out to the breadth required for the cut. This hoop saw is not set at right angles to the plane saw, but at the bevel which corresponds to the angle of the joint. The segments which form the saws are held in their places by means of cast-iron cheek-plates held on by set screws with square heads, and in about one minute the attendant on the machine could change all the segments and replace them by others having a finer or coarser pitch of teeth if desired. To prevent the saws from splintering the wood on its under side, a longitudinal shallow cut is made by a knife-edge at the bottom of the dovetail before the helical saws operate on the wood; this is a most important point, and without it good work cannot be produced. The engraving above illustrates only the mode of forming one part of the dovetail. At the back of the machine provision is made for cutting the other part with equal expedition. An arrangement is also provided for raising the table so that the dovetailing can be done on a bevel if desired. The attendant was all day long besieged by crowds anxious to see this machine at work, and certainly he showed great patience in altering his machine to convince the sceptical of its wonderful scope and accuracy.

PERIN'S BAND SAW.

The substitution of the circular for the reciprocating saw was a very important step of improvement. It introduced a considerable economy of the force employed, and a still larger economy of time. The reciprocating saw occupies as much time in raising as in descending, and is therefore effective only during one-half the period of the operation. But the continuous action of the circular saw is attended with the additional advantages that it can be run at a higher rate of speed than is possible for the older form, and that it admits of a heavier feed on account of the steadiness and regularity of the continuous cut.

These advantages have been secured for the saw with a straight edge, by Mr. Perin of Paris, by giving to the tool the form of a band running over pulleys, of diameter sufficiently large to allow the material to be operated upon to meet the saw on the descending side, without being interfered with by the part which is rising. The saw must of course be made of very flexible steel, and it is therefore comparatively thin. On its first introduction some disadvantage was experienced from this circumstance, on account of its unsteadiness. This, however, has been overcome by the simple expedient of placing a fixed guide, which is nothing but a piece of wood having a slit in it equal to the thickness of the saw, immediately above the material which is to be cut. A similar guide is also usually placed below.

These band saws are constructed of various sizes, some of them sufficiently large to cut heavy timber. But the most interesting forms are those of which the breadth is hardly greater than that of a watch spring. These are used to cut out scroll work, a function which they perform, whatever may be the degree of delicacy or intricacy of pattern, with surprising rapidity. Such saws were exhibited in both the British and the French sections of the exposition, and were constantly occupied in cutting out fanciful patterns for the gratification of visitors. Scrolls and spirals were cut out of blocks of hard mahogany four or five inches in depth, with very sharp curves, and of a thickness not exceeding that of very thin card-board. The initials of the names of the visitors were cut with great rapidity, in a very graceful script, and objects of this kind seemed to be especially popular. The object and the matrix are equally perfect; and owing to the very slight thickness of the tool, the one fits neatly into the other and presents the pattern in relief. The band saw in this form is thus a very important addition to the resources of the ornamental worker in wood; surpassing immensely in precision, as well as in rapidity of execution, any similar tool used in the hand. It is destined, doubtless, to come into very extensive use.

When first introduced, this tool was not an immediate success. On account of the inequality of temper, or want of uniformity of quality of the steel, fractures were frequent. The welding of the two extremities which was necessary in forming the band, however carefully performed, presented always a point of insecurity. Experience has, however, suggested means of overcoming these difficulties, and at present fractures are of rare occurrence. It is considered, nevertheless, to be a judicious precaution against injury from such possible accidents, to surround the saw with a wooden box or shield, at least as high as the head of the workman. The pulleys are covered on their circumferences with leather, and the necessary tension is produced by adjusting screws, by which the distance of the two pulleys from each other can be varied. Some constructors, however, employ springs, or even weights, to maintain the tension.

In the British department the machine exhibited was provided with a table or bed susceptible of being inclined, so as to vary the angle at which the material is presented to the saw. The same object could be secured, of course, but less conventiently, by inclining the material upon a horizontal bed, and blocking it up in such a position. Some of the French constructors have even contrived to make the position of the saw itself variable, giving it at pleasure a vertical or inclined position while the material remains undisturbed upon a horizontal bed. Either of these two expedients contributes very much to increase the usefulness of the machine. The velocity with which the saw runs is very great, being as high as fifty feet per second; yet its motion is so steady and silent that, to the spectator, especially in the case of the narrow scroll saws, it hardly seems to be moving at all. It needs only to be added that the *feed* is not intermittent, as in the case of ordinary saws, but is uniform and smooth, like the motion of the saw itself.

BARREL-MAKING MACHINERY.

Another of the very original contributions of the United States to the machinery department of the exposition consisted of the machines, three in number, exhibited by Messrs. Cool, Ferguson & Co. of Glenn's Falls, New York, for making casks and barrels. The three operations performed by these machines are—first, the cutting of the staves to the required length, finishing the ends, and providing them with the necessary groove for the introduction of the head; secondly, the finishing of the sides of the staves, for which purpose a number are firmly held together, and subjected to the operation all at the same time; and finally, the formation of the heads to the proper size and figure, and with edges suitably prepared to enter the grooves in the ends of the staves. The advantages afforded by these machines over the hand manufacture of casks, are not simply economy of expenditure and saving of time. The article produced is much better than the hand-made article. It is easy, indeed, to perceive that the perfect uniformity of parts secured by the machine, and the perfect similarity of joints, must greatly improve the accuracy of fitting, and render the cask more solid, less liable to leak, and more durable than can be the case where, as often happens, the imperfection of workmanship is only masked or concealed by an excessive strain upon the hoops. The machines exhibited found, it is said, a prompt sale in France, having been purchased for the use of an establishment manufacturing Portland cement.

BRICK-MAKING MACHINES.

The number of machines for the manufacture of brick is constantly increasing, and the great superiority of the product which they turn out, combined with the rapidity of production, is likely to secure for machine-made brick the command of the market to the entire exclusion of any other, except in situations remote from the great centres of commerce or the great channels of transportation. These machines may be distinguished in two classes: the first including those in which the bricks are moulded from plastic clay, and the second those in which the material is employed "dry;" by which term, however, it is meant only that the material is used with such small amount of water as it naturally contains when taken from the earth. In fact, when the clay is literally dry, some moderate degree of moisture must be artificially imparted to it; and this is accomplished, in Wilson's British process, by passing the material through a steam-chamber. On the other hand, when the season is wet, or when the natural source from which the clay is derived is always wet, it is necessary to diminish the amount of moisture; an effect which is most easily secured by keeping a supply of dry clay under cover to mix with that which comes from the bed too highly charged with moisture.

For the purpose of forming solid brick for building, the dry process is preferable, on account of the facility and safety with which the moulded masses may be handled and immediately as they come from the moulds, without being liable to be deformed or distorted; and also because of the saving of the time which must be allowed, in the case of the wet-moulded brick, for drying. This drying process is moreover attended with a necessary exposure to the weather; and rains very often occasion serious damage when they occur during its continuence.

Gregg's Brick-Pressing Machine.—At the exposition of 1867 the machine which seemed to be the most in favor was that of Mr. Isaac Gregg of Philadelphia, in which the brick are formed by the dry process with great rapidity. This machine was doubly exhibited, being presented in model in the palace, and in actual operation in the neighborhood of the Champs de Mars, during all the period of the exposition. The material after being screened and crushed, is elevated into a hopper, from which it is admitted alternately on opposite sides into the moulds, where it is powerfully compressed and delivered directly to the attendants to be conveyed immediately to the furnace. The brick, after burning, present a perfectly uniform and compact appearance. Their surfaces are smooth, their forms entirely regular, and their tenacity remarkable.

Hartel's Plastic-Clay Brick Machine.—Quite a variety of machines were exhibited in which clay in the plastic form is the material used. Of these a very striking one was from Nienburg in Prussia, the invention of Mr. Hartel. The description of this machine, as given by the inventor, represents it to consist of: First, "a plain flatting mill or cylinder for common clays, and of a double one for hard and stony ones. These rollers not only roll the clay, but grind and crush all the hard matters therein, the whole passing off in thin slabs or films to the horizontal plug mill placed beneath. Secondly, in the inside of the horizontal plug mill rotates a screw formed of intersecting blades of a new and special construction, which cuts and mixes the materials, at the same time conveys them into a compartment in which they are subjected to great pressure, and from thence passes through openings in the mouthpiece, ready moulded and forming the products desired. When the machine is applied to manufacturing either solid or hollow bricks, a compound homogeneous mass or stream sufficient to form four bricks is at once and in a continuous manner expressed through the plate die. This mass in traveling along is carried on a slide, and is separated longitudinally into four parts by steel wires operating by the action of the machine. Thirdly, the cutting apparatus on said slides, which separate crosswise in a regular right angle the four said parts so as to produce at once four perfect bricks, which are removed from the slide after each movement of the cutter. This operation is done while the stream of clay is continually advancing."

They also claim that "this machine has solved an important problem, viz: the manufacture of bricks and other ceramic products possessing all the various qualities desired, by using either rich or poor clays, and either arable or stony;" and add that, "in fact, the calcareous bodies, limestone and silex, are so ground and reduced to powder as to neutralize their disadvantageous effect. The mixture of sand and cinders with any clay is, under the action of this machine, rendered quite homogeneous."

The rapidity of manufacture is not, however, quite so great as in the case of the machines above spoken of. Of solid brick, and of rectangular hollow brick, there are delivered from one thousand to one thousand five hundred per hour; of flat tiles, two thousand to three thousand; and of drain pipes and mouldings, variable quantities, according to size.

These hollow bricks are formed in the same manner as lead pipe, by being expelled through a die with a solid core. They have a degree of solidity unusual with moulded bricks made from wet clay. The quantity of water used is in fact only so much as is necessary to insure plasticity, so that the clay is very stiff before compression, and the bricks come from the die firm and solid so as to permit their being piled up immediately to the height of six bricks superposed edgewise.

SHOE-MAKING MACHINES.

Shoes fastened by pegs or nails have long been manufactured on a large scale in the United States; but in general, if not universally, the work has been done by hand. Since the year 1844, screws have been employed more or less extensively in France for the same purpose; and machines have been gradually introduced to replace manual labor in different parts of the process of manufacture, until at length, in many large establishments, hand-work is dispensed with altogether. The French department of the exposition presented a number of very interesting examples of shoe-making machinery; and one house, that of Dupuis & Co. of Paris, illustrated the whole process of manufacture from the beginning to the end. Machines for securing the soles by means of screws were also exhibited by Messrs. Lemercier, Brice, Cobourg, and others, different in some of the details of their construction, but all performing their work with admirable rapidity.

The machines exhibited by Dupuis & Co., formed a complete series, by the successive operation of which a pair of shoes could be produced from the raw material in from one to two hours. The leather is cut into shape by means of tools resembling punches. The thicknesses which are to form the soles are united with glue and compressed previously to being cut. They receive then the necessary concavity by powerful hydraulic pressure; and their surfaces are smoothed and hardened in still another machine. Sewing machines form all the necessary seams, binding, and, if necessary, ornamental stitching of the upper leathers; and then the separate parts are brought together in the important machine which is to complete the shoe by uniting the upper leather and the sole.

First, there is placed upon the form or last in this machine the inner sole. The upper leather is then stretched over this by means of small nippers attached to the machine, which are capable of stretching it with considerable force. It is secured in place by a row of small nails. The outer sole is then carefully applied over the whole. As this has been entirely finished and polished on the edges in the previous process of preparation, it is important that it be truly adjusted, since it cannot be afterwards trimmed. The machine then applies to the two soles, with the upper leather included between them, a force of pressure of not less than three hundred kilograms, increased, if desired, to one thousand kilograms, or one ton. Screws are then inserted all around the margin of the sole, an operation completed in the most rapid machines in less than three minutes for a single shoe, or in five minutes for a pair. The salient extremities of the screws are cut by a chisel, and the burr left by the chisel is ground away on an emery wheel. The last on which the shoe is constructed being made of iron, prevents the interior extremities from passing the surface of the inner sole.

The machine is provided with an indicator, by means of which the exact distance desired between the screws may be easily preserved. For different sizes and kinds of shoe this distance will vary, as well as the size of the screw itself. Any kind of shoe may be made in the machine, from the coarsest boots to the thinnest dancing pumps.

An important feature in these machines is, that they not only apply, but make the screw. The material is brass, which is drawn off from a bobbin in the machine as it is required. The extremity passes horizontally through a guide, and, in order to cut the thread of the screw, the whole bobbin revolves. In hand machines a crank serves to give the revolution; but the driving power may be taken from a motor. When the resistance shows that the screw has struck the iron last, a cutter is brought into action by the foot of the operator pressing upon a pedal, and the wire is cut as near as possible to the leather.

Screw-fastened shoes are becoming more and more generally used in France. They cannot fail soon to replace pegged shoes everywhere, since the fastenings are much stronger and more durable, while the rapidity of the manufacture must greatly surpass that which is attainable in the use of wooden pegs. Whether they will equally supersede sewed shoes remains to be seen.

POOLEY'S AUTOMATIC GRAIN WEIGHER.

An apparatus which attracted a great deal of attention of American visitors to the exposition, particularly of gentlemen from our agricultural districts, was a balance exhibited by Henry Pooley & Son of Liverpool, for weighing grain, and at the same time recording the weight of the grain which has been weighed. This balance, called by the inventors the automatic grain weigher, is self-acting throughout. The only force employed in the several acts of loading, weighing, discharging, and recording, is the weight of the commodity in process of being weighed. The results of any given period of work are exhibited upon the register.

To describe the mode of action by this novel machine more in detail: the grain is introduced to the machine frrom the depot in any manner by which a continuous supply may be conveniently delivered into the feeder; then, when the first scale has received the principal part of its load, that scale falls through a portion of its descent, and in falling lifts a proportional weight equal to the partial load then in the scales, and at the same moment moves the feeder partly towards the second scale, which then begins to be filled while the first scale is receiving slowly the finishing part of the load. When the loading of the first scale is complete that scale falls through the remaining part of its descent, and in falling releases the catch that till then had held it in its position, whereupon the loaded scale immediately tilts and simultaneously shifts the full stream of grain over to the second scale and moves the register figure. The operation thus described proceeds from scale to scale alternately as long as the supply of grain is continued. The flow of grain is never cut off or interrupted during the discharge of the scales.

What makes this invention specially interesting is the ingenuity with which a very severe accuracy in the weight of each charge is secured without any consequent loss of time. In ordinary weighing, if great exactness is aimed at, the last additions are made slowly; and this, in fact, is always necessary if one would avoid inevitable overcharge. Accordingly, as much time is spent in adding the last few grains, or the last few ounces, as the case may be, as it had required to introduce the great bulk of the load previously. But by employing two balances, side by side, with a bridge, or doubly inclined shoot, between them, the inventors have made it possible to keep up a steady flow from the source, and still to finish off each load by so gently growing an increase that it is impossible an error should occur of any sensible amount; while in the mean time the nearly empty scale receives the main stream and rapidly fills. This balance cannot fail to make its way among our western farmers, and among the large class of our citizens who are engaged in the transportation of grain.

The figure will be understood without requiring particular description. The parts important to note are the two scale pans, of which the one on the right is in the position to receive, and the one on the left in the position to discharge its load; the doubly inclined shoot or bridge extending across above the scales, and the supply shoot appearing above the whole. This supply shoot is sustained by a branch iron support, which is single at the base, and which forms a vertical axis around which the supply shoot has the slight lateral movements above described, which change the manner of delivery of the grain.

It is obvious that this balance is applicable to many purposes in which accurate and continuous weighing is necessary, as well as to the weighing of grain.

ENDLESS BAND SAW FOR IRON.

Since the invention of the endless band saw by Mr. I. L. Perin, of 97 Faubourg St. Antoine, Paris, and its entry in the exposition of 1855, the circular plate saw has been rapidly loosing ground in public estimation, so that at present every country in Europe is represented by finely finished samples of these wood-cutting tools. In France it has been applied to ivory, and in Great Britain to iron. The latter adaptation was first made by Colonel Clerk, at Woolwich. In the war department annex are specimens proving his great success. The first one is an Archimedean spiral (of three turns) cut from a block 9 inches square by 6 inches in thickness. The second is mounted in a glass case on a red velvet background and is composed of a crown on either side of which are the letters "W. D." below the words "Royal Carriage Department, 1867." These were sawed from a plate of iron one inch in thickness. The letters are quite artistically executed, and the sawed surfaces smooth. The experience of the department leads them to recommend a speed of 250 feet per minute for a band saw cutting 1-inch iron plates. The teeth of their saws are set and filed straight, having ten to the inch, the width is 5-16 of an inch. They use the hardest saw steel that can be obtained, and with soap and water as a lubricant run the saw four or five hours without sharpening; the latter operation requires half an hour for its completion. Any curved line can be cut in plates of the above thickness with a feed of 1 1-2 inch per minute. By this system very little waste of material is incurred and the sawed surfaces are so smooth that they require but slight after-finishing. It may not be inappropriate to note that previous to Colonel Clerk's experiments with the band saw, Mr. Krupp used the circular saw for cutting out his steel crank axels, lubricated with soap and water, and found the expedient so much more economical than reduction by a slotting machine that he has continued the practice.

PRODUCTION OF IRON.

From the Government Report of
ABRAM S. HEWITT, Esq.,
United States Commissioner to the Paris Exposition of 1867.

Originally the geographical position of the ore, and the natural avenues of transportation, determined the establishment of iron works, when the fuel employed was wood, which was found everywhere. But the demands of modern civilization soon outran the narrow bounds imposed by the supply of charcoal, and in our day the controlling element in the production of iron is the possession of mineral coal. And throwing out of consideration the moderate quantity of iron still produced by charcoal, the iron business in Europe is found to be developed substantially in proportion to the quantity of coal possessed by the respective countries. A glance at the geological map of the world shows that within the limits of temperature favorable to active industry, the deposits of coal are widely distributed through Great Britain and the United States. In France there is but a limited area, and of irregular formation. In Belgium, there is a larger coal field but in veins of very moderate size. In Prussia, in the neighborhood of the Rhine, there is a small but very valuable deposit of coal, while in Russia, there is a considerable carboniferous area, the ultimate value of which is not yet very well determined. The productive powers of these several coal fields are now pressed to limits approaching very nearly, if not quite, to their ultimate capacity. In Great Britain the production in 1866 reached 101,630,500 tons; in France, between 11,000,000 and 12,000,000 tons; in Belgium more than

12,000,000; and in Prussia, in 1865, 18,000,000 tons were produced. The statistics procured at the exposition have enabled me to construct the following table of the production of iron in the world, in 1866, and there is every reason to believe that the figures given are substantially correct, as estimates were resorted to only in one or two cases, and those based upon former official returns:

Countries.	Pig iron.	Wrought iron.
England	4,530,051	3,500,000
France	1,200,320	844,731
Belgium	500,060	400,000
Prussia	800,000	400,000
Austria	312,000	200,000
Sweden	226,676	148,220
Russia	408,000	350,000
Spain	75,000	50,000
Italy	30,000	20,000
Switzerland	15,000	10,000
Zollverein	250,000	200,000
United States	1,175,000	882,000
	9,322,047	7,005,026

Allowing for the production in barbarous countries, and something for the use of scrap iron, it may be stated in round numbers that the production and consequently the consumption of the world has reached 10,500,000 tons, of 2,240 pounds each, or 21,280 millions of pounds; so that if the population of the world has reached 1,000 million, a consumption of a little over twenty pounds of iron per head. A careful calculation, after allowing for iron exported, shows that the consumption per head in England is 189 pounds of iron. The consumption in Belgium has reached about the same limit. The consumption in France is $60\frac{1}{2}$ pounds per head, and in the United States not far from 100 pounds per head. If the industry of the world were as thoroughly developed as it is in Great Britain the consumption of iron would reach nearly 90,000,000 tons per annum. If brought to the standard of the United States, a little less than 50,000,000 tons per annum would answer; or, if to that of France, a little over 30,000,000 tons would be required; figures to be increased further by the steady increase of population in the world.

It will be interesting, therefore, to inquire into the sources of future supply possessed by the nations upon whom the demand must come.

Sweden possesses exhaustless supplies of the very richest and best kind of primitive ore, but she has no coal, and a heavy expense for transportation must be incurred in bringing coal and ore together, and, as a rule, it is found more economical to transport the ore to the coal than the coal to the ore. The limits of the manufacture of iron by wood have long since been reached, and hence Sweden can only be looked to as a source of supply of ore to other countries possessing mineral fuel when their iron mines are too heavily drawn upon.

In Russia, also abounding in immeasurable supplies of ore, there is a possibility, but not much probability, that mineral coal may be developed to an extent sufficient for its own supply of iron. The production of charcoal iron is also capable of some, but not of indefinite, extension.

The same remark applies to Austria and the states of the Zollverein. In Italy there is no coal and hence its rich ores are in the same category as those in Sweden, only far less abundant. Algiers abounds in ore, which has to be transported to the coal. Spain is rich in ore, and has a carboniferous formation on its northern borders, but no attempts have been made to render it available for the production of iron. In France the present manufacture of iron is only maintained by the importation of coal to the extent of over 7,000,000 tons, and of 495,000 tons of ore in 1867.

In Belgium, the size of the coal field, the vertical character of the veins, and their small thickness, render it impossible that there should be any very considerable extension of the business, at least if the supply is to endure for any protracted period. Already it is estimated that Belgium produces as much coal as France, two-thirds as much as Prussia, and one-eighth that of Great Britain, out of a coal-field only ninety-seven miles in length and twelve miles in breadth at its widest point, and in veins of from thirty inches to three feet thick. Belgium is already an importer of ore, and although it is quite evident that it will be the seat of a vigorous and possibly increasing metal industry for years to come, it has no resources adequate for serious competition in the supply of the greatly increased quantities which the world will yet require.

Prussia has a somewhat larger supply of coal than Belgium, and it is remarkably rich in quantity and quality of its iron ores, but it is scarcely possible that in the future she can do more than supply its own wants. Upon England, then, so far as Europe is concerned, still rests the great burden of supplying the world with iron, if the supply is to come from Europe at all. It has been seen that already nearly one-half of the total consumption of the world comes from within her borders. In 1866, she was able to furnish 9,665,013 tons of iron ore, and only imported 56,000 tons.

A careful survey of the sources from which her ore is derived leads to the conclusion that in Wales the local supply is not adequate to the present consumption, and large quantities are transported thither from other parts of the kingdom. The natural limits of production have therefore been reached in Wales, although there will be a still further extension of the business in that region either with domestic or foreign ores, in consequence of the possession of enormous supplies of admirable coal available for the furnace without coking. The Stafford region, by common consent, has reached its culminating point; and a careful consideration of the local supply of carbonaceous ore in Scotland would seem to indicate that not much more extension of the business is possible in that region, except at much higher prices than now prevail. The main reliance of Scotland has heretofore been upon its blackband iron ore, "and the development of its iron trade has been co-extensive with the exploration of that famous mineral, furnaces following in the wake of its discovery. The clay bands are in such small seams, and of such irregular character that the business would soon languish and be greatly reduced if dependent upon them alone. The thickest and best seam of blackband, commonly called the 'airdrie,' is now substantially exhausted, and the reliance is on seams of no greater thickness than eight inches. Blackbands are notoriously irregular, and are not found in uniform thickness; for example, the airdrie blackband occupies but a small portion of the space allotted to it in Lanarkshire coal-field. A more notable example of caprice of blackband is to be found in the slaty band, which occurs occasionally in patches of irregular thickness, sometimes six inches and sometimes six feet in thickness; but there is always something to mark its position, either a coal or iron stone. Indeed, all the iron stones in all portions of the coal-field are erratic. They are persistent throughout in no field, yet it is a singular fact that we have in all the fields blackband iron stone." This extract from a paper of Ralph Moon, government mining inspector in Scotland, is made for the double purpose of showing how impossible it is that there should be any considerable increase in the annual product of Scotch iron unless foreign ores are brought to utilize the unlimited supplies of admirable coal which exist in that country; but, with the further object of giving some information, which may be of use in the development of the blackband iron ore which have been recently discovered in Schuylkill county, in Pensylvania, the value of which to the country can hardly be exaggerated, if it should prove to be in quantity and quality equal to its British prototype. An analysis of the best Scotch ore is here annexed—rather out of place, but too valuable as a guide to be dispensed with:

	Raw.	Roasted.
Protoxide of iron	49.82	27.10
Peroxide of iron	....	60.1
Lime	1.67	2.7
Magnesia	2.33	3.8
Alumina	1.52	2.4
Silica	2.40	3.9
Organic matter	7.60	....
Moisture	0.32	....
Carbonic acid	34.34	....
	100.00	100.00
Iron per cent	38.75	63.1
Specific gravity	2.857	....

There still remains upon the east coast of England the great Cleveland region, and upon its west coast the Cumberland or red hematite region. The latter is now yielding about 1,400,000 tons of ore per annum, taken from beds of irregular shape and formation, in or adjacent to the limestone. There are certainly no signs of exhaustion as yet apparent in this wonderful district, but all analogy leads us to doubt the permanency of these irregular beds, formed in pockets in the rocks, without any regular walls to indicate their continuity. Besides the extremely good quality of this ore and the value of the iron which it produces, will always restrict its use to those better purposes for which a high price is paid, and naturally withdraws those mines from any competition in the supply of the great mass of iron required by the world for ordinary purposes. Not so, however, with the Cleveland region, where the ores exist in beds of from eight feet to fifteen feet in thickness, in the lias or oolitic formation, extending over a tract of country forty miles in length and fifteen miles in width. This ore is lean and the quality of the iron inferior, but by the application of a high order of skill, a quality is produced sufficiently good for the ordinary purposes of commerce, and at a cost below that of any other locality in the world. The consequence has been that, since the erection of the first blast furnace in 1850, 125 furnaces have been erected, and fourteen more are now in process of erection; twenty-seven rolling mills and a large number of foundries and iron ship-building yards are in operation, and cities have grown up with a rapidity and to a size that would strike even a western pioneer with surprise. The present production exceeds a million of tons per annum, and it is difficult indeed to assign any limits to its future growth. But there is one limitation which applies to the whole question of the production of British iron, and that is, her ability to supply coal on the scale of consumption already beyond 100,000,000 tons per annum. This question has received the serious attention of the British association for the advancement of science, and Mr. Gladstone, by one of those happy ellipses characteristic of men of genius, has coupled the extinction of the national debt with the exhaustion of the supplies of fuel, evidently acting under the idea that an honest man ought to pay his debts while his capital lasts. It is presumed, however, that there is still margin enough for the addition of the "Alabama claims" to the sum total of indebtedness, without seriously interfering with the means of payment which the coal-fields afford.

So far as the production of iron is concerned, and so long, at least, as any human being now in existence may have an interest in the question, I see no good reason to doubt why England should not maintain her position as the source from which one-half the required amount will be obtained; but beyond this I do not think she can or will go, from the intrinsic difficulties of producing the required supply of materials and labor, without an enormous increase of cost. There will, therefore, remain a very large deficiency, which must be supplied from some other source, and that source can only be the United States of America, for in no other quarter of the globe are the supplies of ore and coal sufficiently large, or so related to each other geographically as to admit of its production, not merely within reasonable limits of cost, but on any terms whatever.

The position of the coal measures of the United States suggests the idea of a gigantic bowl filled with treasure, the outer rim of which skirts along the Atlantic to the gulf of Mexico, and thence returning by the plains which lie at the base of the Rocky mountains, passes by the great lakes to the place of beginning, on the borders of Pennsylvania and New York. The rim of this basin is filled with exhaustless stores of iron ore of every variety, and of the best quality. In seeking the natural channels of water communication, whether on the north, south, east or west, the coal must cut this metalliferous rim, and, in turn, the iron ore must be carried back to the coal, to be used in conjunction with the carboniferous ores which are quite as abundant in the United States as they are in England, but hitherto have been left unwrought, in consequence of the cheaper rate of procuring the richer ores from the rim of the basin. Along the Atlantic slope, in the highland range, from the borders of the Hudson river to the state of Georgia, a distance of one thousand miles, is found the magnetic range, traversing seven entire states in its length and course. Parallel with this, in the great limestone valley which lies along the margin of the coal field, are the brown hematites, in such quantities at some points, especially in Virginia, Tennessee and Alabama, as fairly to stagger the imagination. And finally, in the coal basin is a stratum of red fossiliferous ore, beginning in a comparatively thin seam in the state of New York, and terminating in the state of Alabama, in a bed of fifteen feet in thickness, over which the horseman may ride for more than one hundred miles. Beneath this bed, but still above water level, are to be found the coal seams, exposed upon mountain sides, whose flanks are covered with magnificent timber, available either for mining purposes or the manufacture of charcoal iron. Passing westward, in Arkansas and Missouri, is reached that wonderful range of red oxide of iron, which, in mountains hundreds of feet above the surface, or in beds beneath the soil, culminates at lake Superior in deposits of ore which excite the wonder of all beholders; and returning thence to the Atlantic slope, in the Adirondacks of New York, is a vast undeveloped region, watered by rivers whose beds are of iron and traversed by mountains whose foundations are of the same material; while in and among the coal beds themselves are found scattered deposits of hematite and fossiliferous ores, which, by their proximity to the coal, have inaugurated the iron industry of our day. Upon these vast treasuries the world may draw its supplies for centuries to come, and with these the inquirer may rest contented, without further question, for all the coal of the rest of the world might be deposited within this iron rim, and its square miles would not occupy one quarter of the coal area of the United States.

TIMBER GROWING.

From a Lecture delivered at the Illinois Industrial University, January, 1869, and published in the Report of the Board of Trustees,

BY O. B. GALUSHA, OF ILLINOIS.

The influence of forest trees upon the atmosphere, in purifying it by absorbing noxious gases, in equalizing its degrees of humidity, in softening the asperities of its temperature, in checking the force of its violent gales, so often destructive to growing crops and injurious to domestic animals, and thus securing a carpet of snow in winter to protect the roots of plants from the damaging effects of sever frost, are facts upon which nearly all men of science and observation are agreed; and certainly they are facts of so great importance that thy should command the immediate attention of all dwellers upon the great western prairies. It does not come within the province of an essay upon "timber growing" to explain the principles in meteorology, electricity, chemistry and vegetable physiology, which operate to produce these important results. These subjects have been ably treated in other papers; yet, we may and should consider the effects of these causes, inasmuch as they indicate to us the path of duty or economy in the direction of forest tree culture.

Foreign nations accuse the "universal Yankee nation" of being "slaves to the almighty dollar." That the American people are impatient of results, is a fact of every day's observation; and this, perhaps, justifies, in a measure at least, the opinion which the citizens of the old world entertain of us. The consideration of profit to ourselves, instead of benefit to posterity, or ultimate good to the nation, has ever been too prominent among our incentives to action. But the time has come when we are called upon to prosecute enterprises which look beyond the present generation for results. We must, for our own national salvation, look threatening disasters full in the face, and prepare to avert them. If we are to achieve and maintain our manifest destiny as the greatest and most prosperous people upon the globe, we must at once commence laying the foundations of this success. One of the important steps in this direction is the cultivation of trees for their climatic influences and for uses in the mechanic arts. The wide extent of our American prairies renders this work far more imperative upon us than it has formerly been upon the people of transatlantic countries; yet the history of many countries of the old world admonishes us of the folly of our present course of wholesale destruction of forests and neglect of planting new ones for the use of future generations.

The fact that our home groves are fast diminishing, without adequate efforts being put forth to make up for the loss, is apparent to all. But it is not generally realized to how great an extent the same is true of the pine regions of the north, from whence we now draw almost our entire supplies of timber and lumber for building purposes. Lumber is becoming dearer each succeeding year, not, as has been generally supposed, from the high price of labor, so much as from the fact that the timber, at almost all points easy of access, is either thinned out or entirely used up, so that logs are now often drawn great distances to the rivers, and floated long journeys, to reach those mills which, a few years since, were supplied from adjoining forests. The amount of timber in portions of these vast pine regions has been greatly overestimated. I have traveled over and looked over hundreds of thousands of acres of these lands, extending from the southern point of Green Bay to lake Superior, and am fully persuaded that two acres out of three, in this great territory, are either destitute of trees or covered with such varieties as are almost worthless. The fires which sweep over these vast plains, and through the forests, destroy the young trees, except here and there an isolated tract, so that we here find little or no provision for a supply when the present crop of trees is exhausted.

While we cannot prevent the destruction of our forests for the use and benefit of the present generation, we can and should take measures to create forests upon our farms, which will be ample to supply the wants of those who are to come after us. Comparatively little has yet been done in this direction, and this little has been confined mainly to the cultivation of those varieties which are of rapid growth, and which would consequently bring the quickest returns. While these varieties are, perhaps, more profitable for artificial groves than most of the slower growing ones, yet it is highly important that a sufficient number of kinds should be grown to subserve all the purposes of the mechanic arts, and these arts call largely for the close, firm texture of the slower growing varieties. I am inclined to the opinion that the rate of growth in trees is generally underestimated, and am quite sure that comparatively few landholders realize that large profits would ultimately accrue from cultivating groves, even of the more moderate growing varieties. To illustrate the rate of spontaneous growth of such sorts I will cite an instance which has come under my own observation.

A few miles from my residence are a few acres of ground which were cleared of timber sixteen or seventeen years since. There was then left upon the ground a growth of underbrush only, consisting of several varieties of oak, hickory, ash, and some other sorts. I have watched the growth of timber there from year to year, until the present time, and am myself surprised at the result.

The land was worth, when cleared, perhaps twelve dollars per acre, not more. There have been taken from it, during the last seven years, poles equal in value, probably, to ten dollars per acre; and one hundred and fifty dollars per acre would hardly buy the trees now standing upon it. So that if we estimate the value of the land (at the time mentioned) at twelve dollars per acre, and compute the interest upon this for sixteen years, at six per cent., compound interest, adding the amount of taxes accruing during the time, with interest upon this at the same rates, we have one hundred dollars per acre as the net profit of the timber crop, while, of course, the land itself has partaken of the generally enhanced value of surrounding real estate, and would now probably sell for fifty dollars per acre, were the timber removed.

A German friend, for whose integrity I can safely vouch, tells me that when he was a lad, and in his native country, his father had a tract of eighty acres of poor land, upon which he had tried in vain to raise remunerating crops. It was finally prepared in the best manner and planted with seeds of Norway spruce, which grow readily there in the open ground. These trees flourished, and, after a few years' cultivation, were left to themselves, thinning them out as they became crowded.

At ten to fifteen years' growth, immense numbers were sold, in thinning out, for hop poles and grape stakes. This tract is now a well timbered forest, from which fair sized saw-logs are cut, and every part of a house can be built with its timber.

These seeds were sown only thirty-six years ago! What would such a lot be worth upon the prairies of Illinois? Who would estimate its value at less than one thousand dollars per acre? What farmer upon the prairies of Illinois would wish to leave a better legacy to his sons? What has been done upon the poor hills of Germany, except starting the plants in open ground, may be repeated, and with equal or greater results, here, where all the hardy varieties of evergreens as well as deciduous, trees grow luxuriantly.

The rates of growth in the more common varieties of trees may be observed by any one, and the time required to bring them to a size suitable for building purposes, and use in the various mechanic arts, easily calculated; thus the actual cost of raising timber may be very nearly ascertained.

Let us estimate the expense of raising a grove of ten acres, planted with white ash and black walnut—five acres with each. These varieties grow at about the same rate, and are about equally valuable for lumber.

The seeds of the ash, like all seeds of this class, which ripen in the autumn, should be gathered when ripe, and kept in the cellar through winter. The walnuts, as other nuts, should be spread evenly upon the ground, where surface water will not stand, not more than two nuts in depth, and covered with two or three inches of mellow soil, that they may freeze during winter—to be planted as soon in spring as they show signs of sprouting. The land should be deeply plowed, late in fall if practicable, and finely pulverized in early spring, and marked both ways, as for corn, three feet eight inches apart. The tree seeds and nuts should be planted eleven feet apart, which will admit of two rows of corn or potatoes between each two rows of trees. By putting two or three seeds in a place—to be thinned out to one if both or all germinate—an even stand may be secured. A better way is to plant in rows, eleven feet apart, running north and south, and three feet eight inches (in the marks for corn). This will secure straight trees—being closer—and they may be thinned out to eleven feet each way when large enough to use for grape stakes, bean or hop poles. This will give three hundred and sixty trees per acre, or three thousand trees in all, allowing for sixty vacancies, though in all cases of tree planting, whether in groves or screens, a supply of good plants, grown elsewhere, should always be in readiness to use in filling vacancies, which should be done at the end of the first year.

The preparation of the ten acres of ground, at five dollars per acre, would be fifty dollars. Average cost of seed, fifty cents per acre, five dollars. Planting, twenty-five dollars. The cultivation during the first five years, will be paid for in crops grown between rows. For cultivation from fifth to ninth years—four years—with horses only—thirty dollars per year, one hundred and twenty dollars. After this time no cultivation or care will be needed. This makes the entire cost, in seed and labor, of the ten acres of trees, two hundred dollars. These trees will, at twenty-five years of age, average sixteen inches in diameter at the ground, and about ten inches at the height of sixteen feet. This will give, deducting waste in sawing, one hundred and twenty feet of lumber per tree.

Allowing one-sixth for damage by the elements and loss from other causes, we have in round numbers three hundred and sixty thousand feet of lumber, which, at fifty dollars per thousand, would amount to eighteen thousand dollars. The value of the tree tops for fuel would be equal to the cost of preparing the logs for the mill, and the expense in sawing would not exceed five dollars per thousand feet. This, added to the cost of producing the trees, and the amount deducted from the value of the lumber, leaves *sixteen thousand dollars for the use of ten acres of land for twenty-five years*, and the interest upon the amount expended in planting and cultivating the trees! This statement may be deemed incredible, perhaps, by those who have not previously turned their attention to the subject, but after much study and many years' observation and measurements of growths of different varieties of trees, I am convinced that in all well conducted experiments, in growing artificial groves upon our large prairies, the profits will not fall far, if at all, short of the rates above stated. It must be borne in mind that trees standing at regular and proper distances upon rich prairie soil, and receiving good cultivation, will grow much faster than the same varieties usually found growing in natural groves. For a list of varieties suitable for planting in artificial groves, I would refer all interested to the lists recommended by our state horticultural society, with the remark, that, the planter can hardly be in error, in planting any tree which is indigenous in a soil and climate similar to his own; while many trees, whose native homes are found in latitude north or south, have thus far proved valuable, as the Osage orange and Catalpa, from the south, and the red pine and white spruce, and others, from the north.

Some foreign varieties are equal or superior to any of our natives; among which are European or Scotch larch (best of all foreign deciduous trees), Austrian and Scotch pines, Norway spruce and white willow.

I regard this last as probably combining more desirable qualities for cultivation in groves for lumber purposes than any other variety of the soft wood, rapid growing deciduous trees, and am decidedly of the opinion that this and the golden variety are the best deciduous trees within my knowledge for wind-breaks or screens, but wish to be distinctly understood as not recommending this tree as a "hedge plant," or the planting of this or any other one sort to the neglect of other desirable varieties. Strong cuttings of this tree seldom fail to strike root at once in mellow soil, and will make a growth of from two to six feet the first season. It thrives in all kinds of soil, making as much wood in a given number of years as any other known sort, not even excepting the cotton wood, growing into a large tree, sometimes four feet in diameter. The wood is of rather fine texture for a light wood, making a fair article of soft lumber, which bears a fine polish. It is also valuable for making wooden ware, bowls, trays, etc. It also splits freely, which is a desirable quality in making fence posts, rails, railroad ties, and fire-wood. I would here remark that it is more than probable that before five years are past the present mode of infusing the gasses of coal tar into the pores of timber will be so improved, or some other method, that soft and porous wood will be rendered almost indestructible, and at a trifling expense.

The golden willow is similar in growth and texture to the white, but I think does not make so large a tree. I have measured about a dozen trees of this variety (golden) which were planted by the roadside fifteen years ago last spring, and find the average circumference of the trunks, at three and a half feet from the ground, to be five feet and three inches. A white willow, standing near my house, which has grown from a small cutting put in thirteen years ago last spring, now measures six feet and two inches in circumference near the ground, forming a head or top thirty feet across. This variety, when planted in groves, grows tall and almost perfectly straight.

I have carefully computed the expenses of raising ten acres of trees of this variety, and converting them into lumber, and find the entire cost not to exceed ten dollars per thousand feet. This estimate is based upon actual measurement of the growth of trees. The land is valued at forty dollars per acre, with interest upon this amount, togther with expenses, computed as before, at six per cent. compound interest.

I take ten acres in these estimates of growing artificial groves, because it is desirable to have trees enough together, or in close proximity, that the cost of putting up and removing a saw mill would be but a trifle upon each thousand feet of lumber sawed.

TIMBER BELTS.

The actual profits which would accrue from a general and uniform system of cultivating trees in belts, or double rows, for protection, cannot as readily be estimated; yet no one who has carefully investigated this subject can doubt the utility and economy of such screens. To show the possible extent of their beneficial influence, I will call up an instance which, probably, very many of this audience will remember.

In the year 1862, at the time when spring wheat and oats, in the northern portion of the state were just past the bloom, and a portion of the grains in the milky state, we were visited by a storm from the northwest, which swept over this portion of the state, prostrating nearly all the grain not sheltered by timber.

I have selected this instance as an illustration, because of the extent of the storm, and also on account of the marked effects of protection by timber in this storm, which clearly showed that the entire loss might have been prevented by belts of trees. In one locality a single line of broad and tall willows, closely planted, proved a sufficient check to the wind, so that a field of wheat adjoining it upon the east stood erect, and was harvested with a machine, while in exposed situations, the shrunken grain, if saved at all, was often gathered by the slow and tedious process of hooking it up with scythes. Many thousands of acres were left to dry, and were burned upon the ground, which two or three weeks before harvest promised abundant crops. The extra expense of gathering the grain of that harvest could not have been less than fifty cents per acre on the whole amount harvested.

I traveled quite extensively over this portion of the state before and soon after the harvest of that year, and am convinced that one-half of the value of the wheat and oats in the territory passed over by that storm was destroyed by it.

There were sown in that year, as per census reports, in the thirty counties lying north of the Burlington, Peoria and Logansport Railroad, about one million two hundred thousand acres of wheat, and at least one-fourth as many of oats. Allowing one-tenth of these crops to have been protected by timber, we find the loss to have been equal to five hundred and forty thousand acres of wheat, and one hundred and thirty thousand acres of oats.

Computing the wheat at fifteen bushels per acre, and the value at fifty cents per bushel; the oats at thirty bushels per acre, and price twenty cents per bushel, we have the sum of four millions eight hundred and sixty thousand dollars, as the cash value of property in these two crops alone, which was destroyed in a single storm in an area of a little more than one-third of our state.

Allowing one hundred and fifty thousand acres to have been burned, or not harvested, and adding to the amount of loss fifty cents per acre of the remainder of the nine-tenths (lodged grain), equal to six hundred thousand dollars, it swells the amount to the enormous sum of five million four hundred and sixty thousand dollars.

Let us see how much it would cost to plant and cultivate screens to prevent such losses. A double row of white or golden willows, with trees in the second row set opposite the spaces in the first, planted upon the west side of every eighty acre lot, would doubtless prove sufficient, as they would, at the age of twelve years, form a dense wall of foliage about forty feet high, and would of course increase in size for many years thereafter.

These would cost, per mile of screen, about as follows: Average value of two acres of land, forty dollars per acre, eighty dollars; preparation of the soil, and planting with strong cuttings, ten dollars; cultivating the first two years, twenty dollars; making a total cost, with purchase money of the land, one hundred and ten dollars. After two years no care will be needed, save a mulch of refuse straw, to be renewed once in two or three years, the cost of which will be more than repaid in the partial protection which the trees will render previous to the twelfth year.

There are, in the thirty counties referred to, about sixteen thousand six hundred and twenty-five sections of prairie land. This will require sixty-six thousand five hundred miles of screen, if planted as above proposed, making the entire cost seven million three hundred and fifteen thousand dollars. Thus we see that, without estimating the immense damage done to fruit and other crops, the wheat and oats destroyed in that storm would, if saved, have paid about three-fourths the entire expense of growing timber belts throughout that entire territory?

I think it may be safely estimated that an average of one-twelfth part of all our crops of grain and large fruits are destroyed by violent winds, which such a system of protection or its equivalent in groves, would so far check as to prevent the destruction. If this is true, such protection would save to the husbandmen and orchardists its entire cost every two, or, at most, three years. Such protection, too, would, by causing the snow to remain spread evenly over the surface of the ground, as before hinted, enable the farmer to raise winter wheat in localities where it is now impossible to do so.

If we add to the benefits of tree culture already considered, those far-reaching and incalculably valuable climatic influences which would flow therefrom, we must all admit the necessity of commencing this great enterprise at once, and prosecuting it with vigor.

I do not introduce this plan of planting straight belts of trees, a quarter of a mile apart, because it is the most desirable plan which can be adopted, for no man of taste would regard it as such. The eye would soon tire of such stiffness and monotony in the landscape.

Tree planting may be so planned and conducted as to give beauty to the landscape, and at the same time secure nearly all the combined benefits of protection to crops, timber for uses in the mechanic arts, and those climatic influences which we all regard as so important. Of course, no rules can be given for such tree planting. Generally where the surface is somewhat undulating (for we have no hills), the planting should be done mainly upon the higher portions of the farms, and along the water courses. Where the surface is level, belts may be planted upon the north and west of the farms, with groves upon the least valuable portions. The last would intercept the straight lines and give diversity. But if each prairie farmer were to follow his own taste, or adapt his planting to secure the greatest profit in timber or protection to his own farm, planting about one-tenth of his own land with trees, it is probable that all the desirable ends which we have been considering will be gained, and the landscape sufficiently deversified to be pleasing to the eye.

Here, then, brother farmers, and farmer students in this university, we have two pictures presented to us. In the one we look into the future and see wide spread desolation—an extended treeless country, visited by destructive storms, by severe drouths, with its streams dried up, and food for man and beast in such scarcity that the poor can scarcely obtain a supply. In the other we see a charming landscape, a rich, fertile country, a population enjoying all the blessings which flow from peace and plenty.

Which will you choose? Will we take warning in time, and arouse ourselves to action in an interprise which promises such rich results?

ROOT CROPS.

From a Lecture delivered at the Illinois Industrial University, January, 1869,

BY JONATHAN PERIAM.

Root crops may be classified as follows: First, those having long tapering tap roots, more or less fusiform, as the beet, carrot, parsnip, radish, turnip and salsify or vegetable oyster. Second, tuberous rooted plants, as the common potato, the sweet potato, Chinese potato or Japanese yam, the chufa or earth almond, and the artichoke, and bulbous roots, as the onion, leek, shallot, garlic, etc. These, therefore, hold before enlightened nations a most important place as sustainers of animal life, increasing always in importance according to the density of the population. Only within the last one hundred years have they occupied their proper place in the economy of animal life and the rotation in farm cultivation, and have enabled Great Britain, especially, to keep pace measurably in her agricultural development with her commercial and manufacturing interests.

The rudest form of husbandry known is the occupation of a herdsman, but one remove from savage life, inasmuch as the savage hunts, kills and eats wild animals, and the herdsman breeds, slaughters and eats domesticated or half-wild cattle.

From thence, by another step, we have the cultivation of cereals, then the planting of vineyards and orchards, and lastly comes in the cultivation of roots, herbs and flowers. A combination of these arts results in agriculture, horticulture being but a branch thereof, (the poetry of agriculture,) pomology, arboriculture, floriculture, etc., being subdivisions again of horticulture, just as the breeding and fattening of stock, or the cultivation of the cereals, or of the grasses for hay, are subdivisions of agricultural art. Science, in a high degree, can only be displayed by an individual in the study of one of these branches, and yet this subject, agriculture, has been too often looked down upon as being only fit to be subordinated to every other profession and art in life—this agriculture, which feeds the millions, and actually sways the destiny of nations.

It is altogether useless for the slovenly or negligent farmer to attempt the cultivation of root crops, since being of slow growth at first, produced from minute seeds, and requiring much labor, as compared with corn, wheat and other grain producing plants, he will be sure of failure. In fact, the so-called gardens or truck patches, of many otherwise good farmers, are a by-word and laughing stock to the passer-by, the home of every vile weed that will grow in the climate.

There certainly is need of agricultural colleges in a country where more than one-half of the farmers are content to live for three-fourths of the year on bread and meat, with perhaps a scanty and precarious supply of vegetables, when one hundred dollars, expended in seed and labor upon a single acre, would produce more healthful and better sustenance than double the amount expended in pork and flour, and doctor's bills, beside the enhanced pleasure in higher enjoyment of life, produced by a table laden with various vegetable productions, important among which are tuberous and other root crops.

It is absolutely essential to success in the economical cultivation of these crops, that the land be in high condition, or it will be necessary to bring it so by deep plowing, heavy manuring, and the cultivation of some hoed crop of easy culture as corn and potatoes.

Attention is also necessary to the nature of the soil. If it is wet or tenacious it must be rendered dry and friable by drainage and manures, which will act mechanically as well as chemically, always bearing in mind that root crops except alliaceous ones, as the onion family, do not like recent manuring, unless it be compost, since it causes them to grow forked and knobby. The time spent in properly preparing the land will be amply repaid in the perfection and quantity of the crop.

* * * * We now come to the field culture of the beet, parsnip, carrot, ruta baga and turnip. It is not for a moment to be supposed that the cultivation of root crops are of any economical value as compared with the corn crop, as estimated according to the value produced for a given amount of labor. If it costs ten dollars to produce an acre of corn, yielding fifty bushels, it will cost eighty dollars to produce an acre of beets, yielding 1,000 bushels. Your corn stands you in twenty cents per bushel, your beets stand you in eight cents per bushel, therefore we can produce 400 bushels of corn for the same labor that we can 1,000 bushels of beets.

Ruta bagas and turnips will cost somewhat less, but are not so good for feeding.

Parsnips and carrots will cost as much as your beets, and will not produce so much per acre, but are richer for feeding.

Consequently, it is useless to argue with the stock farmer, at the present time, to prove the economical value of the roots as a fattening crop, when raised upon old and recently manured land, but place root crops in their proper place in the rotation and they will make a different exhibit.

In breaking up a clover lay, trench-plow a portion of it in the fall ten inches deep, paring the sod as thin as possible. Harrow and roll in the spring, when dry, until it is perfectly friable, drill your beets in before corn-planting time, thirty inches apart, tend with a horse as much as possible, and besides once thinning and once hoeing, you should have but little more to do until they are gathered. This will reduce the cost one-half, and you may confidently expect from seven to nine hundred bushels per acre.

Ruta bagas may be sown upon sod. Trench-plow in the spring, say about May 20th to June 1st, and turnips, broadcast, after early cut grass, or even as late as August 1st.

Mangle wurzel beet is the sort particularly adapted to field culture, from its habit of growing one-half of its length out of the ground, and instances are on record of fifty tons having been produced per acre. It is eaten greedily by cattle, sheep and hogs, both tops and roots, and four bushels will fatten as far as one bushel of corn, as usually fed, and they leave the land in the best possible condition, without replowing for any crop or small grain.

But it is especially to the farmer of but few acres, who wishes, nevertheless, to fatten as much stock as possible, in order to keep up the fertility of his soil, that root crops are particularly valuable. Upon a farm of 160 acres, and less, half may be devoted to grass and hay, twenty acres to root crops—beets, ruta bagas, turnips, carrots, parsnips and potatoes, as follows: ten acres to beets, five acres to ruta bagas and turnips, three acres to potatoes, and two acres to carrots and parsnips, the latter two to be fed to horses and milch cows, twenty acres to wheat or barley, twenty acres to corn, and twenty acres to oats or rye.

In the rotation here mentioned, the manure should be applied to the corn land and the sod before trenching for the root crop.

Within five years I should not be afraid to guarantee, if all the crops, except wheat, barley and potatoes, were fed to stock, and the manure saved and faithfully applied to the land, that the produce of the farm, in each ordinary season thereafter, would be, starting with good arable prairie land, faithfully worked, 160 to 200 tons hay, or its equivalent in meadow, 15,000 bushels beets, 5,000 bushels ruta bagas and turnips, 600 to 900 bushels potatoes, and 800 bushels each of carrots and parsnips. This would give nearly 22,000 bushels of roots, besides potatoes, which should produce 50,000 pounds of beef, mutton and pork, annually, which, at five cents per pound, would amount to $2,500 per annum, as the product of the twenty acres, besides the value of the potato crop.

But it is to the villager, or occupant of from one to five acres, that the cultivation of root crops are especially valuable. We have shown the quantities of the different root crops that can be raised per acre, and they are not fancy sketches by any means, but are below what are often raised. I myself assisted, when a mere boy, in the cultivation of two-thirds of an acre of ruta bagas, in 1839, the product of which was 1,300 bushels per acre, individual roots weighing twelve to sixteen pounds each; and I have also in mind a prize crop of parsnips raised in the Isle of Jersey, in 1839, of 27 tons 8 cwt. per acre—30 tons 1,440 pounds of the present day—1,229 bushels per acre at 50 pounds per bushel. The carrot will produce, usually, more than parsnips, and four bushels are considered as good for feeding as one bushel of corn meal. The principal value of carrots, however, is in feeding with grain, from its peculiar principal pectine, and its action on the digestive organs, enabling them to more readily assimilate the other food. But to return to the village farmer. Half an acre in beets will produce 750 bushels, and the mature leaves, stripped off from time to time, will feed a cow at night and four hogs principally during the summer and fall, and give for feeding for six months in the year, over four bushels per day, which will fatten one cow and feed another for milk; and a quarter of an acre of parsnips will thoroughly fatten the four hogs, besides feeding four more growing ones until the next spring. Thus the village farmer of five acres may raise one and a-half acres of beets, parsnips and potatoes, half an acre of other vegetables, one to two acres of strawberries and other small fruits, besides corn and other crops.

The sugar beet, I believe, is destined to work a great change in the husbandry of many portions of our prairie land, and I see no reason, judging from its success in France and Germany, why it may not only supply us with sugar, both for consumption and export, but, in the vicinity of the establishments for its manufacture, so alter the system of rotation, as to be of great benefit to the farmer. Its success, once established, will add millions to the agricultural wealth of the state of Illinois. It may be brought into the rotation once in four years, or oftener, by the application of manure. A good rotation, where cattle are fed on the refuse of the sugar mill and the manure applied to the land, would be twice in a five-year rotation, viz: on sward trench-plowed, to be followed with small grain, then corn with all the manure, then beets, to be followed by small grain and grass, half of the farm to be in grass all the time, which would give 32 acres each year devoted to the production of sugar.

The cultivation of root crops, which has added so many millions ot dollars annually to the agricultural wealth of Great Britain, and enabled that country to support its millions of population, is not simply due the actual money value of the crop produced, but to the enhanced value accruing to the land by the feeding of cattle, sheep and hogs thereon, thereby increasing the production of the cereals by more than double over former years, and it is humiliating to us, with our deep rich virgin soil, that we do not produce of wheat, oats, rye and grass one-half that produced per acre by the English cultivator, and the difference is principally owing to the introduction of root culture in that country, with its attendant necessity, deep plowing; and the time is certainly coming when we too must adopt some such system to renovate our already partially worn land, and it is to be hoped that we may soon be enabled to institute experiments here that will tend to elucidate the facts connected with the renovation of our soils by drainage. Deep culture, rotation of crops, a knowledge of soils and their adaptability to certain crops, and the economical value of feeding carefully upon our farms the product of our soil. This very county of Champaign, which was formerly noted for its fine stock, is now dependent upon Texas and the Red river country for the steers she fattens. In order to keep up the fertility of our land we must engage more in mixed husbandry, and in order that our land may carry its full maximum of stock, we must come sooner or later to the raising of root crops, unless something shall be discovered hereafter which will take their place. I should consider it one of the most important and interesting experiments that this university could institute, not that I suppose that an experiment in any direction, instituted and carried out by any public institution, could be prosecuted as cheaply as by a private individual, on account of the fact that the minute record kept, and other obstacles attending any public undertaking, tends to enhance the cost thereof; nevertheless, the results arrived at are certain, and consequently carry weight with them.

I have compiled from various sources the following facts:

Indian corn or maize contains about 20 per cent. of water and woody fiber; wheat 30; barley 30; oats 36; rye 22 to 32; buckwheat 40; potatoes 79; turnips 90; carrots 88; mangle wurzel 87; the artichoke 86; the parsnip 86. According to another analysis the parsnip contains more water than the potato, and less than the beet and carrot, a larger per cent. of starch and dextrine, and less nitrogen than the beet and carrot. Experiments in feeding show, however, but little difference in their value for feeding, except in the case of carrots, which, by promoting digestion, thereby enhances the value of dry food.

A curious fact in the cultivation of roots is that stated by Mr. Stevens, embodied in the agricultural report of the patent office for 1847, that in the cultivation of Swedes, the drills 27 inches apart and the plants 12 inches in the row, an average weight of 8 pounds would give the enormous yield of 69 tons, 4 cwt., English, or 155,000 lbs=2,582 bushels per acre. Therefore, if we reduce the average weight per root of this crop 2 pounds, or would diminish the yield 645 bushels per acre, at ten cents per bushel, it would pay the whole expense of cultivating and gathering the crop; hence we see the necessity in root culture of rich clean land and careful cultivation, and, in fact, a lesson may be learned thereby that will suit as well for many other crops. As regards the feeding of root crops, the flat white turnips should be fed first, then sugar beets, if any raised, then ruta baga, and lastly mangle wurzel. These last may be kept good even to June or July, with care. I would not, from any remarks herein set forth, have it understood that I consider that the time has come for making the cultivation of root crops an economical or necessary part of Illinois agriculture at present, except in the case of small farms and village plats. The great drawback, however, is the scarcity of proper help for their cultivation at the right time; nevertheless, I do assert that, as the country is more densely settled, it will become more and more necessary, and that even now, near cities and villages, where help and manure is plenty, it may well become an important part of ordinary husbandry.

ARTIFICIAL STONE.

From the Official Report of
A. F. BARNARD, LL. D.,
United States Commissioner to Paris Exposition of 1867.

More remarkable than the agglomerated *betons*, or than any other form of artificial building material yet invented, is the unique composition of analogous character exhibited by Mr. Frederick Ransome of London. This material is equally adapted to heavy constructions and to objects of art and ornament. Its strength is very extraordinary, greatly exceeding that of the sandstones and of most of the harder natural rocks in common use for architectural purposes, to some of which it nevertheless exhibits a striking resemblance in appearance. From the nature of the process of manufacture, it may be variously colored so as to represent the darker marbles; or, in case white sand is selected as the basis, it may be made entirely colorless. Any kind of clean sand may be employed to form the bulk of the composition. The cement by which the particles are bound together, when the process of transformation is complete, is silicate of lime. A description of the interesting process, by the application of which, out of the most incoherent materials, great masses of solid rock or ornamental objects of every variety of pattern are produced in the works of Mr. Ransome in the course of a few hours, was published during the continuance of the exposition in Mr. Colburn's London journal of engineering, and this account so fully exhausts the subject, and is at the same time so lucid and satisfactory, that it is here substituted instead of the notice intended originally to occupy this place:

"If Mr. Ransome has not found the philosopher's stone, he has at least produced a stone worthy of a philosopher, and which promises to become the stone of the ages. For it appears to have elements of great durability, and it certainly possesses every other quality desirable in building stone, whether for structure or ornament. Although five years are not five centuries, chemistry has analyzed even the tooth of time, and can produce within the period of a comparatively brief experiment, results identical with those of ages of atmospheric corrosion and disintegration. Mr. Ransome's stone has been boiled, and roasted, and frozen, and pickled in acids, and fumigated with foul gases, with no more effect than if it had been a boulder of granite or a chip of the blarney stone. It has been boiled and then immediately placed on ice, so as to freeze whatever water might have been absorbed, and it has been also roasted to redness, and then plunged in ice water, but without any sign of cracking or softening, superficially or otherwise. Nor does its durability rest alone upon such evidence as this, for it is of the simplest chemical composition; and chemistry and geology alike testify to the durability, if not to the indestructibility, of a stone which is nearly all silica, like flint, an onyx, and agate, and jasper. It has no oxidizable constituent; for silica, or silicic acid, is already oxidized, and thus it is unalterable in air; and as the new stone is almost impermeable, it will suffer little, if any, injury from moisture or frost.

"And how marvelous, for its simplicity and beauty, is the process by which this stone is made! Some toiling mason or other, hewing in the quarry or in the builder's yard, must have wished, before now, that stone, like iron, might be melted and run in moulds, even though his own occupation were thus at an end. Did he ever, when by the sea-shore or by a sand-pit, think of cementing indissolubly together the countless millions of grains into solid rock? Mr. Ransome, no mason, however—unless he be, as he may be for anything we know, a member of the mystic brotherhood—did think of this. And he tried every cement he could lay his hands to, and did not succeed. The sand became little else than mortar by such sticking as he could effect. But he found out, at last—and we are speaking of a time more than twenty years ago—that the best sandstones were held together by silicate of lime. And so he set himself to work to produce this substance, indirectly, from flints, of which plenty could be found for the purpose. But the flints had to be liquified first, and how could this be done? Not by heat, nor would caustic soda touch them, so the chemist said. Flints might be boiled in a caustic solution for a week together, so long as the boiler was an open one, and lose very little by the operation. But by-and-by Frederick Ransome made one of the most unexpected discoveries in chemistry, viz., that when boiled in a caustic solution, *under pressure*, flints would melt almost like tallow before the fire. But we are not about to give the long history of the invention. With flint soup, or silicate of soda as a liquid, the question was, what other liquid would, in mixing with it, turn both into an enduring solid? What other liquid would turn both into silicate of lime, the substance he was seeking? When he found that chloride of calcium (in solution) would, when mixed with silicate of soda, turn both into flint, or something very much like it, the road was clear, and the manufacture of stone from sand was as simple and as beautiful a process as the making of Bessemer steel from pig-iron by blowing air through it when in the melted state.

"During the month of June, 1867, on the occasion of a visit of a party of about one hundred and eighty gentlemen, comprising heads of public offices and boards, chemists, geologists, engineers, architects, and others, to the new works of the Patent Concrete Stone Company at East Greenwich, Mr. Ransome showed and explained the whole process of making stone from sand, and exhibited some hundreds of the objects and ornaments, many of them of great beauty, already made to the order of architects and builders for various new buildings in England and abroad.

"The sand, a clean-grained, slightly brownish sort, just such as a dishonest grocer might select for increasing the gravity, specific or otherwise, of his ugar, comes from near Maidstone. There is no end to the quantity of it, and we believe it costs less than three shillings a ton in the Thames. There are flints enough for a hundred years to come brought up from the chalk pits at Charlton; and the caustic soda and the chloride of calcium, the latter a waste product of the soda manufacture, are bought of the wholesale chemists. The silicate of soda is made from the flints and caustic soda as follows: The flints are heaped upon iron gratings within a series of cylindrical digesters, of the material, size, and form of small steam-boilers. A solution of caustic soda is then added; the digester is then closed steam-tight, and the contents are boiled by steam of seventy pounds taken from a neighboring boiler and led through the solution in a coil of iron pipes. The solution of caustic soda is prepared of a specific gravity of about 1.200. The flints are dissolved into 'soluble glass,' and are drawn off in that state as a clear though imperfectly liquid substance, which is afterwards evaporated to a treacly consistency and color, and of a specific gravity of 1.700.

"The sand is completely dried, at the rate of two tons an hour, within a revolving cylinder, through which hot air is forced by a centrifugal fan. A small portion of finely ground carbonate of lime, say Kentish rag, or even chalk, is mixed with the sand, the more closely to fill the interstices; and each bushel of the mixture is worked up in a loam mill along with a gallon of the silicate of soda. Thoroughly mixed with this substance, the sand has a sticky coherence, sufficient to enable it to be moulded to any form, and, when well rammed, to retain its shape, if very carefully handled. In this condition—moulded, of course, and anything that can be done in founder's loam may be done in this sand, sticky with silicate of soda—in this condition it is ready for the solution of chloride of calcium. The instant this is poured upon the moulded sand, induration commences. In a minute or so little lumps of sand, so slightly stuck together by the silicate of soda that they could hardly be kept from falling to pieces within the fingers, were solidified into pebbles so hard that they might be thrown against a wall without breaking, and only a short further saturation was necessary to indurate them throughout. In other words, on the instant of contact, the silicate of soda and the chloride of calcium mutually decompose each other and reunite as silicate of lime and chloride of sodium, the former practically indistructible in air, the latter, common salt, perfectly deliquescent and removable by washing, although the stone, *after* the washing, is impermeable to water. Plaster of Paris does not set quicker than silicate of soda and chloride of calcium.

"The chloric solution is first ladled upon the moulded sand, and the hardening going on, the objects are afterwards immersed in the solution itself, wherein large pieces are left for several hours, the solution being boiled in open tanks by steam led through it in pipes. This expels any air which may have lodged in the stone, and possibly heightens the energy of union with the silicate.

"After this the stone is placed, for a longer or shorter time, according to the size of the object, under a shower bath of cold water. This is not, by bathing, to convert it into Bath stone, although were the Bath stone a sand stone instead of an oolitic formation, this name would do as well as any. The salt, or chloride of sodium, deposited throughout the interstices, is sought out and washed away, in brine, by the water, and were it not that a portion of undecomposed chloride of calcium is also washed out, this brine might be profitably evaporated for common salt. Now this searching out of the salt by the water would appear to prove that the stone was perfectly permeable, but, by one of those parodoxes with which chemistry abounds, the stone, when once freed from the salt, is almost impermeable. The action is one which, if it can be explained at all, can only be explained as to one of the phenomena of dialysis, as experimentally investigated by Professor Graham. There is no doubt whatever that salt has been deposited everywhere throughout the stone, no doubt that it is afterwards completely washed out, and yet the stone as effectually resists the passage of water afterwards as if it were granite or marble.

"It is not necessary to describe the variety of objects that may be made in the new stone. It is practically a fictile manufacture, although not indurated by fire, and, unlike fictile goods, having no shrinkage or alteration of color in the making. Whatever the required size of the finished stone, it is moulded exactly to that size, with no allowance as in moulding fire-clay goods or in patern-making for castings in iron. The heaviest blocks for works of stability, and the most elaborately ornamental capitals, tracery, or copies of statuary may be made with almost equal facility. For any purpose for which natural stone has ever been used for construction or architectural ornament, the artificial stone will fitly take its place. Mr. Fowler has used it extensively in the stations of the Metropolitan railway; Messrs. Lucas Brothers have used it with success in various works; several manufacturers at Ipswich and elsewhere have the bed-stones of their steam engines, steam hammers, oil mills, etc., formed of the new stone. Mr. Ransome has moulded a large number of Ionic capitals for the New Zealand post office, and still more richly embellished capitals, modelled from those of the Erectheum at Athens, for public buildings at Calcutta, besides a great amount of decorative work for English architects. We understand that some thousands of Corinthian capitals of this stone are specified for the new St. Thomas's Hospital, and the architects of the Grand Hotel of New York have decided to employ it for all the decorative work of the grand court of that edifice.*

"While, however, the new stone affords every facility for ornamental moulding, we consider that its more important purpose is as a substitute for ordinary cut building stone, and for that employed in pilasters, window dressings, garden balustrades, etc. It is truly the stone of the million, as well as for the million, and ought to take the place of stucco for exterior work in our own town houses. We have not heard that the workmen have set their faces against it, although an intimation of this sort wonld not surprise us, but we should suppose that a proper knowledge of its advantages would insure its general adoption in spite of any possible opposition of this kind. We believe it to be the fact that builders are slow to move, but there are always exceptions, and, as in other trades, great improvements like this will make way against all opposition.

"On the visit to the new works above spoken of, Mr. Dimes made an experiment upon two cubes of the new stone, each four inches square, and made only ten days before. One took forty-four and the other forty-eight tons to crush it, while a like cube of Bath stone gave way at fourteen tons. Mr. John Grant, the assistant engineer to Mr. Bazalgette, of the Metropolitan Board of Works, also made experiments on the same occasion, on the tensile strength of the stone. Specimens having a sectional area of two and a quarter inches bore, respectively, eight hundred and seventy pounds and twelve hundred pounds. These specimens had been made but five days previously.

"The new works of the Patent Concrete Stone Company have been laid out upon a large scale and admit of easy extension. They are already engaged upon a large amount and a remarkable variety of work, and it cannot be doubted that the excellence and great cheapness of their manufacture, the former now proved by nearly every test known to engineers, architects, chemists, and builders, will rapidly secure for it a vastly wider introduction than it has yet attained."

Besides the important applications of the Ransome process to the manufacture of building stone, and to the production of the works of art, it has furnished a very valuable aid to mechanical industry, by providing the best material yet known for the manufacture of grindstones. The extreme hardness of the silicious cement which binds together the grains which compose this material, secures it from the rapid disintegration which takes place when steel tools are ground on the best grindstones formed from natural rock. The following interesting

*This project has been abandoned, but the fact mentioned shows that the invention of Mr. Ransome is appreciated so far as it has become known in our country.

notice of these stones is derived from the same source to which we are indebted for the foregoing description:

"The success which has attended the application of Mr. Ransome's beautiful process to the manufacture of artificial grindstones has been so marked that there seems to be little doubt that the use of natural stones for grinding purposes will eventually become the exception instead of the rule. Amongst other firms, Messrs. Bryan Donkin & Co., the well-known engineers of Bermondsey, have tried experiments which very decisively prove the advantages of the artificial over the natural stones. Messrs. Donkin were first supplied with a pair of Mr. Ransome's artificial grindstones in December last, and early in the present year they carefully tested these stones and compared their efficiency with some Newcastle stones at their works. Both the natural and artificial stones were mounted in pairs on Muir's plan—a system in which the peripheries of the two stones of each pair rub slightly against each other, with a view of causing them to maintain an even surface—and the two sets of stones were tried under precisely the same circumstances, except that the Newcastle stones had a surface speed more than twenty per cent. greater than that of the others.

"The trials were made as follows: A bar of steel, three-fourths of an inch in diameter, was placed in an iron tube containing a spiral spring, and the combination was then arranged so that the end of the bar project from the one end of the tube barely touched one of the artificial stones, while the other end of the tube rested against a block of wood fixed to the grindstone frame. A piece of wood of known thickness was then introduced between the end of the tube and the fixed block, and the spiral spring, being thus compressed, forced the piece of steel against the grindstone. The same bar of steel was afterwards applied in the same way, and under presicely the same pressure, to the Newcastle stone, and the times occupied in both cases in grinding away a certain weight of steel from the bar were accurately noted.

"The results were that a quarter of an ounce of steel was ground from the bar by the artificial grindstone in *sixteen minutes*, while to remove the same quantity by the Newcastle stone occupied *eleven hours;* and this notwithstanding that the surface speed of the latter was, as we have stated, more than twenty per cent greater. Taking the twenty per cent. greater speed of the Newcastle stone into account, it will be seen that the eleven hours run by it were equal to thirteen and three-quarters hours at the same speed as the artificial stone, and the proportional times occupied by the two stones were thus as sixteen minutes to thirteen and three-quarters hours, or as one to fifty-two, nearly!

"Such a result as this is something more than remarkable, and it is one which would scarcely have been credited, even by those who made the experiments, if it had not been fully corroberated by subsequent experience in the working of the artificial grindstones. Since the experiments above described were tried, Messrs. Donkin have set another pair of the artificial stones to work, and these, which are now in regular use, have given even more satisfaction than those first tried. The saving in time, and consequently in labor, effected by the use of the artificial grindstones, is, in fact, so great, that Messrs. Donkin have determined to use these stones exclusively in future; and we may add that the artificial stones are so much preferred by the workmen, that those men, even, who are employed in shops at some distance from that in which the stones at present in use are situated, prefer taking the trouble to go to them to using the Newcastle stones in their own shops. In addition to their great efficiency the artificial grindstones possess the advantages of being able to be manufactured of any size, and of any degree of coarseness of grain, and they can thus be specially adapted to any particular class of work, while the process of their manufacture insures their being of uniform texture throughout, and free from the flaws and hard and soft places found in natural stones. Altogether, we believe, that the general adoption of the artificial grindstones is merely a matter of time."

LATE FARM EXPERIMENTS.

Since the establishment of agricultural colleges, systematic experimentation has become common in all countries where such institutions exist. It could hardly be expected, on the one hand, that many, nor indeed any, of the various difficult problems that perplex the intelligent agriculturist will be settled immediately; nor, on the other, can it be denied that such questions are at last in the way to be settled, nor that science has fairly undertaken to determine the principles which underlie the agricultural art. Both for the conclusions already reached and for the valuable suggestions they afford to private experimenters, we extract from several of the reports of such institutions such matter as seems most interesting and important.

EXPERIMENTS ON THE FARM OF THE WISCONSIN STATE UNIVERSITY.

From the report of the board of regents of the Wisconsin State University we copy the following account of experiments conducted by Prof. W. W. Daniells, chief of the agricultural department:

EXPERIMENTS.—A scheme of experiments for the year was prepared by me, and submitted to the board of regents, for their approval, at their meeting in February. From that list the farm committee chose the following as those best adapted to present facilities for conducting experiments:

1*st. Wheat*—To try raising winter wheat by protecting from winds by belts of timber. The trial to be made with both red and white varieties.

2*d. Profits of Wheat and Corn Raising.*—Cultivate an equal quantity of ground in each, keeping an account of the cost and value of production; the value of crop to be the average of market values for five years in this market.

3*d*. *Drill and Hill Planting.*—Try the comparative values of drill and hill planting with corn and potatoes.

4*th*. *Potatoes.*—Let experiments of last year be repeated to verify results, and take the same in connection with the amount of rain falling; to be continued throughout another year at least.

5*th*. *Corn as a Forage Crop.*—Try a few acres by drilling, and the same quantity by broadcast sowing.

In accordance with these instructions, the following experiments have been performed:

WINTER WHEAT.—Experiments are now in progress with the following varieties:

Treadwell, white, seed from Michigan.

Mediterranean, red, seed from Michigan.

White Winter Touzelle, imported from France, seed furnished by the department of agriculture at Washington.

Profits of wheat and corn raising was necessarily omitted on account of the la·e date of receiving the instructions.

DRILL AND HILL PLANTING CORN.—The result of this experiment was as follows:

Taking the product of drill planting as 100 for a basis of comparison, hill planting yielded 94.6, or 5.4 per cent. less than the drills. That planted in drills contained 11.4 per cent. of soft corn, that in hills 10.9 per cent. The general appearance of the corn in hills was much the best, the ears being larger and filled out better at the tips.

CORN AS A FORAGE CROP.—Equal quantities of land were sown to corn broadcast, and planted in drills three and one-half feet apart, in each case using seven bushels of seed to the acre.

That planted in drills gave the largest yield* of the best forage. That sown broadcast being much the coarser.

Equal quantities of land were sown broadcast at the rate of eleven bushels of seed to the acre, and planted in drills with seven bushels as before. In this case the yield was in favor of broadcast sowing.

One reason of more seed being required with broadcast sowing is that the seed cannot be all covered with a harrow, so that birds and gophers are attracted to the field and carry away much that is uncovered.

A better method for those having grain drills, is to sow nine bushels of seed to the acre, using each third tooth of the drill.

*I am obliged, in these experiments, and in top dressing grass with ashes, to give the *estimated* results, as we have as yet no facilities for weighing such products.

POTATOES.—The land upon which these potatoes were grown, was sward upon which no crop had ever before been raised, plowed in fall of 1868. Soil, clay loam with clay subsoil. Marked with a plow three and one-half feet apart. Planted one foot apart in row, May 4th and 5th. The seed was covered uniformly three inches in depth, and was prepared as follows:

TABLE 1.

Plat.	Method of preparing seed.	No. lbs
1	Large, whole, one in a place	146½
2	Large, cut in 3 pieces, 1 piece in a place	46
3	Small, whole, 1 in a place	58
4	Small ends, cut in 3 pieces, 1 piece in a place	12½
5	Seed cuts of potatoes of ordinary size, 1 piece in a place	26
6	Potatoes of ordinary size without seed ends, 1 in a place	104
7	The same as No. 2	44½
8	Single eyes, 1 in a place	13

June 1st, plants coming up. June 12th, cultivated once in a row and sowed on ashes at the rate of thirty bushels per acre. The same relative growth of tops was observed that was noticed in 1868, viz: No. 1 much the largest, Nos. 3 and 6 next in size. Cultivated second time, and hoed July 6th. Dug October 11th and 12th, yielding as follows:

TABLE 2.

Plat.	Yield in lbs.	Bushels per acre.	Yield in lbs. of 1 lb. seed.	Size.
No. 1	1,009	350	6.2	Very large.
2	778	270	16.9	Large.
3	800	278	13.8	Large.
4	683	237	54.6	Large.
5	777	270	29.8	Large.
6	858	281	8.4	Large.
7	702	244	15.7	Large.
8	617	214	47.4	Large.

No. 1 yields most per acre, yet gives smallest increase for one pound of seed.

It will be noticed that generally, although not uniformly, as the yield increases, the rate of increase for one pound of seed diminishes.

As in last year's experimant, the size of the seed seems to affect the size of the product but slightly. The single eyes gave the smallest yield, as before, but the difference was much less marked than last year. With the exception of plat No. 1, which gave the largest potatoes, the size was very uniform throughout. No. 4 appeared to contain fewer potatoes that were very small than any other plat. The yield corresponds to the comparative growth of tops. No. 1 largest, Nos. 3 and 6 next in order.

That there is a difference in the yield that cannot be attributed to the size of the seed, or the method of cultivation, will be seen by comparing Nos. 2 and 7, which were treated precisely alike, yct one yields twenty-six bushels per acre more than the other. This is a further proof of the difficulty of securing those uniform conditions in agricultural experiments, which will enable one to draw correct conclusions from a limited number of trials.

In table No. 3 will be found the per cent. of yield given by each method of planting for 1868 and 1869, the means of Nos. 2 and 7 in each case being taken as a basis of comparison.

TABLE 3.

Plat.	1868.	1869.
No. 1	107	136
Mean of Nos. 2 and 7	100	100
No. 3	93	108
No 4	98	92
No. 5	93	105
No. 6	115	109
Mean of Nos. 2 and 7	100	100
No. 8	73	83

Nos. 1 and 7 are taken as a basis of comparison, because they correspond most nearly to the usual method of preparing seed.

HILL AND DRILL PLANTING.—Taking hill planting at 100 as a basis of comparison, and drill planting gives 78.8 per cent. This yield is upon adjacent rows, the products having been carefully weighed.

To determine the value of the "Worm and Insect Exterminator and Fertilizer," of the Union Fertilizer Company of New York, as a remedy for the Colorado potato beetle, one ounce of the "fertilizer" was mixed with the earth of each hill of six rows through the center of the field, and for six successive mornings (July 5th to 11th) the vines were sprinkled with a solution of the "fertilizer." This treatment had no visible effect upon the insects.

When harvested, an equal number of hills upon which no "fertilizer" had been used, but from which the beetles had been picked by hand, yielded 180 bs.; with "fertilizer," as above, 164 lbs.

This experiment does not show the value of this substance as a fertilizer, but that it is of no value as a remedy for the Colorado potato beetle. The reason of a smaller yield, is doubtless that the "fertilizer" did not kill the insects, while upon that with which this plat is compared they were all destroyed by hand picking.

In experimenting with the potato beetle, one part by weight of Paris green, mixed with eight parts of wood ashes, was found to be effective in destroying them. Yet, spreading upon the land in cultivation an active mineral poison, as is the subarsenite of copper, the poisonous properties of which are not destroyed by decomposition of the salt containing them, is, at the best, of doubtful propriety. Hand-picking has given us the most satisfactory results. The cost of this method of destroying the beetles has beeu $1.25 per acre for each time of picking.

The number of times it will be found necessary to pick the beetles, will depend upon the warmth and wetness of the season, as they multiply more rapidly in dry, hot weather. Last year five times was not too many. This year three times has been sufficient.

Excelsior Oats.—Seed from department of agriculture. 16½ quarts weighed 25¾ lbs. Sowed upon one-fourth of an acre, May 18th, soil rich clay loam, with clay sub-soil. Growth very rank. Began lodging before heading out. When harvested were three-fourths laid Crop harvested August 11th and threshed August 19th, yielding 9 bushels. One bushel weighed 27 lbs. The straw was badly affected with rust and mildew.

The land upon which these oats were sown would, in ordinary seasons, have been the best we have in cultivation, but the unusual amount of rain this season had an injurious effect upon all our crops planted upon level land, these oats among others.

Three other varieties of oats furnished by the department of agriculture, the White Schonen, Black Swedish and Somerset, were sown, but the heavy rains ruined them entirely.

Of those varieties of cabbage which have been in cultivation, the Schweinfurt Quintal, and Marblehead Drumhead, (cannon ball variety), are the only kinds that promise to be of special value. Lenormand's short-stemmed cauliflower also promises well.

Upon one portion of the land prepared last year for mowing, unleached ashes were sown last spring, at the rate of forty bushels per acre. The estimated yield upon this portion of the field was double that upon any other portion.

The grass was mostly Kentucky blue grass (*Poa pratensis*), and white clover; the soil clayey with clay subsoil.

CLOVER AS A PREPARATORY CROP FOR WHEAT.

From a paper in the journal of the Royal Agricultural Society of England by Dr. Augustus Voelcker, professor of agriculture at Cirencester, we take the following:

Reasons are given in the beginning of this paper which it is hoped will have convinced the reader that the fertility of land is not so much measured by the amount of ash constituents of plants which it contains, as by the amount of nitrogen, which together with an excess of such ash constituents, it contains in an available form. It has been shown likewise that the removal from the soil of a large amount of mineral matter in a good clover crop, in conformity with many direct field experiments, is not likely in any degree to affect the wheat crop, and that the yield of wheat on soils under ordinary cultivation, according to the experience of many farmers, and the direct and numerous experiments of Messrs. Lawes and Gilbert, rises or falls, other circumstances being equal, with the supply of available nitrogenous food which is given to the wheat. This being the case, we cannot doubt that the benefits arising from the growth of clover to the succeeding wheat are mainly due to the fact that an immense amount of nitrogenous food accumulates in the soil during the growth of clover.

This accumulation of nitrogenous plant food, specially useful to cereal crops, is as shown in the preceding experiments, much greater when clover is grown for seed than when it is made into hay. This affords an intelligible explanation of a fact, long observed by good practical men, although denied by others who decline to accept their experience as resting on trustworthy evidence, because, as they say, land can not become more fertile when a crop is grown upon it for seed which is carried off, than when that crop is cut down and the produce consumed on the land. The chemical points brought forward in the course of this inquiry show plainly that mere speculations as to what can take place in a soil and what not, do not much advance the true theory of agricultural practices. It is only by carefully investigating subjects like the one under consideration that positive proofs are given showing the correctness of intelligent observers in the fields. Many years ago I made a great many experiments relative to the chemistry of farm-yard manure, and then showed, among other particulars, that manure spread at once on the land, need not then and there be plowed in, inasmuch as neither a broiling sun nor a sweeping and drying wind will cause the slightest loss of ammonia, and that, therefore, the old fashioned farmer who carts his manure on the land as soon as he can, and spreads it at once, but who plows it in at his convenience, acts in perfect accordance with correct chemical principles involved in the management of farm-yard manure. On the present occasion my main object has been to show, not merely by reasoning on the subject, but by actual experiments, that the larger the amount of nitrogen, potash, soda, lime, phosphoric acid, &c., which are removed from the land in a clover crop, the better it is, nevertheless, made thereby for producing in the succeeding year an abundant crop of wheat, other circumstances being favorable to its growth.

Indeed no kind of manure can be compared in point of efficacy for wheat to the manuring which the land gets in a really good crop of clover. The farmer who wishes to derive the full benefit from his clover-lay, should plow it up for wheat as soon as possible in the autumn, and leave it in the rough state as long as is admissible, in order that the air may find free access into the land, and the organic remains left in so much abundance in a good crop of clover be changed into plant food; more especially, in other words, in order that the crude nitrogenous organic matter in the clover roots and decaying leaves may have become transformed into ammonical compounds, and these in the course of time into nitrates, which I am strongly inclined to think is the form in which nitrogen is assimilated, par excellence by cereal crops, and in which, at all events it is more efficacious than in any other state of combination wherein it may be used as a fertilizer.

When the clover-lay is plowed up early, the decay of the clover is sufficiently advanced by the time the young wheat-plant stands in need of readily available nitrogenous food, and this, being uniformly distribnted through the whole of the cultivated soil, is ready to benefit every single plant. This equal and abundant distribution of food, peculiarly valuable to cereals, is a great advantage, and speaks strongly in favor of clover as a preparatory crop for wheat.

Nitrate of soda, an excellent spring top-dressing for wheat and cereals in general, in some seasons fails to produce as good an effect as in others. In very dry springs the rainfall is not sufficient to wash it into the soil and to distribute it equally, and in very wet seasons it is apt to be washed either into the drains or into a stratum of the soil not accessible to the roots of the young wheat. As therefore the character of the approaching season can not usually be predicted, the application of nitrate of soda to wheat is always attended with more or less uncertainty.

The case is different when a good crop of clover hay has been obtained from the land on which the wheat is intended to be grown afterwards. An enormous quantity of nitrogenous organic matter, as we have seen, is left in the land after the removal of the clover crop; and these remains gradually decay and furnish ammonia, which at first and during the colder months of the year is retained by the well known absorbing properties which all good wheat soils possess. In the spring when the warmer weather sets in, and the wheat begins to make a push, these ammonia compounds in the soil are by degrees oxidized into nitrates; and as this change into food, peculiarly favorable to the yonng cereal plants, proceeds slowly but steadily, we have in the soil itself, after clover, a source from which nitrates are continually produced; so that it does not much affect the final yield of wheat whether heavy rains remove some or all of the nitrate in the soil. The clover remains thus afford a more continuous source from which nitrates are produced, and a greater certainty for a good crop of wheat than when recourse is had to nitrogenous top-dressings in the spring.

The remarks respecting the formation of nitrates in soils upon which clover has been grown, it should be stated, do not emanate from mere speculations, but are based on actual observations.

I have not only been able to show the existence of nitrates in clover soils, but have made a number of actual determinations of the amount of nitric acid in different layers of soils on which clover has been grown; but as this paper has grown already to greater dimensions than perhaps desirable, I reserve any further remarks on the important subject of nitrification in soils for a future communication.

The following are some of the chief points of interest which I have endeavored fully to develop in the preceding pages:

1. A good crop of clover removes from the soil more potash, phosphoric acid, lime and other mineral matters, which enter into the composition of the ashes of our cultivated crops, than any other crop usually grown in this country.

2. There is fully three times as much nitrogen in a crop of clover as in the average produce of the grain and straw of wheat per acre.

3. Notwithstanding the large amount of nitrogenous matter and of ash constituents of plants in the produce of an acre, clover is an excellent preparatory crop for wheat.

4. During the growth of clover a large amount of nitrogenous matter accumulates in the soil.

5. This accumulation, which is the greatest in the surface-soil, is due to decaying leaves dropped during the growth of the clover, and to an abundance of roots, containing when dry from 1¾ to 2 per cent. of nitrogen.

6. The clover roots are stronger and much more numerous, and more leaves fall on the ground, when clover is grown for seed, than when it is mown for hay; in consequence more nitrogen is left after clover-seed than after hay; which accounts for wheat yielding a better crop after clover seed than after hay.

7. The development of roots being checked when the produce, in a green condition, is fed off by sheep, in all probability leaves still less nitrogenous matter in the soil than when clover is allowed to get riper and is mown for hay; thus, no doubt, accounting for the observation made by practical men, that notwithstanding the return of the produce in the sheep excrements, wheat is generally stronger and yields better, after clover mown for hay, than when the clover is fed off green by sheep.

8. The nitrogenous matters in the clover-remains on their gradual decay are finally transformed into nitrates, thus affording a continuous source of food, on which cereal crops specially delight to grow.

9. There is strong presumptive evidence that the nitrogen which exists in the air in the shape of ammonia and nitric acid, and descends in these combinations with the rain which falls on the ground, satisfies, under ordinary circumstances, the requirements of the clover crop. This crop causes a large accumulation of nitrogenous matters, which are gradually changed in the soil into nitrates. The atmosphere thus furnishes nitrogenous food to the succeeding wheat indirectly, and so to say, gratis.

10. Clover not only provides abundance of nitrogenous food, but delivers this food in a readily available form (as nitrates) more gradually and continuously, and consequently with more certainty of a good result, than such food can be applied to the land in the shape of nitrogenous spring top-dressings.

ROOT AND GRASS CULTURE, FEEDING OF STOCK, ETC.

For the substance of various reports on the above subjects we are indebted to the report of the Department of Agriculture for 1868:

EXPERIMENTS IN TURNIP CULTURE.—The prominence of root culture in the agricultural system of Great Britain is well known, though the value of the product and the quantity obtained per acre by good culture in a favoring climate are not fully understood. In the transactions of the Highland Agricultural Society of Scotland for 1868, is published a report of experiments made by Mr. Henry Shaw, with different varieties of turnips. Upon this result a gold medal was awarded to him by the society. The field on which the experiments were made had a southern exposure, about seven hundred feet above the sea level, its soil being a light loam, dark in color, especially adapted to grass and turnips; the subsoil, a strong, brownish clay. The land had been subjected to a six-course rotation; one year in mowing, three in pasture, followed the fifth year by oats, and the next year by turnips. Sixteen varieties of turnips were sown in plots measuring one-eighth of an acre each. Each of these allotments was manured with two and a half cubic yards of farm-yard dung and twenty-eight pounds of dissolved bone; excepting the spot sown with Swedes, whereon this quantity of dissolved bone was doubled, the amount of dung being the same. The product per imperial acre is given in the accompanying table, fractions of hundred-weights not reported:

Kind.	Product.	
WHITE TURNIPS.	*Tons.*	*Cwt.*
Common White Globe	25	15
Tankard Globe	24	10
Pomeranian White Globe	26	00
Graystone Globe	25	19
Ret-top Globe	25	4
YELLOW TURNIPS.		
Early Bullock Yellow	23	15
Aberdeen Bullock Yellow	23	2
Dale's Hybrid Yellow	22	6
Old Meldrum Yellow	24	3
Tweeddale Purple-top Yellow	21	2
Aberdeen Purple-top Yellow	21	15
SWEDES.		
Bangholme Swede	19	18
Bronze or Kinaldie's Swede	19	14
Shepherd's Swede	21	7
Skirving's Improved Swede	20	6
Skirving's King of the Swedes	19	15

Mr. John Milne also received a gold medal from the Highland society for experiments made during three consecutive years on a farm in Aberdeenshire, designed to test the comparative productiveness of varieties. The field had a light soil, suitable to turnips, resting on a clay slate and had been subject to a five-course rotation. In each case the manures applied per acre were fifteen yards of farm-yard dung, one hundred-weight of Peruvian guano, two hundred-weight of bone-dust, and two hundred-weight of superphosphate. The results are given by Mr. Milne in tons and thousandths of a ton. The abstract here presented is confined to varieties of Swedes:

Varieties.	1864.	1865.	1866.
	Tons.	*Tons.*	*Tons.*
Drummond's Extra Improved	15.804	12.051	16.850
East Lothian	15.804	11.787	14.250
Green-top	12.946	12.402	14.700
Laing's	16.606	10.075	13.150
Bangholme	16.563	13.001	......

The report states that the turnip degenerates, if sown for a few successive years on poor, unmanured soil, from a large fleshy bulb to a small, elongated fibrous root; and years of careful cultivation are required to restore it to its former value. Hence the use of seed grown for a series of years from full-sized, transplanted bulbs is urged; and it is claimed that the difference in productiveness between two varieties, or two samples of the same variety, may be wholly owing to the method in which the seed has been raised.

GRASS AND HAY.—In the report of the Royal Agricultural Society of England for 1867, Professor Voelcker states at considerable length the results of experiments instituted by him some years ago at the agricultural college, Cirencester, on a level clover field of calcareous soil, both by nature and condition of tillage well adapted to this plant. The experiments were especially directed towards establishing the proper period for cutting the hay crop. Twelve plots were set apart, each measuring one rod square. On these plots cuttings were made at different periods, from May 26, to July 28; some of them being mown from two to four times each, others only once. The cuttings were analyzed in such manner as to exhibit in each case, 1st. The weight of the fresh cut clover; 2d. The weight of the hay made therefrom and cured to a uniform standard, containing 16.7 per cent. of moisture; 3d. The per centage of nutritious elements contained in this hay. By estimate from the product of a first cutting made June 16, the yield of hay per acre at that period was 7,557 pounds, being the greatest quantity obtained at any one mowing. Analysis of the cuttings of the different periods show furthermore that at this time the hay contained the greatest proportional amount of nutriment. In the plots first cut at dates earlier or later than that just mentioned, deficiencies in quality and total yield were in approximate proportion to the differences of time observable between said dates and the period of best production, namely, June 16. As an indicatory example, plot No. 5 was first cut June 2, yielding 5,372 pounds of hay, and again mowed June 16, yielding 102 pounds. Total yield of plot No. 5, up to date of June 16, 5,474 pounds; thus exhibiting, when compared with No. 7, not only a deficiency in average quality, but also a deficiency in quantity of at least 2,083 pounds.

Deduction: Cut at the period when the clover plant contains its greatest proportion of nutriment, and before the ripening of the seed. A current agricultural rule expresses the principle: "Cut when one-half of the heads are browned." A like principle is involved in the cutting of the other grasses.

FEEDING STOCK.—Mr. William Birney, Springfield, Massachusetts, commenced ten years ago the practice of cooking food for stock. The present winter (1868) he feeds forty-three head of neat stock, equivalent to thirty-four mature animals; also three working horses, three three-year-old colts, and three yearling colts. The food is cooked in a large steam-box, holding, for instance, 1,350 pounds poor average quality of hay—two-thirds bog or marsh hay—112 pounds wheat shorts, and 44 pounds cotton seed; 200 gallons of water are poured on previous to the steaming, which takes five or six hours, and requires 125 pounds of coal. Steaming is done only twice a week, the food keeping warm three or four days in the box, even in the coldest weather. Twice a day the requisite quantity of material is taken from the box. The horses, when at work, receive four quarts of corn each per day, sprinkled on the steamed food. Each milch cow has also two quarts of wheat shorts per day. Roots fed raw are also administered. The stock is kept in good condition, carded and combed. The temperature of the stable is always above freezing point. A statement of the cost of food is given below. The coal is charged to general account; were it added to the following items it would not increase the average daily cost to seventeen cents:

1,350 pounds poor hay, at $12 per ton	$8 10
112 pounds bran	1 90
44 pounds cotton seed meal	99
Total cost of steamed food for three and a half days	$10 99

Cost for one day, steamed food	$3 14
Extra meal for three horses, 24 pounds	60
Extra shorts for 20 cows, 70 pounds	1 19
12 bushels roots, at 16⅔ cents per bushel	2 00
170 pounds of hay, at $20 per ton	1 70
Daily cost of feeding 52 animals	$8 63

Average cost, 16⅝ cents.

The 170 pounds of good hay is for noon lunch—four or five pounds to each animal, on an average.

EXPERIMENTS WITH OATS, WHEAT, BARLEY, ETC.

The following reports of experiments made under the direction of Thos. H. Burrowes, president and professor of agriculture, are taken from the report of the board of trustees of the Agricultural College of Pennsylvania for 1869:

VARIETIES OF OATS GROWN.—The following varieties of oats were grown in the north-east field—previous crop, corn; ground plowed 5th to 9th of fourth month; seed put in 12th and 13th; two bushels of seed to acre, sown broadcast, harrowed in and rolled:

No.		Weight per bushel of seed sown.	Weight per bushel of produce.	Gross weight of produce per ⅛ acre.	Weight of straw and chaff.	Yield in bushels per ⅛ acre.		Weight of grain per ⅛ acre.
		lbs.	*lbs.*	*lbs.*	*lbs.*	*bu.*	*qts.*	*lbs.*
6	Surprise	17	35¼	265½	151¼	3	7¾	114⅞
7	Prince Edwards	39	31¾	367½	218¼	4	22⅜	149¼
8	White Norway	20	33½	260¾	151⅛	3	8¾	109⅝
9	New Brunswick	17	31	288	165½	3	30½	122½
10	Barley Associate	27	31¼	217½	116⅜	3	6¼	100⅝
11	Common White oats	17½	78¾	410¾	295½	4	0¼	115¼
12	Canada	16	29	246	156	3	3¼	90
13	Black Poland	23	30⅜	335¼	181	5	2¾	154⅜
14	Scotch, (imported seed,)	42	29⅞	329½	213¼	4	0	116¼
15	Norway, (Black), from Vermont	27½	31	354	192⅞	5	6¼	161⅛
16	Norway, (Black), from G. A. Deitz	28½	31½	417½	241	5	19¼	176½
17	White Poland	22	35	328	183⅝	4	4	144⅜
18	Sandy Scotch	20	29	356	243	3	28¾	113
19	White Swedish	36½	33½	381¼	238¾	4	8⅛	142½
20	Georgia	.....	26	300	170	5	0	130
21	Yellow Poland	17½	26¾	320	176¾	5	11⅜	143¼
22	Black Hungarian	17	29	372	209	5	19⅛	163
23	White Schoenen	43	26½	357¾	195¾	6	3⅝	162
24	Black Swedish	41¼	22¼	394¾	270¾	5	16¼	124
25	Somerset	50	36	437⅜	245⅜	5	10⅝	192½
26	Italian	22	28⅞	278¼	172¾	3	20⅞	105½

VARIETIES OF WHEAT GROWN.—It was the aim to make the different parts of the field of as near equal fertility as possible.

No.		Weight per bushel produce.	Bushels grain produced per ⅛ of acre.		Gross yield per ⅛ of acre of produce.	Weight straw per ⅛ acre.	Weight grain per ⅛ acre.
		lbs.	*bu.*	*qts.*	*lbs.*	*lbs,*	*lbs.*
27	Tappahannock	64	3	5	576⅜	347⅜	202
28	White Blue Stem	65	3	19	644¼	410¾	333½
29	German Amber	61½	3	3⅛	609¼	418¾	190½
30	Witter	60	3	19⅞	650⅞	433⅝	217¼
31	Diehl	59¼	2	26	480¾	313¾	167
32	Week's White	62	4	1¼	664⅝	414¼	250⅜
33	Rochester Red	62	2	18¼	566½	397⅜	159⅛
34	Extra Early Jersey	65	3	16½	599⅞	371⅜	228½
35	Russian Amber	60½	3	5⅛	660¼	469	191¾
36	White Chaff Mediterranean, seed imported.	60½	3	2	553½	368¼	185¼
37	Orceina	55	3	0	613	448	165
38	Rue's Amber	61½	3	19¼	652¼	430¾	221⅛
39	French White Chaff Mediterranean	61	3	1⅝	569	382⅞	186⅓
40	White Chaff Italian	70⅞	3	3	531¾	346⅛	185⅝
41	Treadwell	60¼	3	10¾	747⅛	446⅛	201
42	Rough and Ready	63¾	4	12½	807⅞	528	249⅞
43	Hungarian Red	62½	2	27⅛	617¾	439¾	178
44	White Chaff Mediterranean, (old)	58½	3	14	660⅞	359⅞	201
45	Red Chaff Mediterranean	62	3	10⅓	700⅞	494⅞	206
46	Lancaster Red	62	2	22¼	590⅞	423¾	157⅛
47	Mixture of 35 kinds	59	2	1	398¾	278¾	120
48	American White	57	2	28⅝	624¼	459⅛	165⅛
49	Italian Red	62¼	2	28¼	520¾	340¾	179½
50	Brittanny	62	3	31½	721⅜	474¼	247⅛
51	French Red Chaff	59½	3	14	797¼	502¾	204½
51½	Shade Mountain White	58	3	6⅓	879⅛	693⅝	185½
52	Berdenska Red	63½	3	23⅝	628⅛	467	171⅛
53	Talavera	53	1	21½	400½	311	88½
54	Rough Chaff	49½	1	1½	331	279¼	51¾
55	Italian White	59	1	30	418⅞	304⅜	114¼
56	California White	55	1	28¾	405⅝	300⅞	104½
57	Ancona Red	55	0	30½	282⅛	229¾	52⅜
58	Salla Red	50½	1	17½	533⅞	475¾	78⅛
59	Sandonica White	58	2	7	561⅞	433	128⅛
60	Bohemian Red	59¼	1	17	448½	357½	91
61	Sakonka Red	60	1	19	321⅝	225½	95⅞

BARLEY.—The following kinds of barley were grown in the south field, al but No. 105, on land that, last year, had fourteen loads of stable manure, and grew a crop of potatoes. No fertilizer applied this year for the barley. The ground for No. 105 was oats stubble, prepared as for wheat, and put in at same time, but had only six loads of manure to acre. The mildew season occurred at a time to injure the spring barley so as to make a very poor crop. The winter barley was then nearly ripe and escaped uninjured—made a beautiful crop—ripe and cut the 28th of sixth month:

When planted.	No.		Weight per bushel seed sown.	Weight per bush. grain produced.	Yield in bushels of produce per ⅛ acre.		Gross yield per ⅛ acre.	Weight of straw and chaff per ⅛ acre.	Weight of grain per ⅛ acre.
			lbs.	*lbs.*	*bu.*	*qts.*	*lbs.*	*lbs.*	*lbs.*
7th of 4th m'th	100	Common 2 row'd bar	......	47	2	11½	255⅞	144⅞	111
7th .....do....	101	Nonpariel 6..do	44⅔	44¼	1	2⅛	189½	133	47½
7th .....do....	102	California 6..do	48	41¾	0	30⅛	282¾	243	39¼
15th .....do....	103	Probstier 2..do	58	49	1	17⅞	348¾	272 ¼	49¾
15th .....do....	104	Saxonian 2..do	56¼	48	1	1⅛	277½	226¾	76¾
19th 9th m'th '68	105	Winter...6..do	......	48½	5	21¾	543⅝	268⅓	275½

POTATO EXPERIMENTS.—Previous crop—corn, 1868; lot 40 perches long and 10 perches wide; plowed 15th to 23d of fourth month, and in the following manner, viz: 14 yards wide, gathered in the middle with common plow, 4 inches deep. Then outside of this, 7 yards wide on each side, with common plow, 7 inches deep; next outside of this, 7 yards wide, with double Michigan plow, 11 inches deep; and lastly, 7 yards wide on each side, with common plow, 7 inches deep, followed by a subsoil plow, 9 inches deep in bottom of furrow, making 16 inches deep of stirred soil. Outside of all, we plowed 6 feet wide, common plow, 6 inches deep, for turning ground. Here now, we have 14 yards wide of each kind of plowing, and clear of furrows and ridges. The ground barrowed and rolled, and marked out crosswise, or at right angles to way plowed, so that each row will show in 8 parts the relative merits of the 4 ways of plowing. The rows were all 3 feet apart, and all 3 inches deep, except where otherwise noted, and the potatoes all carefully covered with the Hexamer pronged hoes. About one-half this lot had stable manure applied, at rate of 11 ox cart loads to acre, and plowed in. To the balance we applied the commercial fertilizers in the furrow—20 cents worth to each row of 10 perches long, or at rate of $17.28 per acre.

CLASS 1.—Different sized seed; different ways of cutting and thinning; the seed all selected from its corresponding type; the produce of last year grown in same way. The potatoes are all planted 18 inches apart in the rows, (accurately measured by machine alluded to in early potatoes), where not otherwise noted. Planted 11th, 12th and 13th of fifth month. Moro

Philips' phosphate used in all experiments where not otherwise noted—20 cents worth to row.

No.		No. and comparative w't seed planted.		Culls per ⅛ of acre.	Saleable potatoes per ⅛ of acre.	Gross yield pr ⅛ acre.
		No.	*lbs.*	*lbs.*	*lbs.*	*lbs.*
170	Large Monitors, whole tubers, planted 3 ft. apart	56 eq.	21½	19¼	1,155	1,174¼
171	.. do .... do .... quartered lengthwise	28 "	8½	11	1,119¼	1,130¼
172	.. do .... do .... halv'd lengthwise, then cut across; blossom end used	56 "	18½	16½	1,091¾	1,107¼
173	.. do .... do .... cut same as 172, but the root end used	56 "	15½	12½	1,047¾	1,060¼
174	Medium sized Monitors, whole tubers	112 "	17⅛	22	1,179¾	1,201¾
175	.. do .... do .... halved lengthwise.	56 "	8	11	1,031¼	1,042¼
176	Small Monitors, whole	112 "	7	19¼	965¼	984½
	Equal weights of large and small seed contrasted:					
177	Large Monitors, 3 feet apart	56 "	20	22	1,075½	1,097½
178	Small Monitors, 9 inches apart	224 "	20	38½	1,185¼	1,223¾
	Equal numbers large and small contrasted:					
179	Small Monitors, 3 feet apart, contrasted with 177	56 "	3½	9⅝	687½	697½
180	Large Mercers, whole, 3 feet apart	56 "	12	27½	869	896½
181	.. do .... do .... quartered lengthwise	28 "	8	16½	893¾	910¼
182	.. do .... do .... blossom end	56 "	12	24¾	929½	954½
183	.. do .... do .... root end	56 "	14⅓	23¼	951½	975
184	Medium do .... whole	112 "	10	49½	954¼	1,003¾
185	.. do .... do .... halved lengthwise	56 "	6	35¾	935	970¾
186	Small ... do .... whole	112 "	3½	71½	877¼	948¾
	The same experiments are now repeated with stable manure:					
187	Large Monitors, whole, 3 feet apart	56 "	15	11	849¾	860¾
178	.. do .... do ...... quartered lengthwise	28 "	8	8¼	880	888¼
189	.. do .... do ...... blossom end	56 "	19	8¼	973½	981¾
190	.. do .... do ...... root end	56 "	15	8¼	893¾	902
191	Medium do ..... whole	112 "	16	11	987¼	998¼
192	.. do .... do ..... halved lengthwise	56 "	8	8¼	836	844¼
193	Small ... do ...... whole	112 "	9½	8¼	888¼	896½
	Equal numbers of large and small contrasted:					
194	Small Monitors, whole, 3 feet apart	56 "	4¾	8¼	684¾	693
195	Large .... do ..... whole, 3 feet apart	56 "	14½	11	836	847
196	Small .... do ..... whole, 9 inches apart	224 "	14½	17½	1,001	1,018½
	Mercer potatoes, stable manure:					
197	Large Mercers, whole, 3 feet apart	56 "	15	16½	1,047¾	1,064¼
198	.. do .... do .... quartered, lengthwise	28 "	8½	8¼	1,089	1,097¼
199	.. do .... do .... blossom end	56 "	13	5½	970¾	976¾
200	.. do .... do .... root end	56 "	14½	16½	995½	1,011
201	Medium sized Mercers, whole	112 "	10½	22	1,042¼	1,064¼
202	.. do .... do .... do .... halved, lengthwise	56 "	6	11	987¼	998¼
203	Small sized Mercers, whole	112 "	4	44	676½	720½
	Equal weights of large and small seed compared:					
204	Large Mercers, whole, 3 feet apart	56 "	9	27½	882¾	910¼
205	Small Mercers, whole, 9 inches apart	224 "	9	121	940½	1,061½
	Equal numbers of large and small seed compared:					
206	Large Mercers, whole, 3 feet apart	56 "	9	27½	882¾	910¼
207	Small Mercers, whole, 3 feet apart	56 "	2	16½	646¼	662¾
	Letting all sprouts grow, and thinning to three in each hill, compared. Monitors, Moro Philips' phosphate:					
208	Monitors, large, three feet apart, not thinn'd	56 "	21½	19¼	1,155	1,174¼
209	.. do .... do .... do .... thinned to 3 stalks to the hill	56 "	23	13¾	1,028½	1,042¼
	Stable manure:					
210	Monitors, large, 3 feet apart, not thinned	56 "	15	11	849¾	860¾
211	.. do .... do .... do .... thin'd to 3 st'lks	56 "	14½	11	827¾	838¾
212	Large Mercer, 3 feet apart, not thinned	56 "	15	16½	1,047¾	1,064¾
213	Large Mercer, 3 feet apart, thinned to 3 stalks to the hill	56 "	15	5½	842½	848

To show that some of the lots contain a much larger proportinn of small potatoes (but little larger than culls) than some of the others, we put Nos. 194, 195 and 196 through a second screen, the meshes of which are 1¾ inches square—what passed through we call second class—those that went over, extra fine.

No.		Second class.	Extra fine.
194	**Small Monitors, 3 feet apart, 684¾**	74¼	610½
195	**Large Monitors, 2 feet apart, 836**	132	704
196	**Small Monitors, 9 inches apart, 1,001**	338¼	662¾

Different Depths of Planting.

No.		Culls.	Saleable.	Gross
		lbs.	*lbs.*	*lbs.*
	Stable manure:			
214	Monitors, planted 2 inches deep, cut seed	11	756¼	767¼
215	........do ... .7......do.... ...do	5½	525¼	530¾
216	.......do ....3½....do....... do	8½	805¾	814
	Moro Phillips' phosphate, in row:			
217	Monitors, planted 2 inches deep, cut seed	13¼	701¾	715
218	........do ....7......do.......do	13¾	451	464¾
219	........do ....3½....do........do	9½	624¼	633¼
	Times of cutting seed:			
220	Early Shaw, cut 4 weeks before planting	49½	715	764
221	....do..... cut at time of planting	33	874½	907½
222	Monitor, cut 2 weeks before planting	8¼	572	580¼
223	....do...cut at time of planting	11	808½	819½

AGRICULTURAL SCHOOLS.

From the Government Report on Education in Europe and America,

BY DR. J. W. HOYT,

United States Commissioner to the Paris Universal Exposition of 1867.

Agriculture, though first among the occupations of men in the order of time, and the most complex and difficult in actual practice, for the reason that it touches the domain of every science, and cannot by any possibility, except upon virgin soils and under a combination of the most favorable circumstances, attain to the highest success until it shall have mastered the principles of each and brought them into its service—agriculture, first among the arts in importance, and surely destined in the further progress of the race to be first, also, in rank and honor, has been the very last to acknowledge its dependence on the sciences, and so avail itself of their teachings. But conviction is coming at last; and to-day no educational question occupies more of the attention of the educators and statesmen of civilized nations than how to organize and operate institutions and other agencies for the development of agricultural science and the diffusion of its light among the groping millions who cultivate the soil.

For many years after the development of true chemical and physiological science, and the dim recognition of its applicability to agriculture, the only instruction in any sense professional, or that had direct bearing upon the agricultural art, was given from single chairs tardily established in here and there a liberal institution in the Old World.

One of the first of these tentative efforts to elevate and advance agriculture had its origin at Alfort, near Paris, where, in 1785, the illustrious Daubenton established, in the veterinary school, which still flourishes there, a "course of agriculture and rural economy." Subsequently, in 1793, the celebrated Thouin founded at the *Jardin des Plantes*, of Paris, a "course of vegetable physiology applied to culture." Both of these endeavors were successful, and the chairs then established have continued to the present time, having been occupied by scientific men of high distinction. Nevertheless, the first Napoleon, when he undertook the reorganization of the public instruction of the empire, and provided for the establishment of several special schools, so far underrated the practicability of making special schools of agriculture successful that they were not included in his plan. And thus the initiation of that great enterprise which has since commanded the confidence of every enlightened nation of the world was left to other powers.

To Prussia, Switzerland and Austria belong the honor, in common, of founding the first schools specially designed to give instruction in the applications of science to agriculture; the school founded by the illustrious Thaer, at Celle, in Prussia, the one established by Emanuel von Fellenburg upon his estate at Hofwyl, near Berne, and the Agricultural Academy founded upon one of his immense estates at Krumau, in Bohemia, by Prince Schwartzenburg, all three dating from the same year, to wit, 1799.

The Swiss school, so successful for nearly half a century, not only as independently considered, but likewise as a model for hundreds of other institutions with similar aims, soon after the death of its founder, in 1844, began to languish and at last virtually discontinued its labors; and Thaer's school was removed to Mogelin in 1806.

AUSTRIAN SCHOOLS.

The Austrain school at Krumau, on the other hand, still holds its place among the leading schools of the present time. Being established on an immense estate, (originally embracing 300,000 acres,) its natural facilities for imparting a knowledge of practical forestry and the management of large estates have been superior; while great pains have been taken to furnish other auxiliaries in the form of extensive collections of agricultural implements and machines, as well as of the cultivated plants of the country, and of fruits, noxious insects, etc. The instruction is gratuitous and is usually well attended.

At Prague, in 1803, was founded another institution. Nor did the government of Austria rest content with the erection of these two schools, but in 1809 founded those of Gratz, Lemberg, Trieste and Trutsch, and has from that time to this continued to multiply them in various forms, adapted to the special needs of different sections of the empire, until now they are founded in nearly or quite all the provinces.

Among the separate and distinct schools of agriculture in Austria, the Imperial and Royal Agricultural School of Hungary, at Altenburg, is of high rank, and was, moreover, the representative of its class at the exposition. It is a superior or academic school, and to the general course in agriculture adds a course in forestry. The attendance of pupils in 1867 was 147; the instruction being given by nine professors, with the aid of superior facilities in the way of a chemical laboratory, a large and valuable library of scientific and practical works, numerous mechanical and technological collections, and a botanical garden.

Among other objects of interest sent to the exposition by this school, a complete collection of specimens and models, illustrative of the production of Indian corn, (the leading staple of that portion of Hungary,) its chemical constituents and the various transformations it undergoes from the moment of planting until the product, in its many forms, is ready for consumption, together with interesting botanical collections, samples of soils, with the results of their chemical analysis, and with numerous designs, charts, etc., all prepared by the pupils, afforded good evidence of the zeal and proficiency of the pupils there taught.

The term of study includes four half-year semesters, during which, in systematic order of succession, the following branches of study are taught as thoroughly as the time will allow: Practical geometry; general mechanics; agricultural implements and machinery; general and agricultural chemistry; climatology; mineralogy; knowledge of soils, (*Bodenkunde*;) the anatomy and physiology of plants; orchard, kitchen, garden, grape and hop culture; forestry; zoology; anatomy and physiology of domestic animals; general and special breeding of domestic animals; diseases of domestic animals; farm management; science of valuations and book-keeping; technology; architecture; local agricultural relations and circumstances; national economy.

The applicant for admission must be at least seventeen years of age, possess good moral character, and have completed the course of study embraced in the first seven classes of a gymnasium or the first five classes of a real-school, or have completed the entire course in an agricultural middle-school, (school of second grade.)

The Superior Agricultural School at Gratz, though one of the most interesting and successful that I have found in Austria—having courses by nine professors, in mathematics; mechanics; physics; botany; zoology minerology; geology; chemistry; agriculture and forestry, with fine collections in natural history etc.; a silk-worm house and a beautiful botanical garden—likewise embraces a school of mines and belongs rather to the class of polytechnic schools, of which notice will be made in a subsequent section. It is also true of a large proportion of the schools more recently established, including those of secondary grade, that they exist in connection with either general instruction or with other special courses or schools.

Special Austrian schools of forestry are found at Mariabrunn, near Vienna, and at Schemnitz; neither of which, however, is very noted.

PRUSSIAN SCHOOLS.

In number the Prussian schools of agriculture have far outstripped those of Austria; the total of different grades being over fifty, while the latter power numbers not to exceed forty.

Only eight or nine are of superior grade, however, and most of these are more or less intimately connected with universities; as, for example, the ancient school of Mogelin, near Potsdam, whose director is at the same time the leading professor of agriculture in the university at Berlin; the Academy of Agriculture and Forestry at Eldena, connected with the university at Greifswald; the agricultural institute of the university of Halle; and the agricultural institute at Wieden, connected with the old university of Gottingen, (also Prussian since 1866).

Those of Mogelin, Eldena and Wieden are located upon large farms; while the institute at Halle occupies but twenty-five acres, merely enough for experimental uses.

Besides the different kinds of schools, Prussia abounds in what are called experimental stations, the object of which is to settle various scientific and practical questions connected with agriculture.

SAXONY.

Saxony comes next in chronological order, with its Academy of Forestry and Agriculture at Tharandt, near Dresden, founded in 1811. This institution was at first almost exclusively a school of forestry, but now incorporates agricultural instruction as well. The term of study is either two or three years, at the option of the pupils. The instruction is given by nine able professors, and embraces the usual branches taught in such institutions, with an unusual frequency of excursions into the forest and the best agricultural districts of the kingdom.

Besides the school at Tharandt, there are four agricultural schools and departments of schools in Saxony.

In both France and Wurtemburg there were established agricultural schools of the isolated and independent type, in 1818—the French institution by Dombasle, on his estate at Roville, and the Wurtemburg school at Hohenheim, near Stuttgart.

The first named, after many years of heroic effort, was finally discontinued in 1848 as a private institution, and converted into one of the regional schools of the empire, of which besides the seventy or more elementary agricultural schools, there are three—the other two being at Grignon, near Versailles, and at Saulsaie, in the department of Ain.

Many of these schools I have visited, and, did space allow, would be glad to describe; but as I deem them, all in all, inferior to some of the other states, I shall omit such descriptions in accordance with the general plan of my report, which is to select for detailed account such schools as will best illustrate the most advanced conditions.

WURTEMBERG.

The Royal Land and Forest Academy of Wurtemberg has long held the first rank among the agricultural schools of Europe. It is located at Hohenheim, some seven miles from Stuttgart, upon an estate formerly belonging to Duke Charles, regent of Wurtemburg. The buildings occupy a high swell of ground, commanding one of the most extensive and beautiful views in Germany. They include three open courts, rectangular in form, presenting a continuous front of one thousand feet; and, though the marks of nearly one hundred years, during which they have stood, are noticeable upon them, they nevertheless make an imposing appearance and answer the more modern use to which they have been put exceedingly well.

The farm embraces between eight and nine hundred acres, and lies in immediate contiguity to a government forest of five thousand acres, which thus affords extraordinary facilities for acquiring a practical knowledge of forestry as well as of agriculture. It is well planned and conducted on the basis of a scientific rotation of crops, serving the double purpose of a model and an experimental farm. But the important work of experimenting is still more thoroughly carried on upon a subdivision of the farm known as the experimental grounds.

These embrace some twenty acres, divided into about one hundred plats, upon which systematic experiments are conducted with the different crops grown in that portion of the continent as well as with new species and varieties supposed to be adapted to its soils and climate. It is upon these plats that are tested questions based upon soils and their preparation, manures and their application, methods of cultivation, harvesting, etc.—questions of vital importance not only to the agriculture of Germany, but of the temperate latitudes everywhere.

Connected with these experimental grounds there is likewise an establishment which, together with them, is known as the experimental station. It is provided with chemical and other scientific apparatus necessary to all sorts of agricultural investigations, and is presided over by the chemical professor with a responsible subordinate, who resides therein and gives constant personal attention to the solutions of the problems attempted.

There is also a well-planned botanical garden embracing several acres, in which are grown all sorts of plants possible to the climate and soils of the location; a beet sugar factory, a brewery, a distillery, a starch factory, a vinegar factory, a malting and fruit drying establishment, and an agricultural implement and machine manufactory. The last named is sufficiently extensive to employ some forty workmen; the design being not simply to afford means of instruction to pupils in the principles and art of constructing implements for the uses of husbandry, but also to supply the markets of Germany with the best models.

Considered as an institution of learning, the royal academy at Hohenheim consists of three quite distinct schools, to wit:

1. The institute, having the character and rank of a professional school of agriculture.

2. The school of forestry.

3. The school of practical farming.

The institute and school of forestry were designed for advanced young men, able to understand purely scientific lectures. As a general rule, the pupils are either the sons of the gentry, fitting themselves for the general management of inherited estates, or ambitious young men from the middle classes, looking to a stewardship over the estates of others. The requisites are the attainment of eighteen years of age, good moral character, proficiency in the preparatory branches, (equivalent to a common-school education in the United States,) and the payment, for lodging, instruction and incidentals, of $40 to $80 (foreigners pay twice as much as inlanders) per annum. There are accommodations for over one hundred pupils in the lodging apartments, and for an indefinite number at the restaurant connected with the institution. But if pupils prefer to take their meals and lodgings elsewhere they are at liberty to do so. So, also, each pupil may exercise his own discretion as to the number and kind of lectures he will attend, though industry, regularity of attendance, and a faithful use of the opportunities offered are urged upon all. In these respects they are subject to as little restraint as the students of our own professional schools.

The school of practical farming (*ackerbauschule*) is designed for the sons of peasants, between the ages of fourteen and eighteen, who have familiarity with the ordinary routine of farm-work, and desire simply to acquire a knowledge of the general principles of agriculture and the most practical methods. They spend but two or three hours daily in gaining theoretical and scientific knowledge, and the remainder in actual labor on the farm and in the other practical branches of the academy, under the direction of the practical foreman or immediate managers.

Besides these three distinct branches or departments, there are several special courses or schools, designed to give instruction in the principles and especially the practice of different branches of industry. These courses, as a rule, are only open to such as have already acquired, by some years of practice, familiarity with the particular branch of industry to be taught and illustrated in the course to be pursued. They are, therefore, necessarily young men of seventeen or eighteen years of age, with sufficient maturity and discipline to enable them to derive benefit from the brief courses of a few weeks furnished them at the royal academy. Then there are courses in gardening, in orcharding, in meadow husbandry, in sheep husbandry, etc. And more recently there has been established a course of three weeks in autumn, (during the summer vacation in the common schools and the farm schools of the kingdom,) for the better instruction of school-teachers in the general principles and practice of agricultnre. The number of those who may be admitted to this course is limited to twenty-five, and only those are entitled to enter who have shown by their personal labors, either on their own or on the school-house grounds, a disposition to promote the advancement of agricultural education.

Again, in addition to these regular courses of instruction, such occasional or extraordinry courses are opened and conducted from time to time as the exigencies of industry or of the civil service of the state seem to require. In all of these ways the academy occupies a very wide field, and by its great usefulness to the state has acquired a marked influence, not only in the kingdom of Wurtemberg, but in all the countries of Europe.

The immediate management of the whole institution, in all its branches, as well as of the farm, garden, experimental grounds, and all else connected with it, is intrusted by the government to a director, assisted by a secretary, a treasurer and book-keeper, an overseer for the institute, a farm assistant, a house-master, a postmaster and a telegraph operator; which last also serves the public at large, the post and telegraph offices for Hohenheim station being in, and in a certain sense a part of, the institution.

The instruction is given by the director and twelve other professors, in charge of the following general departments, to wit: Mathematics, natural science, theory and practice of agriculture, practical forestry, forest economy, state forestry, agricultural technology, political economy, rural architecture and the draughting of plans.

The instruction in the academy is given by lectures, by demonstrations, by excursions, and in connection with actual practice in the field and forest.

The following are the courses of study in agriculture and in forestry, together with the collateral branches taught:

Agricultural course: General agriculture and plant culture; special plant culture; meadow culture; grape, hop and tobacco culture; fruit culture; culture of vegetables; breeding of domestic animals in general; horse-breeding; cattle-breeding; sheep-breeding; breeding small animals; silk-worm culture; bee culture; forestry; forest valuation; Wurtemberg forest laws; practical forest business.

This course is supported by scientific instruction in arithmetic and algebra; planeometry; stereometry; trigonometry; practical geometry; mechanics; taxation; book-keeping; physics; general chemistry; analytical chemistry; agricultural chemistry; geognosy; special botany; vegetable physiology; general zoology; special zoology; veterinary science; economical architecture; principles of law; national economy.

Courses in forestry: Encyclopedia of forest science; agricultural encyclopedia for foresters; forest botany; growing woodlands; protection of forests; technology of forests; valuation of forests; Wurtemberg forest laws; forest taxation; practical forest business.

The collateral branches are the same as above enumerated in connection with the agricultural course.

The period of a full course in both the institute and the forestry school is two years; though, if specially prepared for admission by a judicious course of preliminary study, one year may suffice. Each scholastic year embraces two sessions; the first beginning November 1, and continuing to Palm Sunday, the second beginning two weeks after the close of the first and ending October 1. Examinations are held semi-annually, but these are obligatory only upon such forestry pupils as intend to enter the government service. Such as are examined receive a certificate of proficiency or of completion of the studies included in the course of instruction, ogether with a statement as to diligence and general deportment. Students not examined receive simply a certificate of attendance, specifying the length of time they have spent in the institution. The expenses of the academy for salaries, instruction of every kind, library, buildings, management in general, etc., are about 34,000 florins (of 40 cents each) per annum; the income from tuition fees, some 20,000 florins; the profits of the farm, about 6,000 florins; leaving a deficit of 8,000 to be paid by the government. The school of practical farming and the school of horticulture, being considered institutions solely for public instruction, are entirely supported by the government.

SCHOOLS CONNECTED WITH UNIVERSITIES.

Of the second class of agricultural schools, those connected with other institutions, especially universities, the number is less, though constantly increasing. The three most highly-approved by Baron Liebig, on whose special recommendation I visited them, are those connected with the ancient universities of Halle, Jena and Gottingen.

In this connection it is proper to make more particular mention of the agricultural agency known as the experimental station (*versuch-station,*) which consists of a few acres of land—twelve to twenty—divided into small plats for purely experimental purposes, in the midst of, or in immediatate connection with, which there is a chemical and physical laboratory, and not unfrequently such accommodations for domestic animals and such general facilities for physiological investigation as are suggested by the problems of breeding, ordinary feeding, fattening, etc.

Stations of this sort have sprung up since the discovery of the applicability of chemistry to agriculture as a means of settling the formerly troublesome questions of natural fertility, manuring and rotation of crops, and so on; and if I am not much mistaken, as now established and conducted, were suggested by Baron Liebig. At all events, he attaches great importance to them and has been largely instrumental in their establishment in nearly if not all the German states. It is easy to see that, in the present undeveloped condition of the science of agriculture, such agencies are a primary necessity; and, judging from the practical workings and invariable success of those I have visited in the different continental states, they are destined not only to go hand in hand with the agricultural schools, but to be established in many cases independently, and where it is neither practicable nor needful to establish a school. In most cases in Europe experimental stations are established and maintained at the expense of the government, as a necessary means of determining the principles which underlie the most successful practice, and as being therefore essential to the industrial developement of the state. It is unnecessary to remark that, their multiplication in the Old World, while it must tend very greatly to advance the science and art of agriculture throughout the world, by the discovery of principles of universal application, they cannot settle all the questions that must arise, since many of them are limited in scope by circumstances of locality, and can only be determined on the very spot where they arise. They must be established in every country, therefore, and in many parts of each country, as the pioneers of the profession of agriculture that is to be.

BAVARIA.

The first Bavarian school of agriculture was founded at Schleissheim, on an estate of nearly seven thousand acres, in 1822, but has recently been removed to the old estate of Weyhenstephen, near Freising, some twenty miles north of Munich. It occupies a farm of several hundred acres, well stocked with domestic animals, and appears to be in a healthy condition. The course of instruction embraces two years, and is given by six regular professors with as many assistants; number of pupils usually about fifty.

Besides this Royal Central School at Freising, Bavaria reckons eleven other agricultural schools of lesser rank, all of them liberally supported or aided by the state.

IRELAND.

The beginning of agricultural schools in Ireland was at Templemoyle, near Londonderry, at which place the Northwest-of-Ireland Society established a farmers' school in 1827. There are nearly two hundred acres of land connected with the institution, which still continues to flourish. Since that date, besides the model farm and school at Glasnevin, near Dublin, founded in 1838, and designed for a sort of normal agricultural school, schools of lower grade have multiplied until the number now exceeds seventy.

RUSSIA.

Russia early manifested an interest in the general movement for the establishment of schools of agriculture and forestry, and as early as 1824 founded an intermediate school for such instruction, including also engineering as a subordinate branch, at Marjino. This was followed, four years after, by the establishment of a school for instruction in bee culture—the pioneer of a great number of agricultural and industrial schools, devoted each to some individual branch. But the first Russian school of superior grade was established at Gorky in the government of Moheeley, in 1833. Its object was to form a nursery of professors for the secondary schools of agriculture, of which there were five already in operation, and others in contemplation, sufficient in number to supply all the subordinate governments of that great empire. It was required of applicants for admission that they should have finished their studies in the *gymnases* (colleges) or in agronomic schools of second rank. Since 1863, this school has been transferred to Lesnoy, in the vicinity of St. Petersburg, where, in the year 1867, it was my pleasure to find it in a most flourishing condition. The course of study occupies three years, and embraces in general terms, chemistry, physics, mineralogy, botany, zoology, mathematics, geology, mechanics, architecture, technology, zootechny, agricultural theory and practice, forestry, rural economy, political economy and statistics.

The number of professors is 15; of pupils, 90. By reason of an annual appropriation from the imperial treasury of $50,000, tuition is free. Pupils, nevertheless, pay about $24 per annum for the privilege of the chemical, physical, technological and botanical laboratories.

The experimental grounds include about seventy-five acres, upon which, during the summer semester much time is devoted to the practical field-studies. From June to September the profesors also frequently lead their pupils in botanical, mineralogical and agricultural excursions.

In 1836 was founded the Imperial Agricultural Institute at Gorigoritz, embracing primary, intermediate and superior departments. Then rapidly followed the creation of numerous establishments for the production of silk, with departments for instruction in the art; schools of horticulture; farm schools; model farms; special schools for the culture of flax, etc.; all distributed with a liberality almost profuse over the vast territory of the empire according to the nature of the soil and climate and the habits and needs of the people. Then in quick succession were established the great agricultural museum at St. Petersburg, with numerous lesser ones of various grades in diverse portions of the empire; a large number of secondary schools of agriculture located at Moscow, Kasan, at Gorky, Saratov, at Kharkov, and other points; also many schools of horticulture, chief among which are those at Orel, at Ouman, at Kieff, and at Voronezh; schools of vine culture at Magalatch, in central Russia, and at Kischineff, in Bessarabia; schools of agriculture and horticulture in Caucasia; and last of all and chief among all, the great Academy of Agriculture and Forestry, founded by the minister of domains, at Petrovskoi, near Moscow, in 1865.

The secondary schools of agriculture above referred to are among the most flourishing of their kind in Europe. Each school is provided with chemical laboratories, physical and agricultural cabinets, and with a model farm well stocked with implements and domestic animals. The course of instruction occupies five years and includes religion and christian morals, arithmetic, natural sciences, the Russian language, geography, history and design, together with practical exercises in the laboratories and on the farm. They are attended by an average of one hundred to one hundred and fifty pupils, and each school is endowed with a regular income from the state of $8,000 to $12,000 according to the necessities of the locality.

The schools of Caucasia, established since the conquest by the Russian government, and the agricultural society of Caucasia jointly, are remarkable for their liberality, which in some cases goes quite beyond gratuitous instruction, and even secures to the pupils small incomes sufficient to meet all expenses of their education.

Thus, at the farm school of Latschino, near Tiflis, upon the property of Baron Nicolai, the instruction given in geometry, surveying, and the application of science to horticulture, arboriculture, bee culture, vine culture, silk culture, the breeding and rearing of domestic animals, and to general agriculture is not alone free; but boarding, lodging, clothing, books, etc., are also gratuitous, and the pupils, (of whom the number is limited to twenty-two,) moreover, each receive $40 for the first year, $64 for the second, $72 the third, and $80 for the fourth and last year, for other important uses. The horticultural school of Tiflis, the school of viticulture at Katcheti, the school of silk culture at Stavropol, the horticultural school at Rhotais, and the agricultural school at Wadikarkas are also entirely free.

The Russian agricultural schools of academic grade are entitled to high rank among the best in Europe. The Agricultural and Forestry Academy of Petrovoskoi, near Moscow, to which incidental reference has already been made, as being at once the highest and most recently established, (in 1865) is worthy of more special notice. This institution embraces two faculties, one of agriculture and the other of forestry, the duration of the course of study in each being fixed at three years. Any one, whatever his condition in life, on making advance payment of $10 per *semester* is admitted to the instruction furnished. Extensive buildings have been constructed for the accommodation of pupils who desire to live on the premises; the price of a furnished chamber being $3 a month. A large restaurant, in which the dietary regulations are determined by the administration of the school, provides food for all at fixed and moderate prices.

The courses of study, conducted by eighteen able professors, embrace instruction in the following general departments, to wit: agriculture, zootechny, veterinary science and art, rural constructions, civil engineering, sylviculture, agricultural and forest technology, and rural and political economy.

Auxiliaries, including a valuable special library, an agricultural museum, a cabinet of physical technology, collections of models of apparatus and agricultural and forestal machines, zoological, botanical, and minerological cabinets, dendrological collections of much interest, an immense chemical laboratory, and a large farm, are provided with a liberality worthy of the great empire.

The farm comprises about twelve hundred acres, of which between eight and nine hundred is arable land and the remainder forest, and is already provided with a nursery, fruit, kitchen, and botanical gardens, with a dairy, wagon-houses and well-equipped establishments for implements of every kind, and with well-arranged barns for grain and domestic animals.

The academy confers two degrees, that of bachelor and that of master. In order to secure the first, the student must pass an examination in all the sciences taught, whether they relate to agriculture or to forestry, and present to the council a scientific memoir upon a given subject. To obtain the degree of master, the applicant must present his diploma of bachelor, undergo a second examination, and publicly defend a thesis on some relevant subject.

The number of students attending this great institution in 1866 was four hundred and fifty, of whom eighty-five received in addition to free tuition, bursaries of some $20 each. But all this magnificent array of forces and material, with a patronage approached by no other institution of like character in the world, does not adequately illustrate the spirit and energy with which the government is pushing forward the noble work of educating the agricultural classes. The present status merely is indicated. The purpose and energy of the government are further and even more forcibly shown by the fact that its annual appropriation to this one great academy at present exceeds the sum of $100,000. * * *

GREAT BRITAIN.

Great Britain has been surprisingly slow, and, so far as the attempt has been made, rather unsuccessful in the department of agricultural education. In 1849 a school was established at Cirencester, with royal title, and with at first a promise of usefulness. The buildings were ample and substantial; the farm of seven hundred acres, though rather poor, tolerably well adapted to the purpose intended; the course of instruction given by six professors, some of them, as for example Dr. Voelcker, eminent in the profession; and the need of such an institution generally recognized among the intelligent agriculturists of the kingdom. Nevertheless, the institution has never flourished in the best sense of that term, and is now half abandoned by even its friends. Whether its failure to meet the expectation of its originators has been due to the form of its organization, or to that pertinacity of the English aristocracy which, so long as pupils from the middle and lower ranks in life attended the college, held back the sons of the nobility from participating in its benefits, or to the refusal of the government to grant the necessary aid, and the consequent high charges made for instruction, ($175 per annum,) or whether all these circumstances combined to prevent its success, there seems to be difficulty in determining. But the fact is undeniable that the institution languishes, while the few young men ambitious of a knowledge of scientific agriculture are found distributed among the schools of the continent.

Some little instruction is given in agriculture by professors in various institutions of scientific and technical character, but hardly sufficient in amount and importance to demand special attention.

In Scotland, professional instruction in agriculture is confined to a single chair in the university of Edinburgh, and to special lectures given in a college at Aberdeen.

BELGIUM AND BADEN.

Belgium claims ten or twelve schools of agriculture, but most of them are either primary, intermediate or connected adjunctively with communal colleges, and none of them have attained to any eminence.

Baden is credited, in like manner, with six schools of agriculture and forestry. Two of these, the agricultural school of the Royal Polytechnic School of Carlsruhe being chief, are superior, the others intermediate or inferior.

CENTRAL GERMANY AND OTHER PARTS OF EUROPE.

Several of the duchies of central Germany, including, especially, Saxe-Weimar, whose agricultural institute of the university of Jena is worthy of special notice, make liberal provision for agricultural education; their schools of different grades numbering in the aggregate not less than thirty.

Of the agricultural schools of other European countries established within more recent years, and in no way specially distinguished, I do not deem it important to speak in detail.

Sweden, Denmark, Italy, Spain and Portugal have each recognized the importance of such institutions by the establishment of one or more schools, and even Greece and Turkey are now following the example of the other more advanced countries.

AGRICULTURAL EDUCATION IN AMERICA.

Although, by reason of the newness of the country and the cheapness of fertile lands, the establishment of schools designed to afford instruction in the applications of science to agriculture was longer postponed here than in some of the European countries, America has at last entered into the movement with a spirit and energy that give promise of great results.

As early as 1837 prominent agriculturists began to agitate the question of creating state colleges of agriculture in the different states, either by direct appropriations from the public treasuries or by joint efforts of the people and governments; but nothing was actually accomplished in this direction until

1855, when the legislature of the state of Michigan, in obedience to a provision of the revised constitution, expressed in these words, to wit, "The legislature shall encourage the promotion of intellectual, scientific and agricultural improvement, and shall, as soon as practicable, provide for the establishment of an agricultural school," passsd an act for the purchase of land and the endowment and management of the State Agricultural College of Michigan. Immediate steps were taken for the actual establishment of the institution by the purchase of six hundred and seventy-six acres of land near Lansing, the new capital of the state, and by the erection of a college edifice.

The institution was dedicated in 1857, and opened with a corps of seven professors and sixty-one pupils. The legislature this same year supplemented its former provision for endowment and support by a further appropriation of the proceeds of the sale of twenty-two sections of saline lands, (value $55,000,) and a sum of $20,000 per annum for the two ensuing years for necessary improvements and the support of the school. Afterwards additional sums were appropriated, and the institution has since been in a steadily improving condition, with an average number of pupils somewhat less than one hundred.

The necessity for actual labor on the farm is a cardinal doctrine of this institution, and regulations for the enforcement of this part of the educational programme have the cordial support of the managers. Instruction is free to all residents of the state, and a moderate compensation for labor is given to those who perform it.

The declared objects are: firstly, to impart a knowledge of science, and its applications to the arts of life; secondly, to afford to its students the privilege of daily manual labor, that neither health nor inclination to labor be lost, and that the principles taught in the school may be more firmly fixed in mind; thirdly, to prosecute experiments for the promotion of agriculture; fourthly, to offer the means of a general education to the farming class.

Candidates for admission to the preparatory class must be at least fourteen years of age, and sustain a satisfactory examination in the necessary branches of an elementary education. The preparatory term of study is one year; the collegiate term, four years.

The number of professors is seven; the departments of instruction as follows: mathematics and civil engineering; English literature; general, analytical, and agricultural chemistry; botany; geology and mineralogy; zoology, general and descriptive; entomology; animal and vegetable physiology; theory and practice of agriculture; theory and practice of horticulture.

The means of illustration independent of the farm, of which three hundred acres are under cultivation, and of the orchards, gardens etc., include a chemical laboratory; the philosophical and mathematical apparatus usually found in our colleges; collections of animals, minerals, plants and vegetable productions, and a library.

The degree of bachelor of science is conferred upon students who satisfactorily complete the full course of study, and the degree of master of science upon graduates of three years' standing who give evidence of having been been engaged, during that period, in scientific studies.

Following the example of Michigan, the states of New York, Maryland and Pennsylvania successively undertook, and early completed the establishment of similar institutions; Pennsylvania, in particular, making large appropriations of money towards this object.

But it was soon found that the expense of founding and properly endowing valuable colleges of agriculture must necessarily be greater than the individual states—especially the newer states—were able to meet; and so, after due agitation of the question of national aid, running through a period of several years and engaging the earnest efforts of a great number of the agricultural, educational, and public men of the country, on the second of July 1862—while the nation was still in the darkest hour of its struggle with the rebellion—the act of congress "donating public lands to the several states and territories which may provide colleges for the benefit of agriculture and the mechanic arts" became a law and thus offered to each of the states not in actual rebellion the means of founding, or at least aid in founding, an institution of this class. Subsequently, congress very wisely amended the original act so as to enable all the states and territories, without regard to their status at any former period, to avail themselves of the benefits it offered. Of the state agricultural colleges in actual operation or in process of establishment at the date of the act of 1862, all except the agricultural college of New York, received from their respective states the national grants. But with those states in which no actual beginning had been made, the disposition of the grants involved so many difficult and perplexing questions, that even at the date of this writing those questions are still discussed in many of the states, and without prospect of immediate settlement.

1. Shall we establish a separate and independent *agricultural college*, like most of those in the Old World and those of Michigan, Maryland, Pennsylvania, Iowa, Massachussets and Kansas, already in operation?

2. Shall we found a separate *industrial university*, like the new one just organized on the basis of the congressional donation in the state of Illinois, or like the Cornell University, also founded upon the national bounty, joined with the princely gifts of the noble friend of education whose name it bears?

3. Shall we establish an independent college by the side of an existing literary college, for the advantage it may confer by the regulated use of libraries, laboratories, collections and scientific instruction already furnished?

4. Shall we bestow the gift upon some literary college; and if so, upon what one?

5. Shall we bestow the grant upon some school of science or polytechnic school?

6. Shall we, by reorganization of our state university, create therein a college of agriculture and the mechanic arts in harmony with the other departments?

Such, in general, are the questions that have agitated now agitate, and seem likely to continue to perplex the several states not provided at the outset with institutions toward which the national grants were drawn by a natural attraction.

And then, again, certain secondary questions, such as the advantage of a model farm connected with the agricultural school, wherever established and however organized, and the necessity for manual labor on the farm as a part of the training of the pupils of such school, have in many, if not all cases, entered into the main problem as a vital part of it, and so increased its complications. If, therefore, with an advantage gained by observation in other countries and a most careful study of the whole subject during a period of some twelve years, any light may be thrown upon these questions, or any of them, this present is certainly a fitting occasion for such an endeavor.

The first question in the above enumeration is practically answered, in all cases where a use of the national grant is contemplated, by the very terms of the act of congress making the offer, which expressly provides for the endowment of a college "where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, * * * in order to promote the liberal and practical education of the industrial classes in their several pursuits and professions in life." It being thus, demonstrable that no exclusive agricultural college is contemplated by the law, the question of separateness and independence is without force or application.

The second question involves a right conception of the law, but is based chiefly on the idea of separateness and independence, and implies serious objections to association with other institutions. Its answer must be determined by circumstances. If, as in the case of New York, there should be in existence no institution the location and character of which would render its conversion into an institution of the kind demanded easier and better than the foundation of such school in a new place, with munificent endowments otherwise unavailable, then the answer may be in the affirmative; but in the case of any state possessing any such suitable institution the answer should be emphatically negative, for the great reason of economy, if for none other. The college of "agriculture and the mechanic arts" necessarily covers a wide field, needing vast sums of money for its equipment; and scarcely any of our states are at present so rich in means that they can afford to disregard enconomical considerations. There is but little danger of any school of learning becoming more wealthy than is desirable, while, on the other hand, a stinted, crippled, and sickly institution had better not have existed at all.

The third question implies a recognition of the economy of association, but betrays a fear of too great intimacy—fear largely founded on ancient prejudice of class, which in America, ast of all places on earth, should be allowed to take root, but also, to some extent, based on a misapprehension of what are the requisites of an agricultural school. If prejudice does exist between labor and learning, there is no reason why science and letters should not dwell peacefully together under the same generous roof.

If it be objected to the incorporation of the school of agriculture with a literary school, first, that a contiguous model farm would be impracticable in any given case, then I would say a model farm is not only not essential, but, so far as I have been able to determine, not half so valuable as we have been wont to suppose. If means were unlimited, there could be no harm in making a truly model estate, with its numerous establishments all complete—unless it should have the effect to make two-thirds of the pupils blindly, often absurdly, attempt to follow it in their own future operations—but in most cases it would be better to employ the extra means upon the school itself and on the experimental farm than in vain endeavors to make a pattern capable of fitting every neighborhood in the state. The teaching of principles which are of universal application and the determination of principles by investigation and experiment, these are pre-eminently the mission of the agricultural college.

On this point the experiences of European countries and the opinion of the ablest and most enlightened scientific agriculturists of Europe are in accord; for, although the foreign schools of agriculture most widely distinguished are those which have model farms, it is only that they are the schools first established, and hence more widely known. * * *

From among the many high authorities on this subject I will merely cite Baron Liebig, who, by his important discoveries and remarkable writings on agricultural chemistry, has contributed more to the progress of agriculture and of agricultural education than any other man, and is so justly deemed the highest authority everywhere. It was on his recommendation that I gave very particular attention to the agricultural institute of the university of Halle and other schools of its class—institutions furnished with the very best instruction in the mathematical, physical and natural sciences, as well as in literature and philosophy, by professors connected with great universities, and simply possessing territory enough for the all-important experimental station, with its laboratories, amphitheaters for practical lectures, experimental grounds, gardens, stock-barns, etc. Under such a plan the out-door labor performed by the pupils is no longer mere manual labor, as required on the model farm, but, when performed at all, is an incidental part of scientific investigations, and never irksome to the student. Other labor than what the pupils of enthusiastic teachers wtll voluntarily and with zest perform is unnecessary, besides being attended with positive embarrassment. If those who teach cannot, by their own example and by the expression of sentiments appreciative of the nobleness of industry and the dignity of intelligent labor, inspire their pupils with just ideas, vain is the arbitrary law that condemns them to the drudgery of routine labor in the fields.

The fourth question, if unqualified, may be safely answered in the negative, as in too many cases the interests of agriculture and the mechanic arts would be confined to men unacquinted with and wholly unappreciative of them. Association between scientific and literary departments, if upon terms of equality and fraternity, is desirable, but not otherwise. The friends of agriculture should make sure, therefore, in effecting consolidation with any institution of different character and aims, first, that the articles of association are wisely drawn, and, what is not less important, that the administration of the new and dual institution be confided to men of large, comprehensive, and impartial views.

But the fifth and sixth questions involve, as it seems to me, the most favorable conditions of success; for if there be in existence, and at a suitable place, a scientific or polytechnic school, the national grant would only give to it desirable expansion and further development; while, if there be a state university, the incorporation with it of the school of agriculture and the mechanic arts, on proper terms and conditions, would accomplish the two-fold object of building up and developing two important institutions of the state at one and same time.

Influenced by considerations like these, the states of Rhode Island, Connecticut, New Hampshire, Vermont, New Jersey, Wisconsin, Kentucky and Kansas have conferred the proceeds of the land grants upon scientific schools, departments or colleges already existing or thus created in state universities or other public institutions sufficiently under their control; while, on the other hand, the states of Maine, Massachusetts and West Virginia have established distinct and independent agricultural colleges.

New York, with the generous aid of her honored citizen, Ezra Cornell, whose gifts already nearly equal $1,000,000, has created a new university on a broad and generous plan.

Illinois has also created a new industrial university entirely apart from all other institutions of learning.

If to the views above expressed, in relation to the establishment and organization of agricultural schools, I were to add but one other word, it would be an appeal for the setting up of high standards of education for the agriculturist, and a warning against expecting large results from small means.

Two important reasons unite in support of the demand for high standards. First, agriculture is a profession embracing a vast field of study, and cannot be mastered in the brief period of one or two years, even by young men already disciplined and well informed by general study, much less by untutored pupils fresh from the farm and the district school. There is no reason why all who desire knowledge of agriculture should not, by proper gradation of courses of study—by practical courses and limited courses—be accommodated at the college of agriculture. But there are grave reasons why agricultural schools should not degrade the profession they seek to build up and establish in honor, by making the highest course of study they offer a limited one, and thus turning away from their halls and forcing into more honored professions the best endowed and best fitted young men of the country.

I would open the lecture-room to all, and grant certificates of proficiency to such as earn them; but the degrees of bachelor and master should be held in reserve for such as aspire to professional honors and are willing to take up and go through the more protracted and thorough courses of study to obtain them.

As to the requisite pecuniary means, the notion is too prevalent in this country that a few thousand dollars, say fifty to one hundred, should suffice for the establishment and equipment of an agricultural college—amounts less than equal to the annual income of some of the European schools of which account has been given in the preceding pages. The states should be made to understand both the importance and the cost of laboratories, libraries, ample means of illustration, and large corps of able, devoted, and fairly compensated professors; and not until there comes a recognition of all these as absolutely essential to success may we reasonably hope for institutions worthy of our agriculture and of our country.

ABSTRACT OF RETURNS OF COUNTY AGRICULTURAL SOCIETIES FOR 1869.

COUNTIES.	REPRESENTATIVE OFFICERS.			PLACE AND DATE OF FAIR.		FINANCES.			
	Presidents.	Secretaries.	Treasurers.	Place.	Date.	Receipts.	Expenses	Premiums.	Amt. in treas'ry
Adams	A. Rood	J. M. Higbee	J. W. Horton	Plainvlile	Sept. 29-30	$120 00	$100 00	$100 00	$20 00
Brown	J. G. Lawton	M. P. Linsley	Daniel Butler	Green Bay	Sept. 22-24	434 25	432 47	308 50	1 78
Columbia	F. C. Curtis	C. C. Britt	John Q. Adams	Columbus	Sept. 22-24	1,003 39	779 55	515 00	243 84
Dodge	Joel Rich	C. Van Schaick	S. Givens	Juneau	Oct. 12-14	205 43	209 00	....	3 57
Dorr		J. Kimber	....	Sturgeon Bay	Oct. 20-21	100 00	100 00	12 70	....
Fond du Lac	W. A. Knapp	Daniel C. Lamb	A. B. Taylor	Fond du Lac	Sept. 22-23	1,818 35	1,757 12	740 75	61 23
Grant	....	F. A. Burr	Harrison Reading	Lancaster	Sept. 15-17	2,284 30	2,123 31	807 00	60 99
Green	H. W. Whitney	Wm. W. Wright	Thos. Emerson	Monroe	Sept. 23-25	1,980 13	1,866 72	909 50	113 41
Green Lake	L. J. Brayton	L. R. Davis	L. R. Davis	Princeton	Sept. 22-23	564 18	489 22	364 72	74 96
Iowa	John Ellwood	Orville Strong	Samuel Hoskins	Dodgeville	Sept. 22-25	1,104 23	869 13	478 50	235 10
Jackson	D. J. Spaulding	Oliver O. Hearn	J. V. Wells	Black River Falls	Oct. 6- 7	503 75	489 65	246 53	151 05
Juneau	F. Langworthy	I. G. Parker	M. Temple	Mauston	Spt. 29-Oct. 1	653 00	637 05	503 10	15 95
Kenosha	H. A. Newburg	Henry H. Tarbell	L. W. Thayer	Bristol	Sept. 21-23	1,743 31	1,138 50	656 50	604 81
La Crosse	C. C. Palmer	A. J. Phillips	V. M. Adams	Salem	Spt. 29-Oct. 1	758 10	775 71	435 00	17 61
La Fayette	J. Merriott	H. L. Brown	Stephen S. Allen	Darlington	Sept. 22-25	1,407 21	1,407 21	867 60	....
Lodi Union	F. Perry	H. W. Cass	H. M. Ayer	Lodi	Oct. 6- 7	915 27	869 35	551 00	45 92
Manitowoc	D. J. Easton	E. B. Treat	Wm. Bach	Manitowoc	Oct. 14-15	386 37	386 37	149 00	....
Marathon	B. G. Plumer	Valentine Ringle	C. Hœflinger	Wausau	Sept. 24-25	611 00	588 05	388 85	22 95
Marquette	H. S. Thomas	G. W. Robinson	S. A. Phœnix	Montello	Sept. 29-30	212 00	258 05	125 25	....
Monroe	Joseph Covey	H. F. Kelley	Thos. B. Tyler	Sparta	Oct. 13-15	571 75	565 07	82 00	6 68
Outagamie	W. H. P. Bogan	W. H. Lnaphear	E. C. Goff	Appleton	Sept. 15-17	525 75	293 50	93 50	232 25
Ozaukee	A. M. Alling	Wm. Vogenitz	B. O. Zas. Kussow	Cedarburg	Oct. 20-22	252 00	252 00	134 70	....
Pierce	J. M. Bailey	Wm. Howes	M. W. Barb	Prescott	Oct. 4- 5	407 20	309 25	214 50	98 15
Racine	L. C. Osborn	E. O. Cole	Wm. V. Moor	Burlington	Sept. 14-16	2,664 75	2,147 85	1,257 75	516 90
Richland	J. H. Carswell	J. H. Waggoner	C. H. Smith	Richland Center	Oct. 7- 8	651 83	651 83	235 15	....
Sheboyban	D. W. Gilbert	A. D. DeLand	M. D. Hoichkiss	Sheboygan Falls	Sept. 15-16	505 20	523 49	327 25	215 31
Trempeleau	R. C. Field	Henry French	D. W. Wade	Galesville	Oct. 6- 7	500 14	485 97	208 69	14 17
Vernon	C. P. Tracy	Geo. W. Muzam	Ralph Hall	Viroqna	Oct. 6- 8	782 02	379 02	258 15	409 00
Walworth	Charles Dunlap	S. G. West	....	Elkhorn	Oct. 5- 7	2,215 00	1,622 99	839 50	592 01
Washington	F. W. Nolting	Valentine Detling	Franze Lorenz	West Bend	Oct. 5- 7	484 07	390 02	107 75	94 05
Waukesha	Edward Porter	W. V. Tichenr	O. M. Tyler	Waukesha	Sept. 21-24	1,280 63	1,066 11	414 00	214 52
Winnebago	Asher Hubbard	James Brainard	Jas. H. Jones	Oshkosh	Sept. 22-24	991 36	941 20	547 20	50 06

REPORT

OF THE

WISCONSIN STATE HORTICULTURAL SOCIETY

For the Year 1869.

ANNUAL REPORT.

1869.

The Wisconsin State Horticultural Society has made good progress during the last year. The meetings have been more numerously attended than ever; the addresses delivered and the papers presented have been of a valuable character; the exhibitions, both general and special, have been more than usually large and attractive; and the society has also been reasonably successful in the new enterprise of directiug the improvement of the experimental garden on the State University Farm. In one thing, only, did it entirely fail—in securing the very moderate appropriation asked of the legislature, to enable it do more and better work in the future.

It is believed that the matter contained in the report herewith submitted to the members of the society and the public at large will be found exceedingly interesting aud valuable.

As the fall exhibition was a part of the general exhibition of the State Agricultural Society, and is fully reported in that society's transactions, but little space will be occupied with it in this report, other than with the interesting address of that veteran horticulturist, Dr. John A. Warder.

Thanks to the liberality of the State Agricultural Board, the society has been enabled to meet all its obligations, and has a small balance in the treasury.

The importance of the work done by the society is recognized more and more fully every year by the intelligent people of the state, and the time is not remote when its services and its necessities will be duly acknowledged by the law-making power.

ANNUAL MEETING.

STATE AGRICULTURAL ROOMS,
TUESDAY, Feb. 9, 1869.

The Wisconsin State Horticultural Society convened for its annual session in the agricultural rooms, in the capitol at Madison, at 7 1-2 o'clock P. M., and was called to order by the president, Dr. Joseph Hobbins, pursuant to the call thereof, published for that purpose; when Wm. T. Leitch, the president of the Madison Horticultural Society, delivered a brief address of welcome.

ANNUAL ADDRESS.

President Hobbins followed with his annual address, which was listened to with intense interest by those present:

Gentlemen and Members of the State Horticultural Society:

The address I am about to make to you consists of such horticultural reflections and suggestions as have occurred to me from time to time during the past year, run together without any particular order or method. Nor, indeed, as you will discover, have I made any special effort to elaborate the thoughts I shall utter, since I would rather that they should be regarded as of a purely suggestive character, leaving the elaborating and perfecting process to you, should you deem them of sufficient importance.

As I move through society I have been struck by the false and by no means flattering idea which many people seem to entertain of the character of a horticulturist, and more especially of the amateur horticulturist. Therefore, I shall take this opportunity, knowing that what I have to say will be likely to reach such people through the publication of our transactions, to disabuse their minds, if possible, and to give them other and better impressions of us.

There are in our community those who erroneously imagine that the love of the beautiful, even when it involves the useful, pertains to or implies effeminacy of character, and that florists and fruit-growers are necessarily men wanting in the more manly qualities of the mind.

There are, also, those in society, who, having no adequate appreciation of the wonders and beauties of creation, of the stars which illumine the heavens, or the flowers which adorn the earth, or of anything beyond the things which minister to the grosser senses, utterly and ignorantly condemn all the refining influences as well of art and of science, as of nature. For them, there is nothing grand and generous in the open day of summer, nothing soft and witching in the silver hour of evening; neither music in the gentle breeze, nor perfume in the perfume-breathing flower. For them, there is no tongue in trees, no books in the running brooks, nor good in anything. Nature never smiles for them. The kindly voice, the song of birds, the merry laughter of children, all alike are but dumb meaningless things. Not a single chord in their breasts to vibrate with beauty or gladness. How aptly has the poet painted an individual of this class—

> "A primrose by the river's brim,
> A yellow primrose was to him,
> And it was nothing more."

We believe, and it is a belief full of wondrous pleasure and satisfation to the mind, that God created the heavens and the earth. The dominion thereof was given to man. Do we not acknowledge this to be immeasurably grand, beautiful and God-like? This work, this creation, was for us! Does not the gift argue the fitness of a like grandeur and likeness to God in the receiver? And yet this great work was to be completed; and so "the Lord God planted a garden in Eden, and there He put the man whom He had formed." Pardon me, if you please, the quotation on such an occasion; in order to dignify as well as justify gardening, the science or knowledge of horticulture, I could not resist the temptation. Where God has put man—his own likeness—you will, I trust, agree with me, man may still take his stand, regardless of the charge of effeminacy. And above all, where gentle woman is placed along side of him in his garden—there, and there alone, so far as I have any knowledge, is your true Eden to be found; the world itself, the outside creation being left to those contemners of the beautiful for whom paradise itself would have no charms. Beauty cannot be ignored any more than virtue, goodness—both are essential to the happiness of man.

The love of horticulture is then of no effeminate character, but arises, though we may be unconscious of the fact, in that love of repose, which is innate in the bosoms of all men, but most manifest among the intellectual and refined. I know that it is common to attribute it to a love of nature. But this is an error in my opinion. An ardent lover of nature usually seeks the indulgence of his passion in activity, in restlessness, in travel, in exploration and adventure. Not so with the lover of the garden. He is found wedded to his idol at home. And if we were to judge him by the calm, and quiet, and happiness he finds there, we should find that his love for a garden had both for its result and origin the love of repose. Neither is there in this effeminacy nor weakness, since repose itself is one of the grandest features of the Divinity, is indeed one of his attributes, a quality by which man as well as things may be fitly tested for their own true worth.

Horticulture then is like all other good and perfect things, of divine origin and nature, a science pleasant and useful, and in this, its origin and nature, is seen its true relationship to ma

The duties of man, in this relationship, are as numerous as they are pleasant and profitable. The earth, the seasons, his own necessities as well as his desires, invite him to these duties and, to a great extent, indicate how they shall be done. This great world of ours has sometimes seemed to me like a great picture gallery, full of beautiful picture frames—some full, some empty, and where every man has an ownership. We all have a little frame for ourselves. Is it filled? If not, will you fill it? The gallery is the beautiful earth itself. The frames are the surroundings of our own homes. Shall then our little worlds be little Edens, or little wildernesses? In other words, shall we have pleasant and useful gardens, or unsightly, unprofitable and empty lots or yards. Resolve we this question favorably, and then it is that our duties as horticulturists are commenced. What kind of a garden do we want? Pleasant and useful it must be; but of what shape, and what will be its internal arrangements? What shall we grow? When shall we plant? How feed and tend the plants? Here is a little world of enquiry for us, but it is a world full of delight and content in which the true lover of horticulture finds himself oblivious to all other cares and knows no disquietude but what shall spring from some pleasurable solicitude for the well-being of a cherished plant or honored tree. In the very littleness of such cares lies hid very much happiness and very many comforts. "A garden," says the great and wise Lord Bacon, "is the purest of human pleasures; it is the greatest refreshment to the spirit of man, without which, buildings and palaces are but gross handiworks; and man shall ever see, that when ages grow into civility and elegance, men come to build stately edifices sooner than to garden finely, as if gardening were the greater perfection."

In the subject matter of the questions just propounded are involved the art and science of gardening, the methods and manner as well as principles of our duties, as horticulturists. A very ignorant man may be a very excellent gardener as far as art is concerned. Of this truth, we have every day proof in the illiterate character of the men who do our gardening. And one who possesses an excellent knowledge or scientific education as a horticulturist may be equally ignorant of the art. The distinction is perfectly legitimate, since it is the province of science to discover truth and of art to apply the truth discovered. Sir Humphrey Davy, the great chemist, as well as philosopher, once made a blunder notably illustrative of his ignorance as a man of science. His science without art or experience led him to believe and to promulgate the theory that recent undecomposed manure was the proper food for plants, a theory at variance with the experience of all art gardeners, and an error. Nor is Sir H. Davy the only reputed man of science who has made blunders in gardening. I have myself known a gentleman who stands pretty high in this state as a horticulturist plant a top onion upside down, it not having occurred to him that there was either top or bottom to an onion. Sir John Herschel has well said in relation to this distinctive character of art and science: "In the progress of mankind from barbarism to civilized life, the arts necessarily precede science. Applications come later; the arts continue slowly progressive, but their realm remains separated from that of science by a wide gulf." Art itself, he wisely characterizes under two heads—that which consists merely of *accumulative experience*, in which the reasonable faculties had played but a small part, and the *scientific art*—the result of "*experience reasoned upon and brought under general principles.*" This is true art, whilst that is only false or *empirical*, as Sir John calls it.

When, therefore, I speak of the principles of gardening or horticulture, I would be understood as meaning the principles of gardening derived as well from art, that is, practical experience, as from true science, which is knowledge, practical as well as theoretical, a basis of fact as well as of reason understood and demonstrable.

I have said that the first requirement of a garden is, that it should be both pleasant and useful. Concerning its shape or the proper form of its boundary line, it is not easy to lay down any rule, nor, indeed, bearing in mind that the outlines of our gardens are already laid out in rather an arbitrary manner, after the fashion of oblong lots and blocks, it is but seldom necessary. Where, however, our residence is in the country, and we are untrammeled by city restrictions, the question may occur, of what form shall a garden be made? And the answer will be just what the practice always is,—according to your fancy. It were to be wished that I could tell you what fancy is, or where to find it, as otherwise I have only succeeded in creating a dilemma for you in the place of affording easy instruction. But, alas! I too can only say:

> "Tell *me* where is fancy bred,
> Or in the heart, or in the head,
> How begot, how nourished."

Fancy is said to be a lady, and in order to possess her, it is first necessary to cultivate her acquaintance. A cultivated taste will go far to supply the absence of particular rules. But fortunately for us, where these rules are applicable only with great difficulty, there are always some general principles to be found for our guidance, which with the aid of taste and judgment are all sufficient for our purpose.

It was the practice of those noble masters of architecture, the architects of ancient Rome, to suit the style of their buildings to the character of the scenery or the objects of the vicinity where they were about to build. And I have observed that where this practice has been adopted by landscape gardeners in the making of gardens, the effect was good, because in perfect keeping, everything was harmonized. The best specimens I have ever seen of this kind of gardening, was the far-famed and justly celebrated Leasowes, designed and executed by the poet Shenstone, and which Dr. Johnson, in his "Lives of the Poets," has so aptly termed "a perfect poem." It is, or rather was, in itself a perfect epitome of all that is beautiful in natural scenery. 'Twas here that Shenstone spent both his life and his fortune, and sweet as were his verses, his true and best poem was his garden. Bold, subdued, hilled, vallied, treed, shrubbed, flowered and fruited; grottoed, cascaded, and rivuleted, meandered by walks leading by "devious ways" to spots opening upon views or objects of beauty and interest. Nothing left to accident, but all ordered by design—a perfect plan—the work or creation of one tasteful, thoughtful, cultivated and poetic mind; no wonder that it should rank as the first of England's gardens, though the land itself is but a land of gardens. The great charm, however, of the Leasowes, was its harmony with the surrounding scenery. The majestic basaltic rocks of Rowly Regis on one side, the dark and towering woods of Hagley park, (the seat of the famous Lyttletons) on the other, with the Clay hills and Malvern the monarch of midland shires in the distance; with a hundred sweet and beautiful vallies between. What grander picture frame could be desired for a poet's painting. And in that painting was to be found everything requisite to the beauty of a garden, regulated almost by scale, so strictly in harmony was every feature, both of nature and of art.

How different is this, which was so perfectly natural, and therefore may be said to be true art, from those other far more but less justly famed gardens of Chatsworth and Versailles. These are almost purely artificial, independent creations—locally regarded. You might plant them anywhere, especially Versailles, and they would look almost as well. And in this, in my opinion, lies their failure. The gardens proper, of both of these world-attracting places are flats, and their chief attractions fine palatial buildings, with fountains wondrous and statuary most exquisite, with the one, and a modern flat building, with a magnificent conservatory, fountains and a waterfall and river, with the other. The same Dutch, stiff style of terrace gardening proper, is followed in both places. As works of art, architecturally considered, they are indeed well calculated to challenge admiration. But as gardens, they neither appeal to the eye, the heart, nor the mind. Shenstone's garden, as Johnson says, was a poem complete, the creation of a garden lover, of a sweet, true, cultivated country poet, while Varsailles and Chatsworth, as I have trod them over, and see them even now, are as it were the fruits of a palace builder's dream, a Kubla Khan, if you will, a broken dream of art splendor, a poem grand and startling, but unfinished, *unreal.*

Now the same principle that obtains in the Leasowes, or in large gardens, applies, though unequally, to our city lots, or small gardens. The difference lies in the size of the garden and the character of its surroundings. But does it follow because our picture frames are small that our pictures are necessarily lacking in art, in finish, or in beauty? By no means. The miniature, though less imposing, may be full as beautiful as the life sized portrait. And the landscapes of Turner, small though they be, are scarcely less valued than the larger ones of Claude. All that is necessary is, that we should harmonize, that we should be governed by the law of proportion—which law itself consists in harmonizing things of different proportions. There is no harmony in planting the lot surrounding your house entirely with cabbages, or potatoes, and yet this is a common practice, nor does it show a particle more of taste to plant a forest of apple trees about your home, a practice almost equally common. The reason is, that moderation is an attribute of beauty. Any error in this respect is an infraction of the laws of proportion without which beauty in art cannot be obtained. Want of moderation, from whatever cause it occurs, betrays at all times a want of proportion. Besides, every garden should have an expression, and that expression should be a reflection of nature, or of finished art, which is the same thing. The absence of this strikes one as does the vacuity of idiocy. This want of it, or where it is found only in a too limited extent, affects one as painfully as does the portrait of a friend where the same want is observable. It is this very feature of a garden—its expression—that denotes the master hand. It is with the spade in the garden as with the brush on the canvass, your colors may be all correct, your grouping to the life, your beds may be in perfect order and your plants in exact position; but something more is wanted than either brush or spade. And that is *intelligence*, right expression, which must be made to shine out as it does in the face of nature; otherwise nature herself, at the best, is but beauty without light, without power of illumination.

A garden is but a horticultural painting, and unless, like a painting, it is true to nature, it is only a false specimen of art, or a specimen of false art, as you like. A garden, then, is "a thing of beauty," it must be so in order to meet its first requirement, that of pleasantness. In this requirement is involved the first and greatest law of garden making. It must be pleasant, and in order, as we have indicated, to be pleasant, it must be made beautiful. Nothing unsightly must be seen. Nature must be won by art to mould herself to your taste and design, and the work being completed, the only test, a simple and ever true one of its perfection, is the spontaneous pleasure it gives to the intelligent eye. Where with an effort you are to look for beauty, argues either no beauty present, or the absence of all taste for the beautiful. The cultivated eye is the sole judge.

A garden, as I have just said, is but a horticultural painting, embracing all the details and accessories that the subject required. It should have its little lawn, its roses and honeysuckles on each side of the front door of your house, and its ivy, the Virginia creeper at each end of the piazza, and reaching as high as the chamber window and falling in graceful festoons from the house gables. It should have a variety of flowering shrubs, choice and increasing in size toward the dividing fence on one side and a moderate sized tree or two, ranged with a few evergreens on the other side, serving both for ornament and as a screen from the public gaze to the back garden. Make a little bed of perpetual roses and another for geraniums and verbenas, and intersperse a few hardy perennial plants among your shrubs. Plant a row of trees outside of your sidewalk, and the arrangements for the front of the house are tolerably complete. The back garden is for use, but equally pleasant as the front. This should be laid out so as to possess a few choice fruit trees, apple, plum, crab, and if you are south enough, a pear, cherry and may be, a peach. The walks may be edged with currants, undercropped with strawberries. The fence with the south or south-west aspect should be covered with grape-vines, and that of the north with blackberries and raspberries. It is perfectly wonderful what a variety of things can be grown, both luxuries and things necessary, in a single lot of ordinary city or village size. It furnishes room for all the summer and fall vegetables, salads, etc., as well as an odd nook or spot for things purely ornamental.

I do not make it essential to have fountains, grotto work, statuary or glass houses which will come with the coming wealth of the state, but rather address myself to what can be done now, with but little expense and with no more care than is at once pleasurable and profitable. Nor would it be possible for me to particularize the tree or shrub, or flower, or fruit, or vegetable that should be planted, nor, such is the diversity of our soil and climate, would it be wise to attempt to lay down any law for their cultivation or proper method of caring for them. That which I have unavoidably omitted, each must supply for himself. Individual taste, intelligence, experience and necessity will teach how this is to be done, and where these fail, this society will be found the best teacher.

I have now, gentlemen, to offer you a few suggestions, crude enough and unelaborate, as already intimated, but which I trust may not be found unworthy of your consideration. And first among them, is one upon the manner of conducting our horticultural exhibitions. My own ideas are that we cannot make our exhibitions too attractive, and that for this purpose, what are usually regarded as extrinsics on such occasions, like music, dancing, refreshments, etc., are perfectly legitimate means for us to use, being used as a means to atttract and amuse, in order to win the opportunity to teach. Amuse, attract, teach. That music, dancing and refreshments greatly conduce to the success of our local exhibitions and to spread the love of horticulture, no one conversant with the history or proceedings of the Madison Horticultural Society would doubt. This is the English method of conducting such societies and the success of the Madison society is in a very great measure, as I think, owing to its being such a good copy of the original. In conducting our state exhibitions, I can easily see that the quadrill feature might not be so advantageous, but I can see no reason why we should not have music. To say the least, it would be quite as good for horticultural as agricultural, and as you know, gentlemen, the State Agricultural Society is set to music, that is, they have their band. Music should be had, scenic ornamentation, fountains, rustic or garden furniture, garden implements, (following the practice of the agricultural society) and in fact specimens of everything useful and ornamental in horticulture. The paramount object of all such societies is to teach. In my opinion, to do this, it is not enough that we simply *show* the *fruits* of our labor. We should show the *means* and *modes* of producing this same fruit. Much of this can be done at a glimpse, and to those who come to learn, such a glimpse is valuable.

There is another feature that can be profitably and legitimately added to our exhibitions, both local and state. I mean the garden vegetable feature. I cannot conceive that any sound reason can be urged for excluding it from our shows. We call ourselves a horticultural society, but our shows would lead people to suppose that we were nothing more than a fruit and flower society. To introduce and promote the collection of choice and good vegetables seems to me a part of our mission. Potatoes sold at a dollar a pound are surely as worthy of cultivation in the garden as the apples which sell at but a dollar the peck. We should lead, gentlemen, in this matter and not follow the farmer.

The policy of our society, too, I should like to see amended in some things. The importance of a more perfect union with the local societies for the purpose of giving and receiving information, must be obvious to us all. Local knowledge is what we want, since the experience of another state, or even of parts of our own state, cannot always be accepted as our guide. Ours is a peculiar state, both in soil and climate, and our practice in fruit growing must be in its modes peculiar also. We must study our own state. Without a more perfect union with local societies, and without an increase in the number of our societies, the knowledge we want can be obtained but slowly and with uncertainty.

The next suggestion I have to make to you is one which, if it meet your approval, I hope you will take such action upon before leaving the city as will be likely to secure its adoption by the legislature. You will remember, gentlemen, with some little pride your initiating the movement for the appointing of commissioners on the part of the state, whose duty it was to report upon the destruction of our forests, its injurious effects, etc., upon the climate, upon the people, and the duty of the state in regard to the matter. I scarce need add that one of those commissioners was appointed as the law directed by this society, or that a more able, and interesting report was never made to our legislature. I wish now to urge upon you the necessity of a horticultural exploration of the state. Its necessity at first sight, I must confess, does not seem very apparent, nor does such a proposition seem to present any sufficient compensating advantages. But when we come to consider that very little is known of our indigenous fruits,—I mean in their great varieties,—that probably still less is known of the character of their habits, and that it is now, as it ever has been even in the old geological ages of the earth, the habit with certain plants as well as with animals to locate themselves only in certain peculiar localities, the importance of finding out the character of these plants as well as the character of their localities if we wish to cultivate fruits, becomes manifest. I shall perhaps be better understood, if I say that it is stated on good authority, that we have over a hundred different varieties of indigenous plums in Wisconsin,—that some are red and some are yellow, but those in one locality are three times the size of those in another locality, while one is of a good quality and the other not good. Now, this is about all we know of them at the present time, and but few people in Wisconsin probably know so much as this about their plums. Add to this, that the plum is a very desirable fruit, that it is almost impossible to grow the tame plum with us, and then the importance of the exploration I ask for is in a measure apparent. And let me add, as with the plum, so with the raspberry, blackberry and other fruits. In all countries are found localities where particular varieties of the same fruit grow best. This is a fact sufficiently familiar to us all. Do we know anything positive of the existence of these localities in this state? Very little. With the great desire on the part of our people to grow fruit, is it not desirable to ascertain whether they exist at all? How is this to be done? By the blind and ruinous blundering on the part of men ignorant of the first principles of horticulture, or by intelligent and systematic research and inquiry? Which of these courses is most conducive to the interest of the people? An exploration then, of the kind I recommend, should have for its object, not only the learning all that can be learnt of our indigenous fruits, but the learning of all that can be learnt of those localities, where, for good and sufficiently ascertained reasons, the people can plant with the reasonable assurance of gathering the fruit. A commission of this character, at an expense of a thousand dollars, would, I have no doubt, if it did nothing more than teach us which of our indigenous fruits, the plum for instance, was most worthy of our efforts to improve by cultivation, and point out the best localities for fruits already domesticated, be a saving to this state of a hundred thousand dollars within the next ten years.

In connection with this suggestion, it ought not to be overlooked that horticulture is not simply calculated to beautify the land we live in, but to introduce among our people every variety of fruit and vegetable which can contribute to health or comfort. The art is but in its infancy among us, and to judge by what it has done for us the last fifteen years by way of introducing and originating new fruits and vegetables, it would seem that a new world of productions necessary, or as luxuries, is promised us within the next fifteen years. Will the legislature help forward this work?

A word or two about our experimental garden. This state, horticulturally speaking, has distinguished itself during the past year in a way unprecedented in this country, so far as I know, by the establishing of the state horticultural experimental garden and the giving of horticultural lectures in the state university by the members of this society. The initiation of such a work is work enough, as it seems to me for one year, but its perfecting and completion must be the labor of many men and many years. Its necessity and great advantage must and will ensure its success. Its progress promises much.

I have spoken of the necessity for a more perfect union between the local and the state societies for the special purpose of collecting local knowledge. While speaking of the experimental garden, I wish to add another word upon the importance of such connection, as without it we can advance but slowly. Nevertheless, a mere collection of facts in any science, particularly, as it seems to me, in horticulture, gathered as they must be under such different circumstances, can in themselves be of little service. They are as it were but the rough unhewn stones intended for an architectural structure; but without the chisel, without the architect and without the builder, the stones like the facts are but little less than useless. Here then it is, just at this point, that the experimental garden is required. It becomes, so to speak, a laboratory for testing the quality of local facts, comparing, sifting them, proving them, and determining whether they are valuable or worthless. Here too, at the same time is shown the value of the parent society, whose duty it is not only to gather information, but to digest it, to put it into shape and to build up the superstructure of its favorite science. In this way and in this way only, as it appears to me, can we have a truly scientific and useful society. Facts without science like science without facts, are calculated to mislead rather than benefit men. We must collect, collate, reason, deduce and prove, before we can hope to teach the people horticulture.

Before I close I have a pleasant duty to perform, in acknowledging the appreciative and complimentary manner in which Governor Fairchild has in his recent message recommended our society to the favorable consideration of the legislature. This action was unsolicited and entirely voluntary on his part, and as he has since informed me, resulted from his own observation of our efforts as a society, and the great good we were doing in the state. There is also another gentlemen to whom this society is under great obligation. I mean Paul A. Chadbourne, president of our state university. President Chadbourne has shown a deep interest in this society as evidenced not only by the able and appropriate address of last winter, but by his working earnestly and faithfully with us in establishing our experimental garden; believing as he does, that horticulture is not only an ornamental and useful science, but that it should form part of the education of an agricultural people, such as ours is. When, therefore, I say, that this is a matter of congratulation, I am sure you will agree with me, since to have enlisted the sympathies, the appreciation and the help of gentlemen deservedly occupying such positions, forms an era in the history of our society.

And now, gentlemen, in conclusion, though I might consider your favorite science in many more of its aspects and relations, I can scarcely believe it necessary. Were, however, any further argument needed to show the advantages of horticulture, it is to be found in its moral as well as its intellectual influence upon the character of individuals as well as of nations. Its action is indeed, in this respect, of a reciprocating nature. It not only is the means of civilizing a people but is again one of the products of the more refined civilization. It is not only a moralizer but the work of a moralizer in return. It is as the heavens, a picture-maker and a picture for the multitude; poverty's solace and the rich man's luxury. A teacher and a lesson in art, in the good, and in the beautiful. It is one of the few and certain means by wihch men can positively obtain that for which all men alike are seeking, how to spend a truly happy hour. It is a quiet communing with nature by which men are made better in the perfect forgetfulness of all other things. And this is to me one of the many, if not the most remarkable, features of horticulture. In my garden whilst tending a simple flower or a delicate vine, cares, thoughts, feelings, memory are vanished. There is a kind of sensuous delight but no preceptible consciousness of anything, but the little specimen of God's love before me. Such a state of mind has often been to me a source of reflection, of enquiry, and the result is that it is in itself but a touch of that felicitous state of existence,—in this world never fully realized but once,—when our parents, the gardeners of Paradise, were young on the face of the earth, and all guile and guilt unknown.

SECRETARY'S REPORT.

Mr. President and Gentlemen of the Association:

One year ago to-day I spoke encouragingly of your labors, and of the future. How well those hopes have been verified, and our expectations realized, it may not now be amiss to examine. Where we once were, were one year ago, are now, and still more ought to aspire to, is well worthy a moment's thought. But a few years back this association was thought to be dead—not life and energy enough in its members to resuscitate itself—but lo! the leaven had been working and "in an hour" many of us "thought not of" it sprang into life and "brought forth fruit," if not an hundred fold, still a reasonable increase, showing we have a healthy growth. Previous to the last year there had been no special object in view, save that of a general nature in the spread of horticultural knowledge, and the encouragement of planting and growing of trees. This, we believe, had its reward, and though we worked to a great extent very blindly, yet the society was instrumental in much good.

At the meeting of February, 1868, new life seemed to inspire the actions and motives of every member present, and with renewed energy they went to their task, feeling there is a pleasure in horticulture, in the spread of the "useful and the beautiful," which we have but half realized. As a result of this view and determination, we have but to refer to some of the tasks undertaken for the year, and to note with pleasure how well they have been carried out. First of all, we look at the resolution of the last meeting, accepting the use of five acres of the agricultural farm—kindly tendered to us by the regents for horticultural experiments. We are not aware that there is another society in the United States that has undertaken such a work. That it is a noble work, one worthy the heartiest support of every horticulturist in the state, none will question. We feel warranted in saying this, when we review the long list of contributions by its friends from all parts of the country. For the benefit of those not acquainted with the grounds, we would say, that it is almost new—soil even unbroken in the spring of 1868, and planting commenced at once. They are of a southern and western slope; running down to and including a portion of the level land. The grapes occupy the south of the hill, but mostly near its base. As a means of protection, but more in the future than immediately, evergreens have been planted in a large circle to the southwest from the grape plantation. Evergreens, small fruits and shrubbery occupy and form a border along the grounds immediately adjoining the principal drive of the farm. Apples are planted in an open space, but protected by high land on the east, and a low thicket at a little distance on the north and west. To start the planting of these grounds, with the expectation of any satisfactory results, was no small task. With comparatively no knowledge of what would be contributed, either in kind or quantity, to expect much was more than we did; to us 'twas like creating a world from nothing, but unlike the world, we have not yet been prepared to say even "very good" in its general arrangement, but hope now that better hands may follow and complete, even perfect it in the beauty and utility, we may imagine of such a work. The spirit with which these donations have been sent. is well worthy of comment. We did not *intend* to approach any one in a spirit of beggary—though we sent hundreds of circulars, and also wrote numerous personal letters, but these were more as reminders than solicitations.

The contributions and some of the letters characteristic of the trade, we thought, would not be uninteresting, and the same were published in the *Wisconsin Farmer*. A *resume* shows that there were 108 apple trees, 4 varieties apple-tree scions, 163 raspberries, 56 currants, 54 ornamental shrubs, 150 deciduous hedge plants, 1,599 evergreens, (of which 1,450 were contributed by one firm for a hedge experiment,) 107 grapes, 16 crab trees, 36 strawberry plants, 47 gooseberries, 178 papers of seeds, 6 assorted deciduous trees, 32 plum trees, making a sum total of 2,560 trees, plants and shrubs.

These are all doing well; but very few died. Grapes, berries, some of the shrubbery and all the apples are well mulched for the winter.

Another task undertaken by a portion of the society, and which we trust may meet with the hearty support of all its members, has been the carrying on of a system of lectures before the students of the university, or the male members of the same. And we would say here by way of parenthesis, that we were very sorry to see this discrimination; for we believe that as a rule, the subject of horticulture treated of in a proper lecture, with a view to its encouragement at home, would be of incalculably more benefit to the ladies than to gentlemen. They will carry it home, viewing it as a pleasure, with a view of beautifying and making home attractive; men are too apt to treat it purely financially. "Will it pay?" Of lectures, Judge Knapp read two, Messrs. Hobbins and Willey, one each. And we trust that they were received with the same spirit with which they were given, and were not altogther lost for good in the encouragement of horticultural progress, but will be followed by other gentlemen, whose light ought to shine more frequently than it does.

The last great task of the season was its annual fair. Unlike that of 1867, when every orchard was loaded to its utmost, this season was almost barren of fruit, yet with all this, the friends of horticulture responded nobly, and floral hall was well filled with choice specimens of fruits and flowers. We will not discriminate, for where all did so well, 'twould be folly to make the attempt. The fact that the choicest of apples, grapes, and as fine a show of plums as we ever saw, and peaches from quite remote sections of the state, were on exhibition is enough to confirm the opinion, already existing in the minds of many, that success depends upon the energy and ability with which we grasp the enterprise, remembering

"That he who by the plow would thrive,
Himself must either hold or drive."

The fair, we believe, may be considered a success, and the arrangement with the agricultural society for a joint exhibition satisfactory. We trust a committee may be appointed, or the incoming officers instructed to arrange with our co-workers upon similar terms for the coming season.

During the week of the fair the friends of horticulture listened to a very interesting address by Judge J. G. Knapp of Madison, on the "relation of our climate to fruit-growing, and the reason of failure." This address presented the cause of failures in a new and somewhat novel manner, laying the base of failure at the extreme drouth of the northwest, and to substantiate his view, cited numerous instances in confirmation of this opinion. It was listened to with much attention, and followed in remarks by several of the leading fruit-growers, who gave their experience with varied success, but all tending to confirm the idea advanced by the speaker of the evening—that the drouth of the latter part of the season of 1867 was the prime cause of the great destruction of fruit trees and plants during the winter following and summer of 1868.

This much then for the past. How well 'tis done, you, not I, may judge. Of the future what shall we say? The field for labor is large—ripening for harvest as much of the seed is already sown. In addition to completing the work already commenced, viz: more fully planting the grounds of the experimental garden, which we trust will be even more liberally supplied than heretofore, not with common things only, but everything which comes into your possession worth growing, and fully meeting the demands that may be made on you for lectures before the students of the university, and the annual exhibition to be given, I say in addition to these, the labors you have already on your hands, there are others which require your time and attention. Gentlemen, this society has a bright prospect before it. It is within your power to put forth the hand and insure ultimate success, if you but will it. Shall it be done, or will you let the golden opportunity pass? That you are weak, financially, is true—then ask for aid. That the legislature of Wisconsin will grant assistance, we have no hesitancy in saying, if your claims are properly set forth and the objects for the same explained. In the scientific world is a field for labor which rightfully belongs to this society to occupy. Shall we let it pass unnoticed; and where choice fruits *should grow*, will you allow it to be covered with crabs and thorns, yea, even thistles covering the waste places of our land?

It is within the province of this society to not only be a help-meet to work out an academy of science, but to take hold at the foundation of the work, and through its interest aid in the legislative work toward the dissemination of practical knowledge, so much desired and absolutely essential. There are rare and as yet unknown plants, both native and foreign, that may be of great service to our state, and which would add wealth to its resources were they but known. Your work involves great scope of action. All the discoveries connected with the natural sciences should be at your command, and when this is done, and the direct object of your labor is properly understood, and the relation it will hold to the state and country at large is appreciated, then has a field of labor been opened out to your view.

The objects to be pursued are many. You should appoint an ad interim committee, whose labors would be required almost entirely to be done during the summer, or at intervals from spring to fall. This committee, consisting of three members (Illinois has five), should visit every nursery in the state, noting the condition in which they find the trees, care of nurseries as far as possible, relative value of sorts cultivated and reliability of same. The bearing orchards of the state should be visited, list of fruits noted, and their value or merits as adapted to this soil and climate carefully written down. Any new or unknown sorts should be watched for and whenever found made the especial study of your committee, more especially so, if it seems to be thriving in its locallity, searching out its history, nomenclature, etc. The small fruit plantations should also be seen, seeking to ascertain in a general way the same facts as mentioned for the orchard and nursery. The facts thus collected should be furnished to the press from time to time, and finally published in your volume of transactions. You may say this a great task—true, but what is it as compared to the same undertaking in our sister state, (Illinois).

And of how much more value will it be to this state than that. How much more we need the information this committee can give us than Illinois does its committee is easily measured by the relative progress of horticulture and the knowledge of the same in the two states.

There probably would be no trouble in finding men who would give all the time necessary for the work, but who would not feel like paying the necessary traveling expenses attending the same. For this purpose the legislature of Illinois grants that state an annual appropriation, and Mr. Flagg, a prominent fruit-grower of Alton, writes me, "it pays." For this purpose an appropriation of $500 would probably be sufficient for the coming year.

It is a fact apparent to you all, when you stop for a moment to consider, that of all the enterprises of the state, horticulture has wonderfully languished, and there has as yet been nothing done by way of an application of the sciences to it, or to show to the world the knowledge, for the benefit of horticulture, which might be gained by a study of the natural sciences, horticulturally considered. Again, has anything ever been done to develop this state scientifically? Has entomology even a name in our midst? What do we know of the insects injurious to our crops, of those which prey upon our fruits; of our insect friends? How little the school boy, who hunts for the fun of it, knows whether he kills friend or foe as he takes aim at the feathered songster. Upon this subject, A. S. Fuller, horticultural editor of the New York *Sun*, says in the *Journal of Agriculture*: "It must be apparent to every observing horticulturist, that insects which are injurious are rapidly increasing. There is scarcely a flower, fruit, or seed which has not one or more insect enemies; and their depredations are becoming so numerous, that it is to be feared that many species of plants will have to be abandoned unless some efficient remedy is soon discovered. Our fruits have suffered most; but flowering plants and ornamental trees are injured more or less every year. To know how to successfully combat these enemies of our gardens requires a knowledge of their habits, and to obtain this information much time and patient investigation is needed, more I fear than every horticulturist can command; therefore, we have to look to the professional entomologist for all the minute particulars regarding the characteristics of each family genus or species." What Mr. Fuller says of the east applies with redoubled force at the west. We need a state entomologist, to whom all questions might be submitted regarding this subject of vital interest to us all, whose mission should be to examine into the habits and peculiarities of such insects as might be sent him; to give in detail through the press and printed reports, their peculiar habits, mode of living, noting with distinctness every trait; so that we might know friend from foe, with some of the remedies or means of ridding the state of the numerous insects injurious to vegetation, and at the same time to tell us all about such as are beneficial, that their lives may be spared. The legislature should be asked to grant the state horticultural society power to appoint such an officer, with instructions to report to this society, and to print said report, for general distribution.

The history of this society shows that nearly all its life has been spent in discussions and comparing the merits of different fruits, thereby forming a list worthy of extended cultivation, as well as trial. This was well. In this, individual experience was of great, even indispensable benefit and importance as a basis. Now that we may make more rapid progress, and no longer than possible grope in the dark, let us add to the science of entomology that of botany. To this, as we gain age and strength, may be added geology, meteorology and climatology. Any and all will prove of value to the tree planter, but we now deal with botany, as of first importance to horticulture. A thorough knowledge of the botany of Wisconsin will throw new light upon horticulture. Of the many wild plums and apples indigenous to this state, who can tell but that some may be found better than our best cultivated sorts. And out of the multitude of localities where these fruits are found, we need the knowledge of locality, soil and aspect. The evergreen forests of the north, deciduous trees everywhere, flowering plants in the depths of timber tracts, and blossoms on the prairies, all have a history, which if well told will tell a tale of interest to every hamlet in the land, and be read by thousands who are looking westward for a place to spend their days. Aside from the gratuitous labors by Dr. Lapham, some years since, and printed in the different reports and periodicals, we have no written botany of Wisconsin. Other states are fast out-running ours, and it becomes us to look to our laurels, or the fact will tell upon us seriously ere we are aware where we are.

The day has gone by when it is expected that a life time of experience must be served as a sort of apprenticeship to fruit-growing. Science, knowledge, comes to our aid, and this, wedded to the already acquired experience, will be instrumental in much good. As life changes, so we progress. A well and authentic description of the botany of any locality cannot well be given without also describing the soil connected therewith. This given, and the adaptability of this to any given fruit tree or shrub, and who cannot discern the reliability of that certain track for the particular fruit of his choice. Then getting out of the beaten track of traveling by experience alone, let us call to our aid the sciences, and with this new demand and great necessity, invoke the assistance of the present legislature to further the cause. Believing that by so doing, we in asking and they in granting, will bestow a lasting benefit upon the future generations, who as they apply the knowledge gained by the study of these sciences to their labors, may more easily and effectually combat with the insect enemies, more readily supply to the wanting soil its proper food, and guard with greater efficiency against the fickleness of our climate.

The advantages to be gained by a botanical report with a proper record of the same, to be made or kept either by accurate drawings of plants, or preserved by drying and pressing or otherwise, specimens of every known species that can be found, is well expressed by Dr. I. A. Lapham, who writes your secretary that already "many of the plants in my (Lapham) collection are now scarcely to be found in the state, having been driven out by the progress of improvement by which *May-weed*, *mullen*, *thistles*, etc., take the place of the native plants. The time is now at hand when my collection will afford the only evidence of the former existence of many plants in certain counties of the state." The "progress of improvement" of which he speaks is going on more rapidly now than ever before, and if a *few* plants are now extinct, soon a large proportion of our once numerous and beautiful native plants will pass away and the future has no history to tell the tale of what covered the face of our earth. Accompanying, or for the use of this survey, should be a room, where all the grasses and plants of the state and a memoir of the forest trees with drawings of the seme, and also the preservation of wild fruits in spirits or otherwise, can be kept. Thus will the state be favored with an herbarium, which will form when opened to the public, a complete history of the natural resources of the state, to be studied and visited by every student of the country—and growing of more and more interest with every advancing age, and especially so to all those who desire to acquire a current knowledge of those sciences.

Of the advantages of the entomologist's reports and his labors we can only judge by estimate or comparison as made in other states. By the best authority, and of those who have given the subject much thought, it is estimated that "the injury done by insects to the various crops in the United States is three millions of dollars annually." Our own state is no more favored than others. Benjamin D. Walsh is doing good service in the insect field in Illinois, and the results of his labors are felt to a certain extent everywhere. Missouri has the services of C. V. Riley. New York calls to her aid the valuable services and experience of Dr. Asa Fitch, and it is estimated by those "familiar with the facts, that his labors in New York, by studying the character and habits of insects, thus enabling him to suggest remedies for the evils they produce have already saved to that state annually, the handsome sum of $50,000."

Should our state interests lag? Can we sit idly by and see this great destruction going on? Rather, shall we not honestly and urgently press our claim and the great necessity of the same before our legislature, till they too will see as we do, and pass a law for the immediate examination and reports, as mentioned above?

Adjourned to Wednesday, 9 A. M.

SECOND DAY.

WEDNESDAY, Feb. 10, 1869.
9 o'clock A. M.

The meeting was called to order by the vice-president, J. C. Plumb, in the absence of the president.

Opened with prayer by the vice-president.

On motion of Mr. Greenman, from the committee on the conduct of business, Thursday evening was fixed upon as the proper time to hear the address by Judge Knapp.

Judge Knapp, from the committee on the address of the president, and report of the secretary, reported a memorial to the legislature, asking that body to give annually $1,000, to be expended in making experiments in the horticultural garden, on the state agricultural farm, collecting information, etc.

Remarks were made by several members upon the necessity and propriety of the grant being made in aid of the society.

Mr. Stickney hoped that the aid asked might be allowed; and that the entire fund would be expended in developing experiments upon the five acres secured to the use of the society on the agricultural farm. He considered this the center or nucleus around which everything would in the end center, and where all might be proved and their merits tested. Such as are good recommended, and the bad condemned.

Mr. Cover thought that it was very essential to have the appropriation made for this object by the state. The design was to benefit the whole people, and not individuals. To make the experiments that were required, funds were needed, and we could not depend upon the amount of members' dues. This experimental garden was a favorable opening; and it was exceedingly proper for the society to lay hold of it and press the matter, and prove to the people what can be done.

Mr. Stickney thought we could scarcely over-estimate the value of the experiments that might be conducted on this ground. New things are continually presented to the horticulturist, which ought to be tried. Now these tests and trials must be made by the hundreds of men into whose hands they may fall, and if they fail, there are the hundred failures, and hundred losses. With the experimental garden all can be proved in it, and the good, if the thing be worthy, will be for the whole, and the failure, if there be one, will be single, and be borne by all.

Judge Knapp referred to the location of Madison as to its position in regard to the cause of the varying isotherms of our climate, and showed that few or no places in the state were more favorably located on which experiments could be made. Trees that would succeed at this point, would be most likely to succeed over a very large extent of country.

Mr. Plumb doubted if any other tract of land in this state combined greater advantages than did this garden; or was better fitted for the carrying on of these experinents. They ought to be made if it were possible. They would be of infinite value to the state, ten times more than the amount asked for.

The further consideration of the memorial was postponed for the present.

The business committee reported the next order of business, to be the reading of an essay by Mr. I. Gould of Beaver Dam, "on transplanting trees."

At the close of the reading, Mr. Gould produced a very large native crab, said to have originated in Indiana; and said it was not a Soulard, but they might call it a *Goulard.* He did not believe either was good for anything. He also showed an apple he had found in Minnesota, where it originated, which he called the *Rubicon.* This he considered about all that was desirable in an apple for the northwest. The tree was perfectly hardy, and the apple was fine flavored, of good size and a late keeper, as it had not yet reached its season.

Mr. Stickney, in commenting on the position taken by Mr. Gould, in planting out large trees, said that he could not agree to the position. He rather agreed with Phœnix and Douglass, that if by an earthquake or other means, all trees of over five years of age could be sunk and destroyed from the nurseries, the cause of fruit-raising would be benefited thereby. He would not rear such trees, nor offer them to his customers.

Mr. Gould would not recommend large trees to be carried long distances; but for short distances he was in favor of them, and they paid him for all his care and trouble in rearing them. And he thought he was doing good for "the cause of God and humanity."

All the other nurserymen present agreed with Mr. Stickney.

Mr. Tuttle, not being prepared to read any paper at present, made some verbal remarks, highly favorable to fruit-raising in this state, and encouraging to the orchardists therein.

Mr. Stickney said he had visited southern Illinois, on a tour of observation, and he was convinced that there were better chances of success in Wisconsin than in southern Illinois. He found there, men depending entirely upon fruit, and when it fails them, they are as poor from loss of crops as are some of our farmers who relied solely upon hops. They might as well take their chances here as any where, on uncertainties.

Mr. Peffer said he had endeavored to grow some peaches; at least he had always kept some trees in his grounds; but he had always noticed whenever the thermometer fell below 16 degrees below zero, that the peach buds were surely killed. And whenever a winter passed in which the thermometer does not reach that point, then his trees will bear. The trees are not killed when the flower buds are killed.

Mr. Tuttle said that he found that there was great difference between the list of fruit growing on timber lands and on open prairie, and he had noticed several degrees in the difference of temperature, depending on the location, whether rolling or level, protected by trees or unprotected.

Mr. J. C. Plumb then read an

ESSAY ON FRUIT GROWING ON PRAIRIE SOILS.

That the "prairies are not adapted to fruit-growing," has become almost an axiom in the minds of perhaps a majority of the people of the northwest, and, in view of the many failures, this is not a strange conclusion, yet it is one which is so unfortunate in its tendency and results, that, if by careful study of the nature of the case, and patient, persevering effort, it may be proven practically unfounded, and not a necessary misfortune of this great garden of the world—the prairies of the west—then it is worth a life's study and toil, to demonstrate how to adapt fruit-growing to the prairies.

Without stopping to inquire how these great interior tables came to have the accumulated vegetable mould of other geological periods, spread out in such lavish profusion, over hill and valley, I shall briefly designate the nature of the prairie soils, as found in this immediate northwest, and endeavor to show their adaptation to fruit growing.

These soils are of so similar a nature as to be classed as one, being composed mainly of alumina and silica, with a large per cent. of mould, and rich in the phosphates. This is essentially the cream from the great perennial summer of a past age, and happily for our time, it varies its proportions, from an excess of mould, to a large per centage of silica, or sand, and varies in depth from a few inches to many feet, where the subsoil is of the same nature, but of lighter color, from the absence of humus, or decaying vegetable matter of the present age.

This soil rests upon a base of many grades, of which the gravel drift is most common; also, lime and sand rock, with us, and in the state of Iowa. In some parts of Minnesota the prairie soil rests upon a base of blue clay, which rests upon a tight bottom, as in the Blue Earth valley at Winnebago City. Now I shall assume that the prairie soil, as first described, possesses all the elements of a perfect structure in the fruit tree, but that there is a tendency to excessive and prolonged growth, beyond the limit of a healthy ripening and perfection of wood necessary to endure the severe changes of winter.

These two points fixed, we can readily adapt our practice to secure the desired end, by choosing such locations as have had their strata of soil resting upon a bed of gravel, or rock, so that there may be a perfect drainage to the surface and subsoil. In case this may not be, then to the highest ground and best natural drainage attainable add surface-ridging by successive plowings before planting. Plant upon the crown of the ridge, and preserve these ridges by all the after-culture. To this add under-drainage of all lands that do not readily permit the water to pass through them, and subsoiling all the spaces not occupied by the roots of the tree, every five years after planting, not omitting to subsoil, in the most thorough manner, the whole ground before planting.

Soils retentive of water must be well drained to the depth the tree roots are expected to go, and is as necessary for the light-bottomed prairies as for the clay banks of the timber land. It is not a defect in the soil, as is often the case in many of our sandy districts, that stand in the way of perfection in fruit-growing on the prairie, but an excess of a good thing. Therefore the excessive and prolonged growth must be prevented.

The prairie planter has been too long in ignorance of the wants of the fruit trees. In fact many former teachers in our profession have said, in good faith, "that the soil that would grow good corn, was good for the apple," but dear experience has taught us that too much of a good thing may become an injury, by absolutely preventing the first condition of hardihood, *maturity*.

Among the artificial means of securing matured wood growth, the most practicable is that of root-pruning in early autumn. This secures a partial disconnection of the trees from that soil, and a ripening of the young wood. But as this is practical only with young trees in the nursery, or in the amateur's garden, we must look to the two grand natural means of securing the desired end, found under the head of *location*—First, with respect to *soil and culture*, and Second, with respect to *atmospheric influence.*

Of the soil I have spoken, and we must take it as we find it, choosing the dryest and leanest of the prairie soil for the apple, and all other fruits which are apt to suffer from excess of food in the soil. A few words about culture, which should be so conducted as to secure the complete ripening of the wood. Thorough culture, early in the season, with very little or no stirring of the soil after midsummer.

Mulching is the perfection of culture on the prairie, and with the abundance of straw and litter they afford, is worthy of constant and permanent use, provided always, that the trunk of the tree should be well banked with earth in the fall, to prevent the mice from eating off the bark.

I will now speak of the effect of atmospheric influences. An *elevated*, *cool* aspect for the orchard, will do much towards inducing an early maturity of the tree. As I have often said and now would reiterate, the cold winds of autumn and winter are among our best friends; inducing an early maturity, and preserving an equal temperature at times of extreme heat and cold.

This position, taken from observations made in 1856, in this state, I have seen no reason to forsake. In fact I have found that about the only good and promising prairie orchards are situated on the cold sides of the swells and bluffs, except in rare cases where the orchard has been planted in a very thin soil, lying upon a gravel or limestone base.

Fortunately for the fruit-grower, these two grand natura means of securing maturity and hardiness are so intimatelyl associated in the formation of this prairie, that in all of the rolling districts, there is an abundance of the finest locations this latitude affords, both in respect to soil and aspect.

The subject of protection to prairie orchards is one of much importance, but which is receiving so much attention from more ardent advocates, that I need only say that we should not rush to either extreme of close protection or naked exposure.

The prairie-planter needs a thin screen to break the force of the wind, both summer and winter; but if to the hot-bed soil of the prairie we add a close green-house atmosphere, we will have a luxuriant protracted growth of unripened wood, unfit for the extremes of our long winters.

The southwest wind is the only one we need to protect from, as its extreme force, in the growing season, often mars the tree and casts the fruit, and its extreme dryness in the spring is very exhaustive of moisture and vitality. Still it is questionable whether the winds from this quarter are not productive of more good, in the main, than evil. Therefore, while I would urge to the utmost, enthusiasm in timber-growing, both deciduous and evergreen, on the prairies, to shelter and protect man and beast, I would caution against any course of culture or protection which will defer or prevent that perfect maturity and hardiness which is the first need of the tree that must inevitably be exposed to the extreme of our climate.

When the principles here named shall be fully understood and applied, then may we see success with the apple on the prairies, as on the poorer lands of the timber.

The subject of revision of the apple list being under discussion, a remark was made that certain trees were liable to

APPLE TREE BLIGHT.

Mr. Willey said that he had observed this tree blight, and had satisfied himself that it was the work of an insect. He had seen the animal; and others could do so who would take the pains to hunt for it.

Mr. Lawrence confirmed the insect view of blight, and described it as a small worm not larger than a small needle, that entered the wood on the new growth, at the base of the leaf, and descends through the pith, where it could be found. This causes the branch above it to die, and the immature leaves remain on the tree during the balance of the year. He knew of no other remedy, except to cut off such limbs just below the worm and burn them, and thereby destroy the larvæ. He had observed that they were more numerous on some sorts than on others. The Golden Russet was most affected.

Mr. Greenman had not seen the animal, but the Golden Russet had so blighted with him that he was disposed to throw it out as a diseased tree.

Mr. Adams was of the same opinion and for the same cause, he would now examine for the rascal.

LIST OF APPLES.

The first list of five hardy apples was left, as fixed upon last year, adding thereto the Westfield Seek-no-further, viz: Red Astrachan, Duchess of Oldenburg, Fameuse or Snow, Tallman Sweet, Golden Russet.

Mr. Stickney had objections to the Astrachan as not entirely satisfactory in his section of the state. His trees were nine years old, and did not fruit sufficiently full. Perhaps it was owing to their want of age, as he understood it did better when older.

Mr. Tuttle's trees came into bearing early and were perfectly satisfactory. The only fault he could find on that point was, they bore too much, even to the detriment of the trees.

The Westfield Seek-no-further, which had been placed last year in the list for trial, was spoken of by Mr. Plumb, who proposed to transfer it to the list of very hardy trees, as an apple that could not be dispensed with, and would be satisfactory to the grower.

Mr. Smith had the tree and he considered it as very worthy of the place proposed.

Mr. Tuttle said the tree was a slow grower, bears sparsely at the first, and unless planted in old mucky ground it does well. It was, however, a better tree for all soils than the Yellow Bellefleur, which was too tender in some localities. He considered the tree as very hardy.

Mr. Kellogg said the Seek-no-further was more subject to damage in his nursery than the Bellefleur.

Mr. Lawrence thought the Seek-no-further much ahead of the Bellefleur, both as a hardy and desirable tree, as well as a fruit.

The *second list* was then taken up, viz: Sops of Wine, Fall Stripe, St. Lawrence, Perry Russet, Red Romanite, Yellow Twig, Blue Pearmain, Plumb's Cider, Fall Orange and Yellow Bellefleur.

Mr. Lawrence said he did not think very much of the Perry Russet.

Mr. Kellogg had never fruited all the kinds named, but he thought very favorably of them.

Mr. Stickney asked if the Bellefleur fruited well. He had never seen a full crop on the tree in this state. To this it was replied that young trees did not bear full, but the crop increased with age. As to the quality of the fruit it was highly spoken of by all present.

Mr. Kellogg had no desire to change the list; but he wanted to hear something about the Blue Pearmain.

Mr. Peffer said it was hardy with him, and he found it fruiting well.

Mr. Plumb said it was a tree that would never go back on its owner; was always good and bore well.

Mr. Stickney had never seen a crop of fruit on the tree, and was disposed to doubt its value in this state.

Mr. Plumb said the Cider was proving hardy all over the country. He had correspondence from Minnesota, stating that it is as hardy there as the Duchess of Oldenburg.

Mr. Adams said it had proved highly satisfactory with him in northeastern Iowa, some 700 feet above the Mississippi; and was the best rooting tree he ever saw.

Mr. Tuttle thought favorably of it, and it did remarkably well with him in Sauk county.

Some discussion arose as to the true name of what has been disseminated as the Fall Stripe, whether it might not be the Sexton. All agreed they could see no difference. Mr. Plumb said he had traced the tree to Massachusetts, where it went under the name of the "English Stripe." Mr. Willey had procured scions from central New York, in 1854, by the name of Sexton. All these names were considered synonymous.

The list was passed as arranged last year.

The *third list for trial* was then taken up, viz: Lowell, Fall Queen, Tetofsky, Bailey's Sweet, Sweet June, Carolina Red June, Northern Spy and Ben Davis.

Mr. Cover, speaking of the Ben Davis, said he had trees some 12 years old, in bearing. It had a very fine appearance in the nursery; was inferior to none in that place, except the Haas. Had heard that the apple was a very long keeper, but had no personal experience. No tree could be more highly recommended as a tree than the Ben Davis.

Mr. Plumb said that in McHenry county, Illinois, there was no more desirable tree. Mr. Skinner of Marengo, said he looked upon it as one of the best. The first year of its fruiting, the apples are apt to be small, but they increase in size in after years.

Mr. Adams had trees planted out five years, which had borne fruit for two years, and it was all that he could expect.

Mr. Kellogg objected to the Carolina Red June, as a poor apple.

Mr. Tuttle said the Haas and Fall Queen are different apples. He had both kinds. The one he had placed on the table was the Haas of Northern Illinois. This was a very valuable sort, and he thought favorably of it for Wisconsin. The Haas of Southern Illinois would not be hardy here. As the Seek-no-further had been removed from this list, he would move to fill the place by the name of the Early Joe. He knew of no better tree. It was hardy, an early bearer, grew slowly, and therefore was not very profitable for the nurserymen, but was exceedingly valuable in the orchard.

The Early Joe was added to the list.

A recess was then taken to 2 o'clock P. M.

2 O'CLOCK P. M.

APPLES CONTINUED.

The meeting was called to order by the president.

During the recess the members of the society had spread large quantities of apples in variety on the tables in the rooms, showing what kinds of apples could be produced in this state, and how well they could be grown. A list of these will appear in the report of the committee on fruits. Among others were the seedlings grown by Mr. Peffer, and on which he had received the premiums at the late fair.

Judge Knapp moved that one of these, and the one pronounced the best, and to which after three years exhibition had been awarded the first premium, be called the Pewaukee; which prevailed. The apple was recommended to be placed on the list for trial.

Mr. Tuttle spoke very highly of an apple he had recently found on the farm of Mr. Walbridge, in Sauk county, and which he found growing in some of the most exposed situations, and on poor land, but it was as far as he could observe, perfectly hardy, an abundant and regular bearer. He knew scarcely anything of its history, but he had found it on this farm, and from that fact he called it the Walbridge. He had no trees for sale, but had a few scions he would willingly distribute to the members of the society.

On motion, a committee to examine the fruits on exhibition were appointed by the chair, consisting of Messrs. Kellogg, Peffer and Greenman.

A communication from Mr. Kinkst of Bad Ax, Vernon county, relating to a seedling apple raised by him in that county, from a seed planted in 1848, in best condition in April, tree hardy, even excelling in that the Siberian crab; bears every year. A specimen of the apples was also sent, but it did not meet with much favor as to quality of fruit. But shows that varieties may yet be found that will be able to resist all the vicissitudes of our climate. The whole matter was referred to the committee on fruits.

LEGISLATIVE AID.

The report of the committee on the president's address, and the memorial asking for legislative aid in conducting the experimental garden, was taken up, the question being on its adoption.

Dr. Chadbourne, president of the university, coming in, was called upon for his views on that matter, who stated that he commended the effort of this society, and could but hope they might so press the matter upon the attention of the legislature, that the aid asked for might be granted. The university would be glad to undertake this work, but it had no means. All its funds are tied up in the lands granted by the United States, and which at the present rates of sale would require forty years to sell. Up to the present time lands enough had not been sold to pay the absolute salary of a single professor in the institution. The object was worthy, and ought to be prosecuted, but the university was powerless to assist in carrying it forward.

The memorial was unanimously adopted, and on motion, a committee was appointed to present the same to the legislature and urge its passage.

FINANCIAL AFFAIRS OF THE SOCIETY.

The treasurer's report was then read and received by the meeting. This showed a balance in the hands of the treasurer of $180.25.

Mr. Findlayson moved that the executive committee be instructed to draw upon the treasurer for the amount of the premiums awarded for seedling apples; which prevailed.

Mr. Stickney moved that an order be drawn on the treasurer for fifty dollars, in favor of O. S. Willey, for his services in preparing the report of the transactions, and other duties as secretary; which prevailed.

Mr. Stickney then read the following

ESSAY ON GENERAL NURSERY MANAGEMENT.

Mr. President and Brother Horticulturists :

In thinking what I might say to you to-day, I have reviewed in my mind all the nurserymen of my acquaintance, and all the nurseries I have seen, and have endeavored to compare ours with other business men; and, as Widow Bedott said of humanity in a religious view, I am forced to exclaim of ourselves as business men, "We are all poor critters"; failing to realize the greatness and importance of our calling; failing to do our duty even as far as we fully understand it; and failing to get the greenbacks, which we so richly earn and deserve.

The wants of a million farmers, in the way of agricultural machinery, are promptly supplied by enterprising mechanics, who call to their aid the necessary capital, employ the necessary labor, and so systematize both manufacture and sales as to benefit the capitalist, the laborer, and the farmer, and secure liberal profits for themselves. Why should the call for trees be less promptly met? Think, for a moment, of the homes in city, village and country, to be supplied with ornament, shade and fruit. Think of the extensive orchard-planting for commercial purposes; of the long lines for wind-breaks and the broad plantations for timber; include in this view, Wisconsin, Minnesota and northern Iowa, which is the ground particularly accessible to us. Do we fully estimate the amount of stock that might and should be planted in the next five years? Do we realize how much the amount actually to be planted depends upon the manner in which we keep the subject before the people? And can we imagine where all this stock is to come from?

If it is brought one or two thousand miles to be sold and planted here, we suffer a loss of a fair profit on the growth and sale of so much stock; and we allow the people, whom it is our duty to supply, to be taxed with freight, agents' expenses, etc., and most probably to be so swindled in quality, as to be, at the end of a year's effort, no further advanced than at the beginning. Is this what the country has a right to expect of us? Do the mechanics, merchants, and professional men of the country respond as feebly to the calls made upon them? In short, do we appreciate the greatness of our work?

That there is a general interest throughout the country on the subject of fruit and trees, we cannot doubt. Let a man talk "trees," almost anywhere, and though his talk is impracticable and absurd, he has attentive listeners and some believers.

Now, whether worthily or otherwise, we stand before the people as teachers, and this lively interest is to us like clay in the hands of the potter, to be fashioned as we will.

How important, then, that all our teachings be sound and practical; such as will lead to sure success. How should all our acts in meetings like the present, be stripped of all "ax-grinding," selfishness, sectional feeling, or personal ambition; and how carefully should we consider all the qualities of fruit or tree before recommending for general cultivation. Thus may we fashion the future forests and orchards of the country.

I do not forget the many and valid excuses that may be brought to cover our short-comings. When I forget the flank movements of frosts and droughts practiced upon us, my memory will be poor indeed. When any of us forget the lessons we have learned, and so dearly paid for, we may take it as a hint that we are no longer fit for the active business of life.

That we, as a class, are full of the qualities necessary to the successful nurserymen, I cannot doubt. Who has more of driving energy? Who have pursued their one object with greater tenacity, or surmounted greater obstacles? Let us think of the past as an experimental school, wherein we have learned pleasing as well as bitter lessons, paid our full tuition, and from which we are now to graduate with enlarged views of our calling, and the necessary skill and knowledge to put those views into successful practice.

Ever uppermost in our minds is the question, what shall we plant? This is all important to us, and, though sometimes forgotten, equally important to our customers. Yes, more important to them, because with us results are reached in two to four years, while with them, the good or poor qualities run through many years.

Particularly important is this question as it relates to apples, because of these is the bulk and weight of our business, and of the farmers' planting. Observe any orchard of twenty varieties, and we shall find five to eight of the best kinds bearing more fruit and bringing more money than all the others. In view of this fact, I ask, why plant the twelve poorer kinds? If we should strike these from our lists, should we or our customers suffer loss or inconvenience? Would it not rather be the removal of a burden? True, the enthusiastic amateur or nurseryman may take pride in his thirty or fifty kinds, as a collection, but this has little to do with the raising of trees or fruit for profit or as a means of support.

In consideration of their early maturity, and success in nearly all localities, I am led to think that we give the small fruits too little attention. I do not mean the wonderful novelties that flood us in such abundance, but the older and well proved. A few years ago, a brother nurseryman raised as an objection to going more largely into small fruits that, to make sales, we must be constantly getting up something new. In practice, I have not found this so. As an instance in proof I will mention grape, cherry and currant varieties, twenty years in our hands, yet of these we have demand for 30,00 to 40,000 annually, and have never yet had enough. Again, in strawberries, the demand for Wilson's is for thousands, while Jucundas, Agriculturist, and all the big guns of the past five years, are sold only by dozens or hundred. It would seem to me to be sound sense, a help to our business, and a benefit to the country, to take a few of the best varieties, in each class and push them with the same energy that the novelties are pushed. True, we get an occasional grain of wheat from all this over-praised chaff. But, instead of pushing along both chaff and wheat to our customers, and thereby taxing and disappointing them, should we not ultimately gain both honor and money by taking time to separate them, and selling only the grain?

On the departure of one of our best nurserymen to an enlarged field of labor, I asked him if the trouble of his present work were not enough? If he must needs undertake a thing so much larger as to kill him outright? I think his reply hits, and should enlighten nearly or quite all of us. It was as follows: "I have thus far been a slave to my busines, being field-worker, foreman, salesman, packer, book-keeper, and porter; I am now going to a business that can support a man for each of these offices." Now this certainly looks pleasant in theory. Is there any good reason why we may not, at least in part, reduce it to practice? The perfect system of manufactories we may not have. Weather, soils, and other things prevent, but system sufficient to accomplish much greater results with far less effort, we surely can and ought to have.

In the large nurseries about Rochester, I have noticed that they used labor far more lavishly than we do. There is, about all they do, an amount of patient pains-taking and thoroughness that surprised me. We cannot doubt but that this is a large element of success, and that as such it pays. Of course it would pay us as well, not only in dollars and cents, but in the stimulation and encouragement of success instead of failure.

Through want of this thorough pains-taking we suffer great loss. Take, for instance, any block of apple trees in any nursery. We find at least ten, and in many instances, twenty or forty per cent. of vacant places. Every vacancy is a positive loss of ten or fifteen cents, and the aggregate is large; quite too much to lose by neglect or indifference.

I have sometimes thought it would be better for each to take two or three articles and make specialties of them, thus securing the thoroughness and close attention so necessary to the best results. Certain it is, to my mind, that he who undertakes anything without this thoroughness, makes only slow and laborious progress. With it, we are masters of our business; without it, we are slaves. The necessary details will suggest themselves to each of us. Now let us decide the question, shall they be brain pictures, or paper sketches only, or will we put them in practice.

By our works and teachings, we have done something to turn public sentiment into the right tree-planting channels, but by example have we done what we might in that direction? Merchants and tradesmen have their show windows filled with beautiful workmanship, to stimulate and direct public taste. Where are our show windows? Where are our grounds, laid out in an artistic manner and planted with trees, shrubs, and flowers, that are model specimens of their kind? Except in one instance I have yet to find this in any western nursery. When we think of the deep and lasting impression such examples make upon our own minds, we cannot doubt the power they would give to us to improve the tastes of others.

I do not think it strange that these things are not already done, but I do think that the time has now come for us to set earnestly about them.

In this there is no necessity for rare or curious things; rather let our grounds show the capabilities of things within the reach of all, and of manifest use to all. Neither, if circumstances do not favor it, do we need broad acres, or a large outlay of money.

In front of a tent on the camping ground of the first regiment Wisconsin sent to the war, I saw an example of gardening skill, that illustrated the beauty of simplicity, and showed what might be done with the simplest materials. It was a miniature garden cut from the green sod; the figures of the most perfect symmetry, bordered with smooth pebbles from the lake shore, and ornamented with a few mosses and a few simple plants in pots. The whole forming an object of beauty worthy of imitation in places of far greater pretensions.

And so may we, with but a fraction of the beautiful things of other climes, produce results that shall astonish even ourselves.

The happy and successful man, the man we all like, is he who makes the most of the things within his reach. With this in view, if any doubt or hesitate about the possibility of accomplishing the things herein suggested, with the means at command, let me ask, with our splendid evergreens and noble forest trees; with a liberal variety of successful small fruits, well in hand, and a firm and substantial background of crabs, and minor plums, why stand irresolute and idle, with a longing wish for the fruits and flowers of more favored lands? Were we in Cincinnati, feasting on delicious peaches, we should still lack the oranges of Florida, and thus would our longings remain unsatisfied. Rather let us accept the situation, and fight out the battle on our present line.

The reading of this essay was followed by interesting remarks from Messrs. Plumb, Kellogg, and Stickney, upon the subject so ably discussed in the essay; and they gave many instances of well-kept grounds and nurseries they had visited.

Adjourned to 7 1-2 P. M.

7 1-2 O'CLOCK P. M.

The meeting was called to order agreeably to the adjournment, when, on motion of Mr. Lawrence, the following were appointed a committe on the nomination of officers, viz: Messrs. Lawrence, Plumb, Greenman, Stickney and Kellogg.

AMENDMENT TO CONSTITUTION.

Mr. Lawrence offered the following, viz:

Amend art. 4 of the constitution, by striking ont the following lines: "In addition to the foregoing officers, the presidents and secretaries of all local societies shall be deemed *ex-officio* members of the executive board,' **and inserting the following :** " The presidents of all local societies shall be deemed honorary members, and *ex-officio* vice-presidents of this society."

Which after consideration, was carried.

HONORARY MEMBERS.

On motion of Mr. Stickney, Gov. Lucius Fairchild, Dr. J. W. Hoyt, D. J. Powers, and Judge J. G. Knapp, were elected honorary members of this society.

On motion of Mr. Lawrence, the executive committee were instructed to fix the premium list for the annual fair.

And the regular business of the meeting was then taken up, when Judge J. G. Knapp read an able paper upon the climate of this and the neighboring states, tracing the extremes of heat and cold, moisture and drouth to their causes, so far as known at present; and urging the necessity of further observations, and collections of facts, as a means of counteracting the effects of those extremes.

The secretary then laid before the meeting the following communications from Samuel Edwards, president of the Northern Horticultural Society of Illinois, and others:

La Moille, Bureau Co., Ill., Jan. 20, 1869.

O. S. Willey:

Esteemed Friend:—I am under obligations to write, *very briefly*, for your meeting on the 2d proximo, on evergreens for orchard screens. Our first trees were set some twelve or fifteen years since, and were White Pine, which answer well. The first Norway Spruce screen for this purpose were set in the spring of 1860; a double row, ten feet apart, and the same distance in the row, alternating trees in one row opposite the space in the other. They are planted on all sides of the orchard, and fifteen rods apart; the rows running north and south. A single row is set in the place of a row of fruit trees.

A pear orchard of near 500 trees has smaller squares, divided off by evergreens. They appear to endure our winters much better when thus protected. Scarce any apples are now planted here, except such as endured the hard winters of '55 and '56, but I am beginning to set of some of the best varieties which were injured then, and am confident, with the shelter, and working in limbs on hard stocks they will succeed.

Apple and pear trees among evergreens, have here borne full crops, when others standing near, without protection, had most of their blossoms destroyed by spring frost. As pear trees are liable to die from blight, it is my purpose to replace them with evergreens.

Many of our farmers are buying evergreens of small size, by the thousand and growing them for screens. Whenever they are generally planted, we will see their full benefit in a marked amelioration of the severity of our winters. A perceptible change is already seen and believed to be occasioned by our fences, orchards, groves and cornfields.

Wishing you a pleasant and profitable season, with a cordial invitation to send a delegation to our meeting at Aurora, 16th, 17th and 18th of February, I am in haste, Yours, very cordially,

SAMUEL EDWARDS.

River Falls, Pierce Co., Jan. 25, 1869.

O. S. Willey, Esq., Madison, Wis.:

Dear Sir:—In answer to yours of Dec. 10, 1868, I cannot speak of that success in fruit-growing that would be pleasing to me to give. There have been a good many trees bought and set in this county, for a number of years past; a few are doing well, but the larger portion are worthless. A few have planted and taken care of their trees, but the larger part have been planted and left to take care of themselves; you can tell the consequence.

So far as my observation extends, the Duchess of Oldenburg stands at the head of the list for hardiness. I cannot see but what it stands the climate as well as the crabs, although it does not grow quite so fast. Is looks healthy and is beginning to bear. The Astrachan, Fameuse, Perry Russet, Golden Russet, Sweet Pear, and Talman Sweet, have stood pretty well. I think these are the most reliable. Those that have set the Tetofsky speak well of it.

The Transcendant and Hislop Crabs do finely and bear abundantly; the Tradscendant bears a little the best, so far as my observation extends. There is quite a call for these large crabs. People think they make quite an apple, and are anxious to have them, as they make good pies, sauce, and are quite good to eat, where they raise no others.

We have no pears or cherries here; of plums none but the wild ones, those we have in abundance. Our small fruits, such as strawberry, raspberry, gooseberry and currant do nicely. The Wilson strawberry and Houghton gooseberry take the lead.

Our climate is different here from what it is in the south or east parts of the state. The atmosphere is dryer; not near so much rain. Nothing uncommon to have the thermometer down to 30° below zero in winter, and but little snow, and in summer as high as 90° to 100° and even more in some places. Our soil on the prairies is a loam, varying from a sand to a clay. In the timber and on the bluffs more clay. On the prairie, sand and sandstone underlie the soil; under this limestone. Our water for wells is found mostly in the limestone, from 40 to 100 feet deep. Don't think trees have any trouble with wet feet on the prairie.

In looking among my trees, I find more trouble from malformed crotches than from the climate; at least so it looks to me. Some varieties, for instance the Autumn Strawberry, wants to grow all crotches, while the Duchess has but very few. I have strong hopes that we shall succeed in raising some varieties of apples in this latitude. Nothing like *trying* and keeping at it. I hope you will have a pleasant meeting and be able to give us some good advice. I wish I could be present, and should be happy to hear your discussions.

Respectfully yours,

MATHEW D. PROCTOR.

DARTFORD, Green Lake Co., Jan. 31, 1869.

O. S. WILLEY,

Secretary of the Wisconsin State Horticultural Society:

DEAR SIR—I find I am a little too late in responding to your request to report on the condition of fruits and fruit trees in this county. I was thinking the meeting occurred a week from now.

Much might be said on this subject, but I do not think it advisable to use many words at this time. There is a very different state of feeling in regard to the whole subject than there was a few years ago. There had been so many failures from want of experience and knowledge of what the climate and soil of this state required, that failures were inevitable and should have been expected and provided for. It is not strange that men that set fruit trees as they would set posts and treated them afterwards in the same way, became discouraged, and believed in time, that Wisconsin would never be a fruit state. A better state of feeling prevails now; there is no discouragement in this county. There is no man in this county, of any intelligence, but knows that certain kinds of trees will succeed with proper care, and that certain other kinds will fail, under any circumstances. Not that every man, or indeed any man knows, *all* of the varieties that are thus sure of success or failure, but a sufficient number of varieties have been found to guide any man in starting an orchard or fruit farm.

It was a fine thought in the horticultural society to select that list of fine apples, against which nothing need be said. They are all known and appreciated in this county. One of them (Duchess of Oldenburg) was introduced at a very early day into this town by Wm. C. Sherwood, Esq., and there are few orchards in the county but contain more or less of them, and I believe it to be the most popular early apple in this part of the country. Of course the apple is the principal fruit here. Pears, plums, cherries and even peaches are grown to some extent. Everybody has a grape vine, but there are no vineyards in the county yet. Currants, raspberries and strawberries do well. Delaware and Concord are the favorite grapes, Wilson's Albany the most popular strawberry.

There seems to be two things required to make this a first class county, to-wit: a sure market and a few more failures of the wheat crop.

Perhaps I ought to say that the bark louse is known here, and blessings on the head of the man that shall provide a remedy for it.

Respectfully,

M. H. POWERS.

BERLIN, Dec., 14, 1868.

O. S. WILLEY,

Secretary Wisconsin State Horticultural Society:

DEAR SIR:—Agreeably to your request, under date of 10th inst., I will endeavor to give you some information in regard to the conditions of the orchards in this section of the state.

The apple orchards it is safe to say, are improving yearly, from the fact that the early-planted orchards contained many sorts of trees not adapted to our climate. They were mostly brought in here from the east by peddlers, and sold under the name of any sort desired by the planters, and consequently our first planting was mostly a failure; but now, having ascertained the kinds adapted to our climate, and our home nurseries being fairly established, the planter generally understands what sorts he needs, and obtains a good class of trees, mostly true to name. We have here some fine thrifty orchards which have been and promise to be remunerative to the owners, and to the inhabitants generally sources of health and pleasure; as nothing adds more to the attractiveness of home and country than an abundance of fruit.

What we need most now is an addition of a few new kinds of hardy varieties of late winter apples, of first quality, and it is worthy the attention of fruit-growers to endeavor to obtain from seedlings some new varieties just adapted to our climate; and with a careful selection of seeds from our best varieties, this could without doubt be accomplished. The scale or bark louse still infests our orchards, but I think not so extensively as they did a few years ago. The only remedy we know of here is to keep the body and large limbs of the trees well scrubbed with strong suds or lye, and when the tree is not in leaf, and while it is moist with rain or sleet, dust on ashes and lime. The apple-worm, or codling moth, injures and destroys a large amount of fruit. The product of some apples is lessened, annually, probably one-half by this pest. Hoping that it will be of some benefit to apple growers, I will state that the past season I accidently discovered that the codling moth has a great liking for vinegar; and acting upon the hint, I prepared several open mouthed vessels, with vinegar and water, and hung them in my trees. The first night's result showed that it was a success, as in some of the dishes there were as many as twenty or more of the millers, showing evidently, that the vinegar, to them, was more attractive than the fruit, and every night during the season, more or less were caught, the number gradually growing less. I also caught other insects, in variety, and among them was the beetle known as the Indian Cetonia, a chap who has a sweet tooth, and takes to sweet apples, musk melons and other sweet fruits. I feel confident that this remedy will lessen, if not destroy, many pests of the orchard in the shape of insects, for they seem to like the vinegar as natnrally as Nasby does corn whiskey.

Of pear culture little can be said, as but very few sorts will withstand our cold winters. The Flemish Beauty seems to be the hardiest and most productive. I have the new pear, "Clapp's Favorite," grafted on to the Flemish Beauty, and two or three other sorts, to test its hardiness, and to judge by its well ripened *hard* wood and its reputation to stand the cold in the eastern states. I anticipate that we can add another variety to our pears. Being two or three weeks earlier than the Flemish Beauty, and superior in quality, it will prove an acquisition.

Plums, excepting natives, prove almost a failure, in consequence of the curculio, and occasionally the killing of the fruit buds by our severe winters. About every third year we get a fair crop. Of native sorts we have a few good ones. A variety known as the Winnebago is worthy of being grown in every garden or orchard, yielding annual crops of good fruit and being proof against the curculio and other enemies.

After fifteen years' experience on this place in grape culture, I give the preference to the Delaware over all other sorts grown here, although the past two seasons the Iona has done well, and yielded splendid bunches of fine fruit, ripening up with the Delaware; but the early ripening of the latter, both in fruit and wood, makes it preferable to all others. It has the reputation of being a slow grower, but I find it the contrary, and when planted in our white oak opening soil, composed of sandy loam, underlaid with red clay and dug deep enough to mix the clay with the loam, and but little if any manure worked in, it proves to be a rapid grower and fruits early. The valley of the Fox is probably as favorable for growing the grape as any section of our state, and the culture of it is being extended yearly. From the fact that the vine requires protection during the winter, it insures a crop every season. As yet no enemy or disease has shown itself here.

From close observation and experience, from year to year, I am convinced that to obtain the best results in growing any of the fruits before mentioned, the red clay is preferable to any manures that can be added to our soils. It produces a healthy growth and is sufficiently stimulating.

Cranberries. Increased attention has been given to this fruit, for the last few years, and as a general thing, the business has proved profitable. Our extensive natural cranberry meadows produce the finest fruit in the world; and, where proper drainage and flowage is given them, are more productive than the cultivated marshes on the Atlantic coast. There were shipped from here, in 1866, about ten thousand bushels of this fruit. The present season the crop has been small, in consequence of the heavy frosts early in September. On the whole, the business promises to be a source of wealth to those engaged in it, and as so small a proportion of the land is adapted to the growth of the fruit, it cannot be well overdone.

Respectfully, yours,

G. N. SMITH.

After the reading of these letters, Mr. Geo. J. Kellogg of Janesville, read the following

ESSAY ON STRAWBERRY CULTURE.

Mr. President—Too much cannot be said or written in favor of the finest fruit of its season, the strawberry. When under favorable circumstances it can be grown at the rate of two hundred and forty bushels per acre; it should be in every man's garden and grown by every one who has a spare rod of ground. This amount has been produced by the writer and without extra care.

Success is certain if the weather in May and June is favorable; there need be no loss of plants by winter-killing if the beds are properly mulched. When coarse marsh hay can be had for cutting, it is doubtless the cheapest and best, being free from weed seeds. A sufficient amount to shade the ground is all that is necessary, about one or two inches; and if left on in the spring, it will insure clean fruit for the market and table, and be a decided benefit in case of drought. By raking off part of the bed it will give fruit a few days earlier than that on which the mulch remains. Examinations should be made as the plants are starting, and in some places it will be necessary to remove part of the mulch, unless more than usual care is taken in putting it on.

We attach great importance to mulching, believing that, unless done at the proper time and well done, all previous labor will be fruitless. The proper time to apply the mulch is about the time of freezing up.

Beds should not be allowed to thaw without protection, as a very slight thaw will kill the crown of the plant. It is the crown that is killed and not the roots. Could we depend on snow as mulch, it would be safe and sure, but beds may be thus protected until March or April, and then all be killed.

Preparation of soil is a matter of great importance. Ground rich enough for ordinary garden purposes is none too rich for the *Wilson*, but many varieties will go to vines if the ground is too rich. Deep working is necessary, either with the spade, subsoil plow or with a common plow, twice in a furrow, with a man on the beam the second time round. Strawberry roots will penetrate to the depth of two feet, when the ground is in good condition, and deep worked beds will better withstand drought.

Distance apart to plant is a point on which doctors disagree. For garden, we recommend two feet by two; for field culture, four or five by two. Allowing the plants in the garden to cover the ground, and in the field one-half the ground, the first season, the balance of the ground the second season; after two crops, it will hardly pay to let the bed remain; some recommend renewal every year.

For renewing garden beds, spade under every alternate strip of 18 inches, and then allow the plants to cover the ground, and after the fruit is picked the following season, spade under the older strips, and so on as long as the bed can be kept reasonably free of weeds, and be made profitable. This plan of renewal we have never seen work well, by using the plow, as the ground is left either too uneven or the space plowed is of too great a width. Cultivation in hills we do not recommend except for amateurs and fancy men.

Transplanting is often a source of loss and vexation, especially as done by most hired help, who scoop out a little dirt and double in the roots, leaving a portion on top of the ground. Putting a spade in the full depth of the blade, pressing it sidewise, and then seeing that the long fibrous roots go into the soil in something like a natural position, will give better returns than the careless mode usually adopted. Always remember that one dozen plants transplanted with a little earth attached to the roots, is better than a hundred from a distance without any soil. Therefore, set out a new bed every year, so as to keep the plants on hand. And do not wait to get the ground in just the right condition until it is too late, but keep planting. The strawberry ought to be furnished in our market at ten cents per quart.

What to plant is a matter of taste, no doubt, but this enlightened body of practical horticulturists, will make out a list for *general cultivation*, which will not need correction until the next annual meeting.

As yet we have found but one variety worthy of extensive and general cultivation. For *profit*, quality and flavor, we recommend the *Wilson*. It is just tart enough when the sugar and cream are added. We never knew a man, woman or child that refused a well ripened dish of the Wilson. Again we say, plant the Wilson for the *million* and for the *million bushels*.

There are many varieties worthy of extensive trial; many that succeed in certain localities; and we hope the time is not far distant when even the Wilson will be excelled. Let all try for this by producing and proving new seedlings.

Teach your children to plant; give them a bed—not in fence corners among weeds, but where they may be encouraged to succeed. Always remembering that clean cultivation is necessary to success.

At the close of this paper the subject of strawberries was taken up, and Mr. Stickney said that the Green Prolific was, in every respect, and especially for quality, superior to the Wilson; but not as good for shipping purposes, as it was a soft berry.

Mr. Greenman concurred with Mr. Stickney as to the quality of the Prolific, except as to its productiveness. In that it was inferior to the Wilson.

Mr. J. S. Shearman of Rockford, Ill., said he thought very highly of it. He found it bears uniformly good crops throughout the season; and was of fine flavor; though it was a soft berry for transportation.

Mr. Lawrence said that Mr. Burr's New Pine is the earliest he has in his grounds, and in flavor far exceeds anything he grew. Next to that he placed the Agriculturist. When the snow came this fall he had on this last fruit and flowers, and thought with proper care it could be made a perpetual bearer.

Mr. Greenman had expended $25 for the Agriculturist, and had not received from it 25 cents in return for his money.

Mr. Stickney would place the Wilson first on the list for all purposes. The Russell was nearly its equal, or but a little behind it, except that it was softer when ripe. The Agriculturist bore about one-half as much as the Wilson, when all were treated alike.

Dr. Hobbins said he would grow the Wilson for selling or giving away, to such as know no better berry. He grew the Russell for his own taste and for his table. The Agriculturist was a good fruit, but a shy bearer. Still he would not be without it.

Mr. Stickney said he grew the Wilson, Green Prolific, Russell and Agriculturist, and he classed them in the order named, as to value.

Mr. Greenman inquired if sun scald had been observed to do any injury during the past year. He had lost many bushels by this cause; and on that account he had reduced his list of berries to three or four of the most hardy sorts; and unless they did better in the future he should cut the list down to one—the Wilson.

Mr. Plnmb, for this cause, mulched besides. He did not think too much mulch could be applied; or that it would kill the plants unless they were absolutely covered up.

Mr. Lawrence covered his with rye straw. When straw has been on all winter, he fears for the result, as he thinks more plants are killed by heavy covering with straw, than by cold winters.

Dr. Hobbins said that he always waited until after the first flurry of snow had fallen, and then he applied a little straw as a cover. This keeps the ground from thawing out fast and saves the plants.

The list of strawberries, as named last year was then agreed upon, adding the Green Prolic, viz:

For general culture.—Wilson, Russell, Agriculturist, and Green Prolific.

For trial, etc.—Burr's New Pine, Austin, and Brooklyn Scarlet.

WHAT WILL BE RECOMMENDED.

Mr. Lawrence then offered the following:

Resolved, That this society will not recommend or endorse any variety of fruit, vine, shrub or tree, for general cultivation, without the same has been thoroughly tested by members of this society, in different localities, at least two seasons; and then only, where the same is found worthy of special merit to the community at large, as to hardiness and quality.

Which was unanimously adopted.

A motion was then made and carried, that Mr. J. S. Shearman, of Rockford, Illinois, a delegate from the Northern Illinois Horticultural Society, be declared an honorary member of this society.

Mr. Shearman, being called for, returned his thanks for the honor just conferred, and said that he had just returned from a tour in Minnesota, and especially along the bluffs and rolling lands, and observed the fruit trees growing thereon. Many sorts of apples appeared to be doing remarkably well. He found many were experimenting with seedlings. Minnesota is becoming a successful fruit-growing state. Grapes have been successfully grown, and many sorts of strawberries, especially the Russell, which appears the favorite there.

COMMITTEE OF OBSERVATION.

On motion of Mr. J. C. Plumb, the executive committee were instructed to appoint a committee of five members to visit and carefully observe the cultivation of fruit trees and plants, successful varieties, insects and diseases, soil and modes of culture, and other items of interest to the fruit-growers which can be collected and presented for the benefit of the society and its interests.

The meeting then adjourned to the following day.

THIRD DAY.

THURSDAY, February 11,
9 o'clock A. M.

The meeting was called to order by the president, and a prayer was offered by Mr. Kellogg.

The committee on nominations made their report for officers for the ensuing year, and thereupon the society proceeded to ballot, which resulted as follows, viz:

President—Joseph Hobbins, M. D, Madison.
Vice-President—A. G. Tuttle, Baraboo.
Recording Secretary—O. S. Willey, Madison.
Corresponding Secretary—F. S. Lawrence, Janesville.
Treasurer—George A. Mason, Madison.
Executive Committee—J. C. Plumb, Milton; J. S. Stickney, Wauwatosa, and Geo. P. Peffer, Pewaukee.

Judge Knapp offered the following resolution, which was adopted:

Resolved, That the executive committee be instructed to make provision for a series of meetings, to be held in the villages, towns and cities of the state, and to organize local societies therein as far as po sible.

Mr· Kellogg offered the following, which was adopted:

Resolved, That J. S. Stickney, J. C. Plumb, and F. S. Lawrence, are hereby elected and appointed delegates to the Northern Illinois Horticultural Society, with power to appoint substitutes, and that we recommend said committee to take such fruit as is grown by members of our state society as they please, and which is now on exhibition.

Judge Knapp offered the following, which was adopted:

Resolved, That the executive committee appoint some suitable person to take charge of the experimental garden, and to conduct the management of the same.

REPORT OF COMMITTEE ON FRUIT.

The committee on fruits on exhibition reported that there was a very fine show of fruit, and in good condition, viz:

Mr. George P. Peffer of Pewaukee, Waukesha county, exhibited twenty-eight varieties of apples; thirteen varieties of seedlings, and one of pears, the Winter Nellis, of fine flavor, and in good condition. Several varieties of these seedlings are deserving of speciol notice, and particularly the one to which a premium was awarded at the state fair.

Mr. E. Pearl of Pewaukee, had two varieties of seedling apples; and Mr. Isaac Smith of the same place, two varieties of seedling apples.

Mr. Hinkst of Badax, Vernon county, one variety of seedling apple, und Mr. Eli Stilson of Oshkosh, Winnebago county, one variety of seedling apple.

Mr. I. Gould] of Beaver Dam, Dodge county, exhibited fourteen varieties of apples and two of crabs. We especially call attention to a variety, procured by him from Minnesota, called the Rubicon; also, a large native crab, with much the appearance of the Soulard, which showed no signs of decay, and is *perhaps* good for cooking purposes.

Mr. J. S. Stickney of Wauwatosa, exhibited a jar of preserves made of the Soulard Crab, which showed that the variety is worthy of special notice as a preserve fruit.

Mr. P. A. Jewell of Minnesota, exhibited a winter crab; also a collection of twelve varieties of seedling apples was shown by Mr. J. S. Shearman of northern Illinois, which he had procured in Minnesota, north of Winona, which appeared very fine and promising. The committee recommend extensive trial in northern localities by producing and proving new seedlings.

Mr. D. W. Adams of Waukon, Iowa, exhibited a very fine collection of well-grown reliable sorts, consisting of seventeen well known and choice kinds, and three new seedlings.

For the lack of table room Mr. A. G. Tuttle of Baraboo did not exhibit his collection of fruits (Signed,)

GEO. J. KELLOGG,
CHAS. H. GREENMAN,
Committee.

RASPBERRIES AND BLACKBERRIES.

The subject of raspberries was then taken up, and remarks called for; when

Mr. Lawrence said that he was willing to allow that the

Doolittle was very productive, but he wanted a better berry for his eating. He was trying Davidson's Thornless. There was something to be said in its favor, especially facility in handling the bushes. He had fruited the Franconia, and the Belle de Fontenoy, but would not recommend either for general use, as they were not good bearers, and their second crop was of no value, as he could get full as many from the Fastolff, or Brinckle's orange, which were far better berries, and profuse bearers. These were the choice and desirable varieties. The Fastolff grows from three to four feet high, with stout reeds. One year ago he failed to cover, and they passed the winter without loss.

The fruit is large, but to his taste is not equal to the Brinckle's. This last is very tender, and yet, those who will take the trouble to cover it, will find this the best of berries, and one that will fully pay for the care. The Yellow or Golden Cap is very hardy, but it has no advantage over the other caps, in fact is not as good as the Doolittle.

Mr. Stickney said that the first year he had fruited the Philadelphia it was not satisfactory, but since then it had borne better, and given him good crops of fine fruit.

Mr. Collins of Vineland, N. J., being present, and called upon, said that he was engaged in growing Davidson's Thornless. In New Jersey this took the lead of all the berries for the market and was the most productive. He could not pronounce upon its hardiness in this state; but in Minnesota it had done well. As to fruit, it was no better than the Doolittle, but it was a stronger grower and equally hardy, so far as proved, and, being thornless, was more desirable, because it could be more easily handled.

Dr. Hobbins mentioned a red seedling that had been produced in this town, which promised well; but he did not feel authorized to report on its merits as yet. He considered Brinckle's Orange as the best for table use. His do best near the sewer, where they get the water and slop from the house and kitchen.

Mr. Lawrence had found a great difference in this fruit, owing to the exposure it received. It did not do well when receiving the full heat of the sun. It did best when grown in the shade or partial shade. Thus on the north side of a fence or building the bushes would fruit well, while on the south side the fruit would dry up and give a poor crop.

Mr. Plumb agreed that almost everything depended on the position of the plants. When that was favorable, a full crop might be expected; if not, the first half of the crop might succeed, but the last would dry up and be lost. With raspberries, culture would always pay well. He thought more depended on this than on anything else.

Mr. Shearman said the Purple Cane bore well with him, and the birds always chose it before all others; thus showing that it was of a superior quality. He had heard the Davidson's Thornless highly spoken of; considered it favorably, and fully equal to the Doolittle as to fruit.

Mr. Askew said he had found the fruit of the Purple Cane too tender to carry to market, though an excellent berry at home. The Canes had proved hardy with him.

Mr. Kellogg said he grew the Purple Cane, both for family use and the market. It was a good bearer, and compared favorably with the Doolittle.

Mr. Tuttle had grown the Clark, but did not approve of it.

Mr. Stickney spoke of the Kirtland, and asked if any one had had any experience with it, or knew its value as a fruit. He wanted a good hardy variety of the red variety, and hoped such a one would be tound yet.

Judge Knapp spoke of the raspberries that grew natively in the northern portion of the state, where it was much colder than here. And yet these proved perfectly hardy; and he thought successful experiments might be made with them True, in the north they were found in the shade of trees, or where they were protected by trees, and where the ground was well mulched with leaves.

Dr. Hobbins said that he had been informed that at Menominee Mills in Chippewa county, the best of blackberries grew in abundance, and very fine.

Mr. Lawrence urged the necessity of growing both raspberries and blackberries in the shade. He did not believe that the latter could be grown without shade.

Mr. Finlayson agreed that shade was necessary for these fruits, and especially blackberries; and thought they could be successfully grown under apple trees, where they should be mulched freely. Thus they would not injure the apples at all.

Mr. Plumb said that he understood that when a plant was removed from one place to another, it must receive the same conditions that it had before grown in, as near as possible. He gave many instances of plants which could not be removed from one habitat to another.

Mr. Adams said he could not succeed with blackberries brought from Massachusetts to his place in northeastern Iowa.

Dr. Hobbins said that he had been told that raspberries brought from the Rocky mountains had failed in this state.

Mr. Stickney spoke of a new blackberry, by the name of A. H. Briton, because it was found with him. He had seen the berry and was much pleased with it. It was not for sale; a friend of his had bought all the stock, and was propagating it. He had himself a few plants, all he could get, but did not wish to part with any of them. He considered the bush hardy. He was told that the original plant came from England some ten years ago.

No change was made in the list from last year.

Currants.—No change was made in the list, and all appeared discouraged from the ravages of the currant borer.

Gooseberries—.The Houghton and American were recommended for cultivation. These were also attacked by the borer.

By-laws.—Mr. Willey moved to amend the by-laws by adding to the standing committees—committees on Meteorology and Entomology.

The meeting then adjourned to 2 o'clock P. M.

2 O'CLOCK P. M.

The society having been called to order, Mr. Greenman read the following

ESSAY ON GRAPE CULTURE.

The successful cultivation of grapes, in this country is a desideratum long sought for, and realized by but few of those who have engaged in their culture. At first European varieties were largely planted, but without success. The variableness of our climate forbidding their cultivation in the open air. Recourse then was had to our own native American species, followed by better success.

The *vitus labrusca* is generally considered the best type to improve upon, while many believe that the *vitis cardifolia* is to be preferred, and that from these, seedlings will be produced that will have the ability to withstand the rigors of our winters, and whose early ripening, healthy foliage, and excellence of fruit will crown our efforts with success; and were it not for such experiences as that of 1867 and '8, very little more could be asked, so far as varieties are concerned.

Clay loams and calcarous formations are the best soils for vineyards; while eastern and southern exposures are to be preferred. Much, however, depends upon a thorough preparation of the soil, all the parts should be loosened to the depth of twenty inches; on soils free from stone, the subsoil plow will be requisite. Trenching will be necessary on gravelly hill-sides, where it is well to invert the soil, leaving the stone near the surface.

Good two-year old roots are the best for planting, and the distance apart will depend upon the variety and mode of training. Upon this point different cultivators are not agreed; but that system of training that will not impede a free circulation of air, and at the same time expose the foliage to the rays of the sun, thereby elaborating the crude materials in the sap, developing well ripened buds, and wood, will be most conducive to the advancement of grape-growing in this country. To secure these ends, I recommend the adoption of a low trellis, the construction of which will be explained under another head. Lay off the rows six feet apart, and the vines six feet in the rows, setting a small stake for each vine. Dig a hole large enough to receive the roots, and ten inches deep; spread the roots out evenly; raising the crown of the plant two inches; cover lightly with soil and press firmly upon the roots with the hands; fill the balance with loose soil; mulching liberally, to secure the plants against drouth. Allow but one cane to grow the first year. Removing all laterals, as they appear; pinching out the top when the vine has obtained a height of six feet; allowing it to have its own way the balance of the season. Prune to three feet; cover with soil, and mulch for winter protection.

A low trellis is constructed in the following manner: prepare stakes four feet long and two inches or more in diameter, sharpen one end and coat with coal-tar half way up; to secure their durability, drive a small staple near the top on each side, making four staples to each stake. The bows may be riven as for hoops, or sawed one inch wide, by one-half inch thick, and sixteen feet long. These should be steamed and bent on a former, on a half circle of seven feet, allowing both ends to project in a straight line two feet. The ends are sharpened to fit the staples in the stakes. It requires one stake, and two bows for each vine; drive the stakes eighteen inches deep, and two feet in advance of each vine in the row; place one end of a bow in the first stake in the first row, and the other end in the second stake in the second row, then commence in the second row in the same manner, and so alternately, until all the stakes are filled. This crosses the bows in the center between the rows; and these should be fastened together in the outside rows. A bow will extend from stake to stake around the vineyard. These bows will be high enough to allow cultivation with a horse. Bring the vines to the stake at an angle of about forty-five degrees. This will facilitate laying down for winter protection, when the vines have attained a large size. Allow the four top buds to grow, except on the corner vines, which will have three; train one branch of each bow; rub off all the buds on the lower portion of the vines, and allow no fruit to set, as all the strength of the vine will be required to produce wood for next year's fruiting. Keep the laterals pinched in, and by the end of the season, the canes will have reached the center of the bow. At the fall pruning, cut back to two feet, and cover with soil, and mulch for winter protection. The next season extend the fruiting canes to the center of the bows, and a moderate crop of fruit may be taken from last year's wood. The next year the vine will be in full bearing. Prune on the short spur system, renewing the canes as often as desirable. The advantages claimed for this trellis are cheapness, durability, and simplicity of construction; exposing the foliage to the rays of the sun, and at the same time shading the fruit; allowing a free circulation of air, and thus secure the necessary conditions in successful grape culture.

I now come to the important matter of selecting varieties for the vineyard. This will depend more upon the location than the soil, as the aggregate amount of heat differs materially in the same latitude, and their adaptability can only be approximated, by a close observation of the amount of heat required by the different varieties, to bring them to perfection. From observations taken at Waterloo, N. Y., in 1862, and reported in the *Horticulturist*, I find that it requires an average of 53° of Fahrenheit to bring the Delaware to leafing, which occurs about the middle of May, and an average temperature of 59° for a period of forty-five days, or a total of 2,678° Fahrenheit from the breaking of the leaves to the setting of the fruit; and requires a period of 122 days, with an average of 68°, or an aggregate temperature of 7,927° from leafing to the ripening of its fruit, while the Concord requires about 500° more than the Delaware to bring it to perfection; and the Isabella needs 10,000°, while the Catawba cannot do with less than 11,000°, and requires about 142 days from leafing to ripening. At Janesville, Wisconsin, for six years, from 1857 to 1863, the summer mean temperature averaged 71° Fahrenheit, and at Prairie du Chien, for 19 years, the summer mean corresponds to 72° Fahrenheit, while at Green Bay, for four years, the summer average was 68°. From this I conclude that the Delaware and Concord may be safely planted in southern Wisconsin, and that the Delaware will ripen at Green Bay. While near large bodies of water, or on high altitudes, where the September mean temperature extends into October, without intervening frosts, the Isabella, Catawba, Iona and some of Rogers' hybrids, with other late varieties, will succeed. I, therefore, further conclude that no varieties should be extensively planted that require an aggregate summer temperature of over 8,000° Fahrenheit, while near lakes, as at Madison, or on the bluffs along the Mississippi, or near Baraboo, the late ripening varieties may be planted with expectations of success.

Among the thoroughly tested varieties, I would name the Delawares as at the head of the list, and the Concord as nearly equal to it. While the Janesville, with its early ripening wood and fruit, together with its productiveness, adapts it to a large range of country, where the late ripening kinds cannot be successfully grown. And in concluding, let me urge the horticulturists of Wisconsin to observe the requirements of the many candidates for public favor, and thus determine what varieties to plant, that every family in our state may sit under their own vine and enjoy their refreshing fruits, using as not abusing, one of the best gifts of God to man.

The essay being completed, the president announced that the subject of discussion in order was

GRAPES AND VARIETIES.

Mr. Adams remarked, that with him, in northwestern Iowa, Rogers's Hybrid No. 8, ripened as early as the Delaware; and he thought much of that grape.

The Creveling.—Mr. Kellogg preferred the Hartford Prolific to the Creveling, for its fruit and bearing qualities.

Mr. Greenman said his Crevelings rotted badly on the vine.

Mr. Adams said the Creveling was of the first quality with him; though the bunches were loose, it fruited well.

Mr. Tuttle considered the Creveling better than the Hartford. It fruited heavily on his grounds, but does not ripen evenly in the bunch.

Dr. Hobbins said he was almost tempted to place the Creveling first on his list. It is a vine not injured by drought or cold, like some other kinds. His family preferred it to all the other kinds in his garden.

The Diana and Rogers' Hybrid.—Mr. Tuttle thought we had much better grapes than the Diana. The vine of that was too tender for our severe winters. We wanted not only a hardy vine, but also a berry with long keeping properties. Such could be found among the Rogers' hybrids. He would name Nos. 4 and 15, as grapes that possessed the long-keeping properties. The last in particular. He had some of No. 15 in a box, among other grapes that had rotted, and yet they were sound. They could be kept till April with proper care. He had noticed that it loses its muskiness with age. The first choice in his garden were the Rogers' hybrids.

Mr. Kellogg said that he had heard the Diana recommended for its long keeping qualities. But he knew the Delaware would keep as long as the Diana. He had Delawares now which he had kept by merely putting papers between the bunches.

Mr. Adams saw the No. 15 at the Iowa state fair, in January, in good condition; and was satisfied of its long keeping properties.

Mr. Finlayson preferred the No. 15 to all others, except the Delaware.

Mr. Askew preferred the No. 15 to the Concord even.

A motion was then made and carried to place Rogers' No. 15 at the head of the list and before the Diana, for its long-keeping qualities.

Mr. Kellogg moved to place Nos. 4, 3 and 19 on the list for trial, which prevailed.

Mr. Tuttle should support this motion; as far as he knew, the Rogers' hybrids have all the good qualities of the Concord and often keep equal to or better than the Diana. Nos., 3 and 19 commenced ripening as early as the Hartford Prolific, and Nos. 4 and 15 with the Concord.

Mr. Adams was in favor of the motion, as they had done so remarkably well with him.

The Janesville.—Mr. Plumb moved to place the Janesville on the list as a good grape for trial. He had watched this grape for some time, and it had behaved admirably. It was hardy and ripened its wood and fruit well, though in quality it could not be placed at the head.

Mr. Greenman. It has stood where the Concord and Delaware have failed. He hoped to have a large show of fruit for another year. He had started a large number of vines this winter, in a forcing house, but the house had taken fire, and he had lost the whole of that stock; and he did not know of any other for sale, except a few plants in his open grounds.

The motion prevailed, and the Janesville was recommended for trial.

Other Kinds.—Mr. Peffer has seen the Martha, which had made considerable noise, but it did not come up to the recommendation it had received. He thought it a regular humbug for this state.

Mr. Kellogg had seen the Worden Seedling in New York, where it was produced. He found the parent still alive, growing by the side of all the leading sorts, and ripening its fruit five days earlier than the earliest. He thought it was a seedling from the Concord. From three years' trial it had proved very hardy in his nursery, and he was favorably impressed with it.

NEW FRUITS AND EXPERIMENTS.

Mr. Plumb offered the following, which was adopted:

Resolved, That we, as a society, do extend to all producers of new fruits our warm sympathies in their efforts for the good of the cause, and recommend them to bring their fruits before the public through our patronage and under the observation of our members, and by placing them in the experimental garden.

Mr. Stickney offered the following, which was adopted:

Resolved, That we will forward to the experimental garden, such things as we have, that will be useful or desirable therein.

STANDING COMMITTEES.

The president then appointed the standing committees for the year:

Nomenclature.—Messrs. Plumb, Findlayson and Tuttle.
Seedlings.—Messrs. Stickney, Kellogg and Gould.
Finance.—Messrs. Leitch, Greenman and Peffer.

Mr. Peffer then read an

AN ESSAY THE PLUM.

There are many varieties of the plum, both native and wild, and the cultivated or imported from other parts of the world. Among these are found some of the best, finest and most luscious of stone fruits. Most of the varieties may be raised in this climate, by a little care and attention. I say most, though in reality there are but few, compared with the great number of varieties, now in the United States, whose names are found in the fruit books, and among our horticultural writers, that can be found here. Therefore, I shall not name all the sorts, and shall only give a list of those that have been tried and carefully noted. These I shall place in the order, as they will stand the climate of this state, marking the degree of cold that will destroy the trees with me at Pewaukee.

Before giving the list, I will premise, that I assume that the plum can be easily grown in all parts of this state, as most of our wood lands and "openings" are, or were covered more or less with the native or wild varieties. Many of these are of fine flavor and excellent quality, and all may be made useful. Some are early and some are late; some sweet, some sour, and some large, others small. All can be improved greatly by cultivation, and the production of new sorts. This wild plum should be planted more extensively all through the northwest. Suppose a variety we have reared is not so desirable as could be wished, the tree need not be lost, as it can be grafted with some other variety, either native or cultivated, that is desired. These native stocks, especially the late and free-growing sorts, I have found to be the very best on which to work the best sorts. Some years ago, when I first owned a small spot of land and commenced to make it into a garden, I set it out with trees as far as my means would allow. But being unable to procure as many as I needed of the cultivated kinds, I filled my borders with the wild or native trees, designing to graft them, and prove their utility. I therefore took up wild plums, crabs and white thorns, set them out and grafted them with such varieties as I could then procure. Some were top-worked, some root-worked. Nearly all the plum scions grew. The top-grafted fruited the second year, while those under ground took three or four years to come into bearing. I had occasion to take up some of these, to set other trees, and found that in some instances the scions had taken root, and in some cases they had nearly died to the surface of the ground, by reason of the cold, yet the wild plum stocks were alive, and the trees grew again, though their own roots were dead. Such were finally killed by the rotting of those dead roots, with the wild roots still alive. This experience has proved to me that the better sort of tame plums, on their own roots will not stand our climate.

I was further confirmed in the faith by purchasing, about the same time, plums worked on tame stocks, and on peach roots, which had been imported from the eastern nurseries. All those trees have died by root killing; and up to the present time, I have no plum tree good for anything that stands on its own roots. And I would use only wild stocks for plums.

Most of the varieties of tame plum trees will prove hardy with us where they ripen their wood; but in some sorts the fruit buds are tender, some more, some less so, just as the climate may have varied where they originated. I will now name a few that will stand certain degrees of cold, and will, all things considered, fruit in some seasons, but not in others, when the cold is too great. There are some sorts that can stand no more cold than the germ of the peach, or tender cherries.

Those that will stand from 20 to 26 degrees below zero, are the Lombard and its seedlings, Blucher's Gage, Imperial Gage, Duane's Purple Gage, German Prune and the White and Blue Damson.

Those that will stand from 16 to 20 degrees below, are the White, Yellow, Red and Purple Egg, Coe's Golden Drop, Huling's Superb, Reine Claude de Bovey, French, McLaughlin, Manning's Long Blue Prune, Horse Plum, Bingham's Gage, Green, Red and Purple Gage, Featheringham, Blue, White and red Pertrigan.

Those that will stand only from 14 to 16 degrees below, are the Washington, Jefferson, Early Royal and Peach Plum.

Our best wild sorts are occasionally killed in some localities. But this does not arise so much from absolute cold weather as from their location, so that, though they survive the winter, they start their buds, and then a cold snap coming on, the flower buds are killed; and thus the fruit is lost.

There are drawbacks to the successful growing and raising of plums beside severe cold; such as leaf-blight, aphis, thrips and curculio; and some trees are damaged by overbearing. The blight makes its appearance in July and August, and causes the leaves to drop very early, and then if a warm fall follows, it will stimulate a second growth, and new leaves and blossoms appear just when the first frosts occur. I have never seen a tree recover when thus affected. They always die. The *aphides* and *thrips* also destroy the leaves by eating them, sucking out the juice, and they also drop immediately, thus producing almost the same effect as blight. These insects can be assailed, by killing them by some of the means known to gardeners; such as decoctions of quassia wood, tobacco and some other things, which will kill them, if put on with some instrument that will wet the leaves on the under side.

The Curculio.—This little beetle is perhaps the greatest enemy to all stone fruit we have. In some places they are so numerous as to destroy the whole crop for a number of years. I know many who say they do not want to plant any more plum trees, because the fruit was all stung by the curculios; and the trees are therefore of no use to them. A very sure way of destroying them is to jar the trees and catch them on a sheet spread under the tree, when they fall, as they always will when the tree is jared. Several receipts and preventives have been proposed within the last few years. Of these, I think the only practicable one is to destroy the plums that are stung, as fast as they fall from the tree. For that purpose hogs may be kept in the orchard to pick them up as fast as they fall; or some four inches of the soil may be taken from under the trees, and carried to some other place, and other soil put in its place.

The plum tree will generally live from twelve to thirty years; but owing to the curculio, many trees are robbed of their fruit before its maturity; and of consequence, the trees make an extra effort to produce their species, and so they will set so full of blossom buds, for the next year, that they are killed by this effort to produce fruit. During our sunny days in winter, these trees, overloaded with buds, evaporate what little sap is left in them before spring arrives, and so they are killed outright from over exertion. Some years it may happen that blossoms and fruit are killed by late spring frosts and so there is nothing for the curculio to feed upon, as was the case in 1860, and then they will get thinned out, and the next year there will be a large crop of fruit. The oldest plum tree I know of, in this state, stands in the grounds of a friend of mine, in town of Lisbon, Waukesha county, and is now twenty-two years of age. It has never perfected but one crop of plums, and that it bore the third year from the graft. The curculio has taken them ever since.

I should select a list of plums, for cultivation, from those that will stand the greatest degree of cold, as given above. All of which I recommend for hardiness in this state. Their qualites and merits I submit to the consideration of the members of the society, and to the public.

The subject of plums being thus brought before the society, Mr. Plumb said that the essayist had presented this fruit under a new feature, that of placing them in lists of ability to withstand degrees of cold, instead of merits as to fruit, and surely it deserves a careful study before it was adopted or condemned.

Mr. Stickney had tried to rear many sorts worked on tame roots, but all had failed. He, therefore, from his own experience, had concluded that the plum must, in this state, be worked on wild stocks, if we would succeed.

Mr. Plumb knew one tree grafted on the Red English, which is in good condition, and has borne several crops of fruit; but such cases are rare. The best trees are those worked on the wild stocks. He thought that plum trees were often killed by overbearing.

Mr. Adams had quite a large list of trees, and he would greatly like to see how they would look while dying with the disease of overbearing. His trouble had been to get them to bear at all.

Mr. Tuttle has the Lombard, sixteen years set, and used to get fruit plenty, but of late he had failed. The curculio had been too severe for him, and he new no effectual remedy. On their account he thought he would have to abandon the attempt to raise plums. As soon as the curculio finds them, it is sure to destroy the entire crop.

Mr. Stickney had succeeded in protecting his plums against the curculio, by enclosing them and keeping fowls, or hogs in the enclosure.

Judge Knapp had heard it stated that the curculio would not work on a tree that grew over water, and asked if any one could tell if that were the case.

Mr. Peffer. They will not work in such a place, as they would, in falling, which they are often doing, in that case fall into the water and be drowned. Instinct seemed to teach them to avoid the water.

PEARS.

Nothing new was offered, and it was conceded that none but the Flemish Beauty would stand the winters, and even that was often killed.

THE CHERRIES

were allowed to stand as last year.

ENGLISH SPARROWS.

Judge Knapp. The subject of insects and the mode of destruction, leads to the enquiry as to what would be the effect of the insectiverous birds. We have such, but then many of them are also frugiverous, and for that cause they were objectionable. But it was known that the English sparrow had been introduced into New York city for the purpose of clearing the streets of the insects that destroy their foliage. He would like to be informed by some one who knew whether they would eat any kind of fruit, and whether it was believed they could be kept in this state.

Mr. Plumb thought the blue jay would destroy them as it now does some of the other small birds, especially the young ones and the eggs;

Judge Knapp knew that jay bird, and knew no good of him. He was only a thief to rob other birds of their eggs and young. He is the origin of the word "Jay-hawk," or stealing, as known on our Kansas frontier—a word that had its rise in the mind of a Wisconsin lawyer, some years back, from this habit of the bird. But to return to the sparrow. It was not a migratory bird, but remained about the houses, where it nested, summered and wintered like the domestic fowls, and provision would have to be made for its protection.

Dr. Hobbins remembered the bird in England but did not know of its habits, farther than that it lived about the houses and ricks, and ate the grain in winter. He had known bounties to be offered for their destruction.

Judge Knapp said he was aware of such offers, but he also knew that at a later day laws have been passed, both in England

and other European states, for their protection, on account of the benefits derived from their killing insects. One thing we must confess to, there are less destructive insects preying on the fruits of Europe than in America, and he was disposed to attribute the difference to the sparrows, finches and other birds of Europe destroying the insects, rather than to anything in the climate. On the other hand, Europe has less hawks and jays than America, and so her birds increase in numbers.

Dr. Hobbins said he would correspond with the president of the Royal Horticultural Society of England, and believed he could learn from that source the value of the sparrow; and perhaps could obtain a pair direct from England.

On motion a committee, consisting of Messrs. Dr. Hobbins, Willey and Knapp, were appointed to correspond on this subject and if possible to procure a pair or more of sparrows.

EVERGREENS.

The society recommended the same list of evergreens as last year, except substituting the American Arbor Vitæ for the Siberian. The list therefore stands, white, Red and Scotch Pine, for large trees, Norway Spruce, American Arbor Vitæ, Juniper (red cedar,) for ornaments and wind breakers, and several others for ornamentation.

HEDGINGS.

Mr. Willey said, that for a hedge plant, he thought we had none equal to the Barberry. It was sufficiently thorny, grew thick, cattle would not eat it, and he believed it would make an excellent hedge row.

Mr. Findlayson liked the Barberry very much and believed it the only thing that we had that would stand our cold climate, or that was good for anything as a hedge plant.

Dr. Hobbins said the Barberry was very ornamental in leaf, flower and fruit. It grew freely, and was readily propagated from seeds.

Mr. Stickney had been trying it, and was satisfied that it was the only good hedge plant we had.

Mr. Plumb had thought much and practiced some on hedge plants. He had heard the three-thorned locust named as making an excellent hedge, and had sent for seed of the same; but more than one-half of them had proved thornless, and he had abandoned the idea of making a hedge of them, and should therefore cultivate the trees for shade trees. A neighbor of his had been trying the Osage orange, and it promised well on the high, dry land; and he meant to plant it himself.

Judge Knapp said that in his opinion Wisconsin was north of the zone of the Osage orange, and experience would prove, if it had not already done so, that it could not be depended upon as a hedge plant in this state; in fact many of the plants proved tender at Bloomington, in Illinois. And where one dies out, the hedge is destroyed as a fence. Some plant was required, every one of which would be hardy. The three-thorned locust, in addition to the objection of its dangerous thorns, would not bear to be sheared down sufficiently to keep in bounds. It was a tree and not a shrub.

Mr. Adams said there was a difference in the seedlings of the Osage, as to their capacity to resist the cold, the same as with apple seedlings; and for that reason he did not think it would make a good hedge plant here. The tender ones would die out and thus the hedge be destroyed.

The meeting then adjourned to 7 1-2 in the evening.

7½ O'CLOCK P. M.

The meeting convened agreeably to adjournment. The president in the chair.

The secretary then read from Mr. De Wolf of Delevan,

AN ESSAY ON THE RASPBERRY.

Mr. President and Gentlemen:

The raspberry is among our most important branches of horticulture, and is rendered doubly important at the present time, by the neglect it has received in the past. * * My love for all persons living within our beautiful state prompts me to make one frank statement, and in this I desire to encourage those who are just starting or it may be putting it off, and have not set fruit of any kind, and now, because their wheat will not sell for two dollars per bushel, plead that they are unable to plant this coming spring. Horticulturists are not able to defer the planting of fruit for one moment. "Delays are dangerous" in horticulture. If a man can spare but one dollar, and he invest it in the Black Cap Raspberry plants, I believe that it will do him more good than five dollars expended for any other variety of fruit.

History of the Raspberry.—Pliny, the elder, who is supposed have written his natural history about the year A. D. 45, mentions the wild brambles, which the Greeks called Idea. Palladius, a Roman agricultural writer, who flourished in the fourth century, or about 1400 years ago, mentions the raspberry as one of the cultivated fruits of his time. But like most other small fruits, very little improvement was made until within the past century, as the old gardeners depended mainly upon the wild plants, which they obtained from the woods of their own or some foreign country. Even yet, very many of the farmers and gardeners of our own state are following the same practice of getting their raspberry plants from the woods.

Objections to the Culture.—I meet these men and try to sell them raspberry plants of new varieties. "But," says one, "I don't want any of them, I have fooled away money enough upon them now, as mine all killed out last winter." I ask such a man, "Sir, what variety did you have?" And after a great deal of study he finds the names of several very popular foreign varieties; or it may be the name of a seedling o some of these varieties, no better than its parent. This man had never heard that these varieties must be protected in winter, unless their owner had provided a green house, to grow them in. Persons not having this convenience, will do well not to purchase any variety for general cultivation that needs winter protection. The next man I meet has heard about "winter protection," and says, "I will not bother with raspberries. They are more trouble than profit." The third man says, "They have spread all over my lot, and I would not take raspberry plants as a gift." I meet the neighbors of the above mentioned persons, and they cry out, "Humbug!" I plead with them to read what Andrew S. Fuller and other horticulturists have written. "No. I do not care for the opinion of Fuller. I believe my neighbors in preference to any one."

These and similar objections have met me often during the past three years; and they have had to be removed, or they could not be persuaded to invest in any variety of raspberry. * * I have endeavored to seek out a variety of the raspberry that was free from these serious defects. * * Perhaps our pomological writers have been somewhat at fault in condemning every variety that did not come up to their standard as to quality; forgetting that a moderate supply of a medium quality of fruit was far better than none at all. Quantity is that which gives satisfaction to the masses.

The Black Caps.—On examination I have found that all the black caps were hardy, and needed no protection in winter; also, that they did not sucker. "But," says the farmer, "I have black raspberries; I brought them from the woods. What better are yours?"

The Black Caps, like other valuable fruits in their native state, are found to have several defects, that must be remedied before they can be pronounced worthy of general cultivation. These defects are: 1st. Small size of fruit; 2d. Dryness of the pulp; 3d. Excessive seediness; 4th. Small yield; 5th. The short and uncertain period of its bearing habit. A neighbor of mine, a few years ago, becoming interested in the culture of the raspberry, set out a large piece—I think several acres, with the common black raspberries, but after a time, a friend of his from near Oak Corners, in New York, when the Doolittle raspberry was just started, induced him to try some of those plants. After trying the Doolittle thoroughly, he dug up and threw away all of the native plants, and planted the others, thus subjecting himself to no small loss of time, labor and money in their culture. His neighbors said he was crazy, thus to throw away money, months of hard labor and his plants, and then give his note for sixty dollars to pay for plants of the Doolittle; which they were sure were no better. But mark the result. In 1866, two years from setting out the Doolittle, he says, "I have raised one hundred and fifty bushels of the Doolittle Black Caps, which I have sold at an average of $8 per bushel, wholesale, making the nice sum of twelve hundred dollars, for one crop." And he adds, "There is no fruit that gives so quick and profitable returns, for the labor bestowed and money invested. No fruit retains its flavor, or keeps better when canned. It is easily and rapidly dried.

I could refer to many instances of enormous profits received from the culture of improved varieties of the Black Caps, but as the one mentioned took place in our state, I shall let that suffice, as a practical reference. Within the last three years greater perfection in this class of raspberries has been attained.

Varieties.—Davidson's or Sinton's Thornless, is the earliest in ripening its fruit. Its fruit and habits are similar to the Doolittle, with the exception of being a little earlier and free from thorns, thus making it a special favorite among ladies.

Garden ripens next in order. This is a dark red or brown berry, as if red and black were mixed. By some this is highly prized as a garden berry.

Doolittle ripens next in order. This variety has been too long before the public to require further description.

Seneca is extremely late and very prolific. It is a decided improvement upon the Doolittle. This fruit is larger and the canes more vigorous and productive.

Improved Miami is certainly one of the largest black raspberries in cultivation; and the best of the cap varieties. It may be briefly described as follows: fruit very large, dark brownish-black, almost entirely covered with bloom, juicy and sprightly in flavor; canes very strong and vigorous, with more or less bloom, not so much as on the Seneca, but more than on the Doolittle; spines numerous and strong, on the one-year old plants, but afterwards they are quite scattering; leaves large, and deep green, with leaflets rather broad in proportion to their length. Very productive; berries ripen some days later than the Doolittle. It is very probable that this is the same as the Mammoth Cluster. * * * I care not by what name they are called, the Improved Miami, McCormick, or Mammoth Cluster. I have five acres of them and claim they are the best five acres of raspberries in our state. In the *American Hoticultural Annual* for 1869, Fuller says: "In 1867 I sent for the Miami, and obtained a small lot from H. M. Purdy. These plants have fruited finely this season, and from them I have taken my description of the Mammoth Cluster Raspberry."

The above are five distinct varieties, and are from the earliest to the latest known. All of them propagate from the tip of the canes, layering in the fall. They do not sucker, and need no winter protection, nor staking, if properly trimmed; or any more cultivation than corn.

Culture.—Any soil that will produce good corn, with deep tillage, will answer, yet light soils should be well manured. Plow well and deep; if sub-soiled all the better. Prepare the ground thoroughly. Planting must be well done. Spread the roots out properly, then cover the plant about two inches and no deeper. Many persons lose their plants by neglecting this caution. We plant four feet apart in the rows, and from six to eight feet wide, and cultivate a row of corn or potatoes between them, the first year or two. In the garden they may be set closer, but the rows should be six feet apart. Cultivate with the hoe and cultivator, keeping the ground mellow and entirely free from weeds. The first season be careful not to hill up around the young plants, but keep the ground level If it be hilled up much the canes will die. Do not work nearer than about 18 inches to the hills with the cultivator, for fear of breaking the roots. Cultivate the ground as early in the spring as it may be fit. After the berries have blossomed, do not work too deep, lest you destroy the fibrous roots, that feed the forming berries.

Trimming.—The second spring after planting the canes should be shortened to twelve or eighteen inches, according to their growth, so that they may not over-bear, and also to keep the fruit from the ground. When the new wood of the second year has made a growth of three feet it should be checked by cutting it off. The old wood should be removed each year, as soon as the fruit is gathered, and the new shortened in. After July never cut or break any of the growing branches.

Garden Culture.—All the advantages of house culture may be secured by planting quite closely together and mulching the ground heavily with any course material.

Experience teaches us that respberries can be more successfully cultivated in Wisconsin than any other fruit. May Divine Providence speed the day when Wisconsin shall be as noted for her raspberries as some of her sister states are for their peaches and other fruits.

The secretary then laid before the society the following

LETTER FROM JOHN A. WARDER.

CLEVES, (O.) 12th mo. 31, 1868.

O. S. WILLEY, Esq.,

Secretary Wisconsin Horticultural Society:

MY VERY DEAR SIR:—I wish it were possible to expres to you and to my good friends in Wisconsin the disppointment which I felt that I was unable to accept your invitation last fall. I had quite set my heart upon being with you, but could not get away. And now, must inform you that my engagements at Champaign are for a course of from 12 to 20 lectures. The managers allow me but four each week, commencing with January 12 prox., and I shall not get through by the 2d of February; if I can get away at that time it will afford me great pleasure to meet with my good friends of Wisconsin, for whose esteem I have a very high regard. * * * * * *

I am delighted to learn that you horticulturists are doing so much as you report, at and about the Agricultural College—just what we might have expected from such a noble set of fellows. This institution alone would attract one to your beautiful city of lakelets, about which I have read such charming accounts, and which I have been so anxious to behold.

The botanical exploration of your state would indeed be a most valuable labor, and should be undertaken by the legislature. A report upon the plants of Wisconsin would indeed be very valuable, and you have the men to do it. Your Lapham's report on grapes is one of the best, indeed the very best one extant in any of our states. Yours, very truly,

JNO. A. WARDER.

On motion of Mr. Plumb, a committee of five, consisting of Messrs. Plumb, Stickney, Moody, Leitch and Gripper, were appointed to name the judges at the next state fair.

AGE AT WHICH TREES SHOULD BE PLANTED.

Mr. Stickney offered the following, which, after discussion, was adopted:

Resolved, That we recommend that the most suitable age for planting trees is at two and three years.

In the discussion that arose on this resolution, Mr. Tuttle said that there was some difference in trees. Some are better at two and some at three years. It was a wrong impression, that trees so very old were the best. When men send to him for the best trees, he always sends them two or three year trees. He had himself planted the Fameuse, some two and some three years old, and the small ones were soon as large as the others, and now some are double the size of the large ones, and are worth much more. Men invariably want two year old trees after they have once tried them, who before would not set a small two year old tree.

Mr. Adams agreed with the last speaker, and said that his experience was that a small tree, that can be planted with all its roots, was worth much more than one that must necessarily be mutilated in taking up. While the large tree was recovering from its loss of roots, the small one will be making top, and equal the other in size.

Mr. Kellogg thought this the most important subject that had been before the meeting. Old trees that are damaged by removals, are never as healthy as young ones that receive no such shocks. He had rather have a graft six inches high than a tree six feet high. He thought the cheapest and best way was to set grafts that had not yet struck, putting two or three in a place to secure the growth of one and then thin out, rather than to set any trees that had grown.

LOW TOPS.

Judge Knapp offered the following, which was adopted :

Resolved, That we recommend that apple trees be trimmed with low tops, and that the branches be induced to grow as nearly as may be at right angles to the leading shaft of the tree ; and not more than from two to four feet from the ground to the lowest branches.

Mr. Tuttle should support this resolution. He thought the manner of forming the top very important. There should be a leading shaft, and all branches should be as nearly at right angles to that as possible. Such a tree would not be liable to split down, nor rot in the angles. Some trees are disposed to grow upright, with such the trimmer will meet with most difficulty, but perseverance would do much towards overcoming such trees. He approved of the low tops. They would stand the climate better, and the fruit was more readily picked on such trees.

THE WESTERN FARMER.

Mr. Kellogg offered the following, which was unanimously adopted :

Resolved, That we not only endorse *The Western Farmer*, as an able agricultural paper, but we will make it our organ of communication, and will contribute more fully than heretofore to its columns by correspondence, and by every means in our power assist in its circulation.

WILD BERRIES, NUTS, FOREST TREES, ETC.

The business of the society being concluded, the question of the culture of wild berries, nuts, forest and shade trees was then taken up.

Mr. Cover furnishing the following hints :

Berries aud Nuts.—The sanice or shadberry grows well in all parts of our state. Plant in rows 12 feet apart. Blooms earlier than any other tree ; bears, in clusters, a most delicious fruit ; ripens in early June ; bears at 10 years old. Thrifty, upright, tall and ornamental. Birds only too apt to steal the fruit.

Black walnuts and butternuts are fine trees for shade, and hardy. Should be planted in fall as soon as the walnuts fall from the trees. Difficult to transplant, but no difficulty in getting trees from nuts planted where trees are wanted. Bear at 9 or 10 years old. Never fail to bear thereafter.

Shell bark hickories may be raised the same way, and bear at 16 years old or thereabouts.

Judge Knapp remarked that some chestnuts which had grown to the bearing size, had died for some cause; and inquired if it was supposed that they could not be grown in this state? He had supposed they could be, and should be very reluctant to have to change his mind.

Dr. Hobbins spoke highly in favor of the chestnut, and believed it could be grown.

Mr. Adams had gathered an abundant crop of chestnuts, and fine ones at that, on his place in northeastern Iowa, on the Mississippi river; and he saw no reason why they should not grow on this side of the river.

Mr. Peffer said they would not grow with him in Pewaukee on the limestone drift soil. He regretted this, but it was true nevertheless.

Several members spoke in high terms of the white elm, sugar maple and bass wood for shade trees, and also of the hickory, walnut and butternut for their timber and fruit.

Mr. Greenman offered the following, which was adopted:

Resolved, That the thanks of those members from the country are hereby tendered to the friends of horticulture in this city, for their kind hospitality during this meeting; also to the Milwaukee and St. Paul Railroad for their courtesy in returning members to their homes free of charge.

And the meeting adjourned *sine die*

THE GENERAL EXHIBITION.

As hetofore, for many years, the annual exhibition of the society was held in connection with, and as a part of the exhibition of the state agricultural society. The display in all departments was a very fine one, doing great credit to individual exhibitors, to the competing localities, and to the state at large.

As some account of it, and the full list of premiums awarded, have already been given by the secretary of the state agricultural society in the volume of which this report constitutes a part, it is not deemed advisable to occupy space with any further report of it here.

The annual address was delivered on Thursday evening of fair week, in the assembly chamber, to a large and appreciative audience, by Dr. John A. Warder of Ohio. For the following report of this address we are indebted to the *Western Farmer*:

ADDRESS OF DR. JOHN A. WARDER,

ON THE PRINCIPLES OF HORTICULTURE.

And this is Wisconsin!—*the land of the winds.* But a few years agone, in my primary geographical studies, it was a portion of that *terra incognita*, the so-called northwestern territory, with here and there a small military post and between them vast plains, partially occupied by the wild game and the wandering tribes of the *aborigines;* now it is the happy home of a great people, amounting to a million of souls, who have made themselves famous by the arts of peace, with their abundant productions, as, in our common country's struggle, they also did in the field of battle, fighting bravely for the right in the great cause of human liberty and progress.

The reasons for your greatness were explained by my eloquent friend, who told you last night that the best men of their and had emigrated from the east, to populate the growing but boundless west. Had his extreme modesty allowed him, our amiable friend would also have reminded you of that interesting fact in the history of the settlement of our country, that population follows very closely the parallels of latitude, and he would thus have proved the legitimate claim to a portion of your young renown that is due to New England.

In traveling rapidly over portions of your beautiful state, the stranger cannot fail to be struck with the evidences that everywhere present themselves of the successful thrift of your people; with the vast extent of cultivated lands; the amount of timber planting, the general tasteful embellishment of homes, and, if he be an observant agriculturist, he will also rejoice to see that you already realize the value of the truths, that were so well and so happily presented to you last evening, as to the necessity of preserving the fertility of your virgin soils. He will rejoice to see vast fields dotted with the enriching contents of the barn-yards. Not waiting for your fields to be exhausted by a bad system of farming, which would sooner or later compel you to pull up stakes, and to seek new fields in another land of promise, your attachment to your homes in the beautiful Wisconsin leads you to keep up and, let us hope, even to increase, the richness of her land.

He who comes with the light of the geologist sees your plains, their swells and swales, and crystal lakes, with the deepest interest, and acquires an insight into the secret arcana of the formation of your country, which enables him to understand one great cause of your success, and also to know why your prosperity may and should be sempiternal, if you choose so to will it. When the geologist studies the nature of your soils and sub-soils, he finds that they are not (as is often the case otherwheres) dependent upon the nature of the underlying rocks, which are here generally concealed and covered to a great depth, and which may have contributed in but a trifling degree to the overlying strata of clays, gravels and sands, that make up the scil. In many portions of the United States the geologist may safely predict the particular crops, and in the fruits, even the particular varieties that will succed or fail in a given locality, because he knows the characters and chemical elements of the particular rocks upon which the soil is placed and from which it has been derived. This is especially true in the regions where the soils rest upon the coal-measures, those upon the Devonian shales, and in the great famous Bluegrass regions of the Silurian limestones, where the soil has been produced almost exclusively from the decomposition of those several rocks. You are very differently situated in this vast region of the lakes; you are in an immense drift formation. Here we have the most extensive evidence of the wonderful power of glacial transportation; the whole country is overspread with moraines of the debris of ancient glaciers, whose power alone can account for these heavy deposits of clays, and gravels, and sands, accompanied with great masses of hard rocks that have withstood the disintegrating forces of the elements, during their journeys of hundreds of miles from the places of their original deposit.

With such a basis, with such materials at hand, rich in the elements of plant food from various rocky strata, containing in their wonderful mixture all the substances that can be needed by every crop, you have indeed the basis of a valuable soil. The boulders that lie scattered over your country, and which prominently crown so many of your beautiful knolls and swelling ridges, and the smaller pebbles and gravels will furnish materials for a most interesting cabinet of minerals, since they are the debris that have been torn from every rock between you and further north.

Better the triumphs of horticulture! A wide but important theme! Why is this request to speak on this subject made? Why of me? Because for a want of a more thorough understanding of these principles many of us have failed to attain the results towards which we have aimed. This is true of other places than Wisconsin. We have all suffered alike and can learn from one another's experience—from that excellent but most extravagantly expensive teacher!

You have started on the right track for correction of errors. Your keen intelligence has led you to estimate correctly the value of a broad foundation of correct principles as guides for your future action. The little mistakes which you have made, the occasional failures which may have occurred, amidst your general success, have attracted your attention and you have already done the best thing that could have been done in the premises.

The first question is thus answered by reference to your good sense in desiring to come back to principles, to a sure foundation, to a scientific basis, rather than longer to be misled by the uncertain guess-work of ignorance or of untried and hastily formed theory.

The second question is easily answered. A too exalted estimate of your admiring and sympathizing friend, has called him to your presence, only to make a frank confession that he, like yourselves, has met with failures, from which, like you, he has endeavored to draw comfort and advantage in the way of learning how to avoid a recurrence of similar disasters. Like you he acknowledges himself but a learner, a beginner, a student in the great school of horticulture, which is ever open to all those who will but use their eyes and hands in scanning and testing nature, and in studying out the great problems that lie in every clod, in every dormant seed, in every living bud, in every expanding leaf, in every growing shoot, in every smiling flower, and in every melting fruit that he may have trained and cherished, or that his willing hand may pluck, and his grateful spirit may enjoy. But I am asked to entertain you by discussing the principles of horticulture.

Whether we consider under this general title, the elegant pursuits of landscape-gardening, the useful occupation of timber growing, on an extensive scale and as an important economy of the state, the propagation and culture of the orchard fruits, either to supply the needs of the family, or with a view to their profit when produced in quantities for commercial purposes, the culture of the various small fruits, which contribute so largely to the health of our citizens, the planting and treatment of the vineyard and the vine, so wouderfully productive of the purple clusters of the luscious grape; whether we direct our attention to the humble but useful pot-herbs and esculent vegetables that should furnish a large proportion of our daily food, or to the care of the lovely shrubs and flowering plants that adorn our door yards, and enliven the parterres of the lawn, and to the tender exotics that need the protection of glass houses and artificial heat in our rigorous climate, in all of the various occupations, we are pursuing some branch of horticulture.

Now horticulture is an art—it has been called a fine art, the fine-art of agriculture, and such we all believe it to be.

Like every other art, horticulture, to be successfully pursued, must have a scientific basis—and this in two directions; in the first, we must consider all that relates to the soils; in the second, we must study everything that concerns the plants upon and for which we expend our labor.

First then, we shall find it necessary to acquire a knowledge of the soils, their peculiarities, their qualities, and elements, and thus we shall learn their requisite manures. In these investigations we must be aided by the sciences of geology and chemistry.

We shall also need a knowledge of the mechanical condition of our soils, their wetness or dryness, and their power of resisting the extremes of temperature and their hygrometric state; this requires a knowledge of physics. But, as to the soils, we have yet to understand the best methods of its preparation, cultivation and treatment, for which we shall be dependent upon the laws and appliances of mechanics.

A wide range of investigation is thus opened before us, and the important dependence upon scientific research and study must be realized by the student of horticulture while as yet only considering this branch of the proposition.

But secondly, he will also find it necessary to make himself familiar with the nature of the plants with which he will have to deal, whether it be those that are to be cultivated or those that must be eradicated. For this purpose he will be dependent upon botany and the botanists. He must acquaint himself with the peculiar habits and habitats of the plants; with their climatic and other neccessities, their peculiarities, their modes of growth, and with the functions of their several parts; for this knowledge he must study vegetable physiology.

The extremes of temperature to which his plants may be exposed and the other atmospheric conditions, such as wetness and dryness, and electric phenomena, are all of the greatest importance to successful culture of different tribes, and the knowledge requisite for the solution of these problems can only be obtained from the science of meteorology.

But there is yet another branch of scientific investigations which will require the close study of the horticulturist, so as to enable him to protect his plants from the depredations of parasitic fungi, from the insects, and from other animal intruders. This will necessitate the aid of natural history. In this branch the study of entomology is especially worthy of attention, and with the rapid increase and diffusion of noxious insects some natural history has become absolutely necessary to every one who devotes himself to the delightful pursuits of horticulture. Fortunately for us, noble hearts and willing hands, well fitted to the work, have already undertaken to popularize this study, and the legislatures of some of our states have made provisions for their assistance.

The state of Illinois has Dr. Benjamin D. Walsh as its state entomologist; the same position is filled in Missouri by Mr. C. V. Riley. These gentlemen edit with much ability the *American Entomologist,* a monthly periodical of great value, published at St. Louis. We have also Townsend Glover, the eminent entomologist of the department of agriculture, Dr. Asa Fitch, who holds the position of entomologist to the New York state agricultural society, and Dr. Trimble of New Jersey. One of the most valuable works we have on that subject is Harris' Injurious Insects, edited by our friend here present, Hon. C. L. Flint.

It must be apparent, therefore, that the principles of horticulture constitute a vast scheme, based upon extensive studies and stretching over a wide field, so wide indeed, as almost to deter one from undertaking to grasp them. Fortunately for us, we have already interested some of the best minds in our behalf, and we can point to profound students, in almost every branch of scientific ivestigation, that have devoted themselves to the investigations of the very questions which most interest and concern us. The practical spirit of the age is working in our behalf—and science is yielding her treasures to art; and we have only to collect and collate the knowledge thus derived from the study of nature, and with practical good sense apply it for our benefit.

The philosophy of a former age, falsely so called, consists to a great degree of a collection of guesses. Theories were built up to sustain conclusions that were arrived at in anticipation of events, which, in some instances, never happened. The baseless fabric could not stand, and the beautiful structure of imaginative fancies necessarily crumbled to the ground.

The inductive philosophy, starting with established facts, arranging and comparing these, has given us quite other results. This has remodeled all our philosophy, and has caused a revolution in all our sciences of observation. Our studies are more than ever the investigations of phenomena, the observation of facts. We are no longer so apt to be led astray by the authority of names; in our republic of science each pupil may verify for himself the statements of his teachers and predecessors. The observed fact is of value, because it is a fact, and not because of its having been heralded by a famous name.

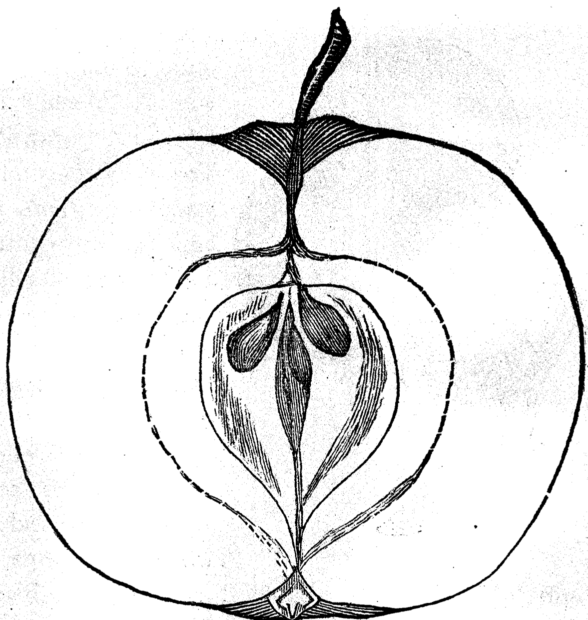
The observations apply with special force in horticulture. Many mistakes are made from this source, and from bad selections of orchard fruits; from wrong treatment and from ill adapted and changed conditions, soil, etc.

Mr. President, through you, allow me to tender to thts audience, an expression of the deep sense of gratitutde for their patient forbearance under the infliction of a mere didactic lecture, when they may have come to be amused and entertained. The forensic arts have never been the forte of your earnest, working friend who is also the warm well-wisher for the success of horticulture and agriculture in Wisconsin.

NEW WESTERN FRUITS.

BY O. S. WILLEY.

During the last few years much interest and anxiety has been felt by fruit-growers of the west as to sorts to plant upon which they could rely, feeling that their labors would not be in vain, but that they might eat of the fruit thereof in due season. Happy to say that we now have many sorts which, thus far, have proved quite satisfactory, and are bearing regular uniform crops. Many of our fruit-growers are turning their attention to seedlings, experimenting with the different sorts, with an especial reference to finding something adapted to the



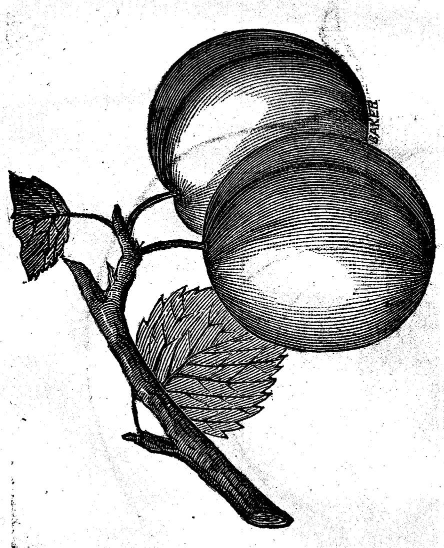
PEWAUKEE.

fickleness of our climate, as well as desirable for culinary use. The state horticultural society, in offering premiums, has had the effect to bring out a large competition, among which have been some varieties worthy a more extensive trial.

Among others is a seedling grown by G. P. Peffer and which was exhibited for three successive seasons, receiving the premium of fifty dollars—and named by the horticultural society, the Pewaukee.

Fruit medium to large; round obovate, waved, cavity small; basin shallow and slightly plaited; calyx rather large; stem variable in length, with a fleshy substance on outside, sometimes so large as to turn it clear to one side, from one-half to one inch long; skin dull red on a bright yellow ground, with whitish dots all over; flesh yellowish white, with a rich mild sub-acid flavor; January to June. Tree an upright center; branches at almost right angles; wood very hard; shoots dark, smooth with very white specks.

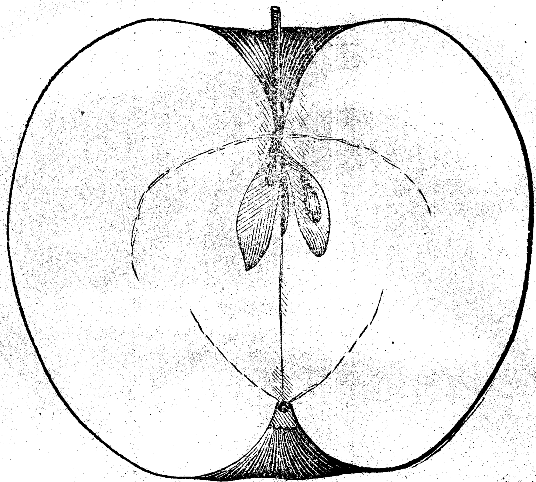
BLUE TWEENS.



This is a small dark blue plum, with a whitish bloom, raised from seed by Mr. Peffer. Tree is fifteen years old, stands on a high ridge, exposed to southwest and west and northwest; bears large crops every other year; is very hardy, but grows very slow. Fruit hangs in twos, flesh yellowish green, adheres to the stone on one side, and when fully ripe of a a rich sprightly subacid, agreeable flavor; ripens about the last of September to the 15th of October.

IMPERIAL WASHINGTON.

This variety is from the seed of a Lombart, apparently crossed by Imperial or Washington Gage, as it has the character of both in some degrees; color red brown, with light yellowish specks; skin thin, and rather tender, flesh greenish yellow, juicy and rich, quite firm and nearly free from the stone. Fruit large, nearly round oblate, flattened at both ends, a slight suture; stalk about 3 1-2 inches long, rather stout, inserted in small and sometimes no cavity, with occasionally a small ring ridge around it; season middle to last of September. Tree hardy, vigorous and productive, and nearly equal to the the Lombart in hardiness; also from Mr. Peffer.



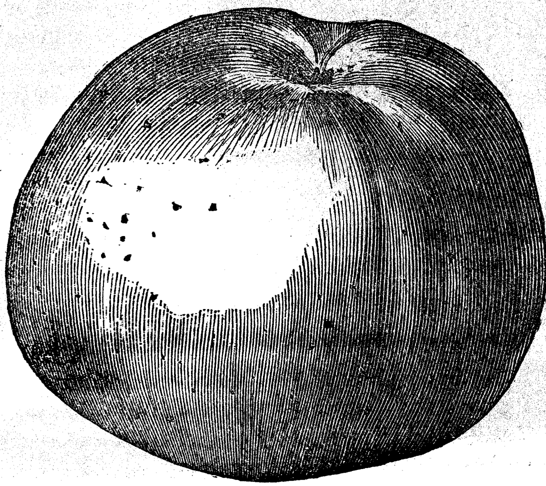
THE RUBICON APPLE

originated in Michigan, where it is said to be very hardy, so much so as to be called by some the "oak grub variety."

Mr. L. L. Hall, horticulturist of Van Buren Co., Michigan, says he has over one hundred varieties in cultivation, and thinks the Rubicon the most hardy of any, and has no doubt but that it will stand our climate, and be a great acquisition to our fruit. In a letter from Mr. Hall, in March last, he says: "It is bound to be the leading market apple of the west. It is the most beautiful and long-keeping apple in cultivation. It keeps until July and August. It is a smooth, scarlet-red apple, about the size of the Baldwin, but every way superior."

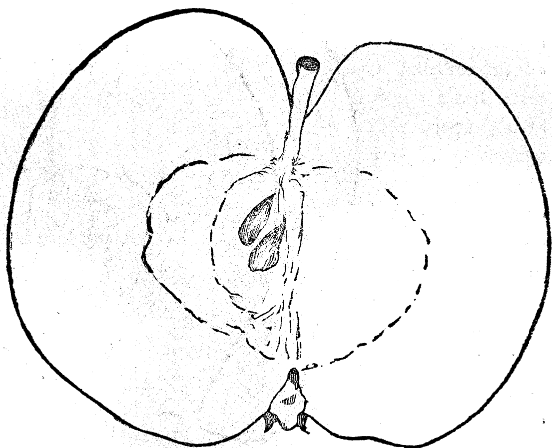
These good traits of quality and hardiness are confirmed for it as far as tried in Minnesota and Wisconsin, and I trust that a wider and more extensive acquaintance with it, over a larger and more varied portion of our state, will confirm all that has been said of it, and, if so, too much praise cannot be given to I. Gould of Beaver Dam, Wisconsin, for exhibiting the fruit at the state horticultural annual meeting, and thus bring it to the notice of our fruit-growers.

For full description and use of cuts of the Reliance and Northern Blush apples I am indebted to D. D. T. Moore of the *Rural New Yorker*, who says:



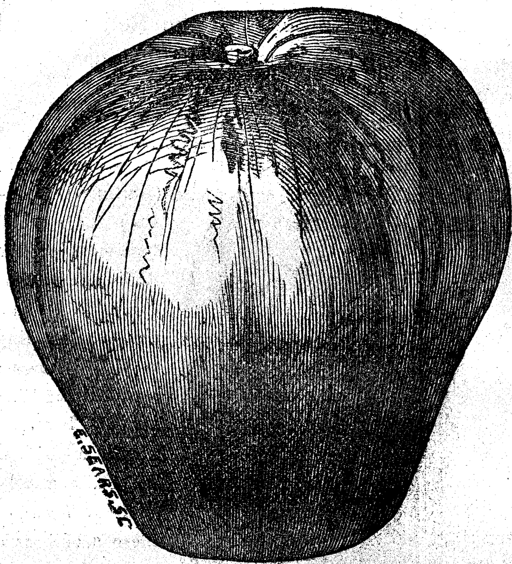
NORTHERN BLUSH APPLE.

"I am indebted to G. N. Smith, (Berlin, Wisconsin,) for several specimens of the Reliance and Northern Blush apples, new seedling varieties, shown at one of the Wisconsin horticultural meetings. The claim mainly made in favor of these seedlings is that of hardihood in the trees, they being the best two in an orchard originally planted with seedlings, and out of which more than one-half have died from the severity of climate, while these have withstood all changes and yearly produced fruit.



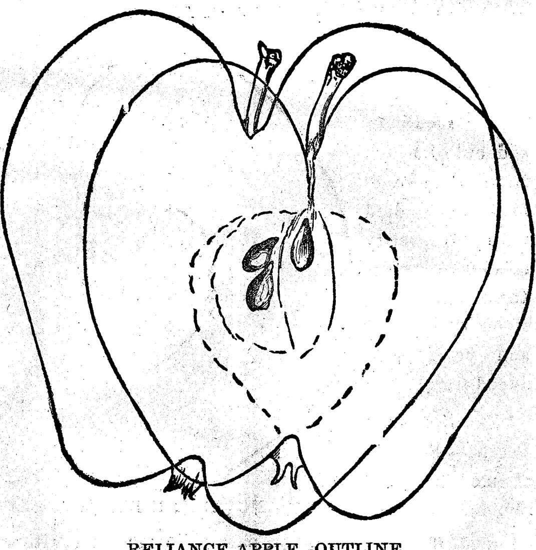
NORTHRRN BLUSH APPLE—OUTLINE.

"THE NORTHERN BLUSH.—Fruit is of medium size, roundish oblate, irregular or furrowed, light, pale yellow ground, with a vermillion blush in sun at stem end; stem short; cavity open, deep; calyx large for size of fruit, half closed; basin broad, shallow, corrugated; flesh white, coarse, spongy, dry, hardly good; core medium; seeds brown, plump; season December.



RELIANCE APPLE.

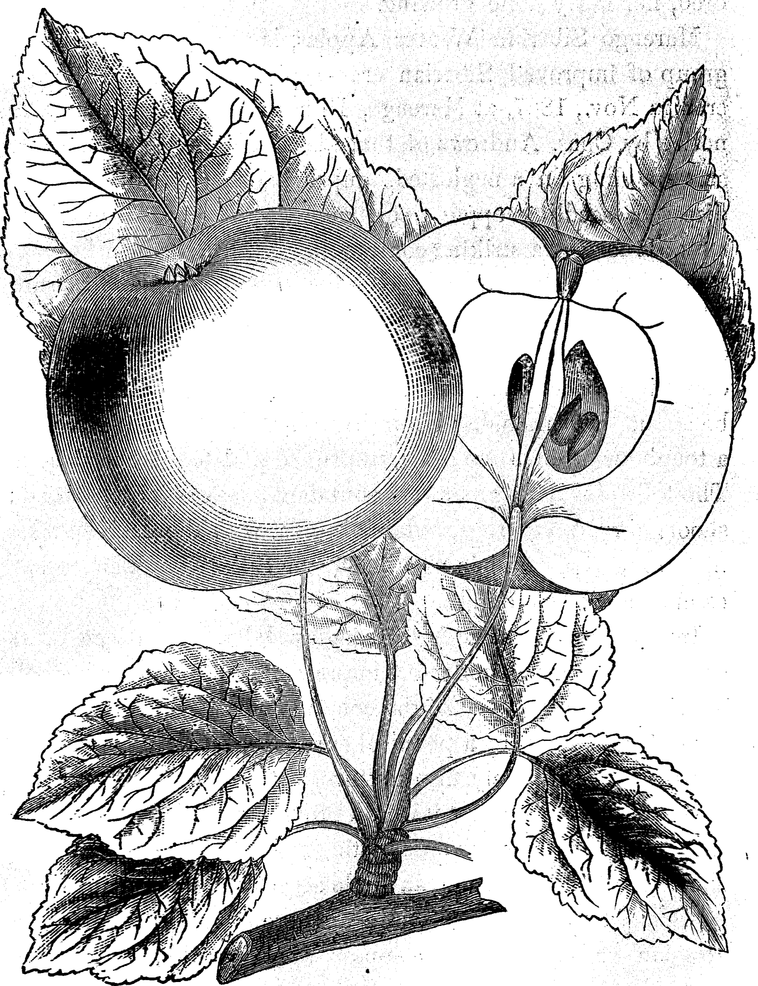
"The Reliance is of medium size, conical, broad and flat at stem end, some specimens a little oblique, (see outlines,) slightly ribbed, or with broad shallow furrows, as with mostof the class of Gilliflowers. Color is light, pale yellow ground, with broken stripes and shades of red on sunny side; when fully exposed, the red is deepened and maintains its color, especially towards the blossom end; calyx nearly closed, with segments divided and slightly recurved or reflexed at end; basin deep, broad, open, with many small, sharp furrows; stem short, cavity deep and open, with slight greenish russet at base; flesh white, moderately fine grained, mild subacid, tender, moderately juicy, good to very good; core rather open at center, with long capsules; seeds plump, dark brown; season January to March.



RELIANCE APPLE—OUTLINE.

Another source from which we hope much is in some of the Russian sorts. Grafts from this northern country have been imported, and are now growing in this state. It is to be hoped that some may prove of inestimable value to our climate. A. G. Tuttle of Baraboo, and J. S. Strickney of Wauwatosa, are, we believe, laboring assiduously in this direction, and have confidence in the most favorable results.

Still another source from whence we are looking for like favorable results, and which has already been crowned with success quite satisfactory, is in the improvement of the Siberian crab-apples. Much has already been done in this direction,



MARENGO.

more probably will be; but we find already something to record which shows progress. At the last state exhibition, held Sept. 25th, 1869, five varieties of the Marengo Winter Siberian apples were exhibited by Dr. C. Andrews of Marengo, Illinois. The largest of these, christened "Marengo," shown here, is much larger than previous years, having improved, we are told, since the tree has received cultivation. Gathered at this date, however,—Sept. 28th— they were not fully colored, nor fairly done growing.

Marengo Siberian Winter Apples, is the name given to a group of improved Siberian crab-apples which were discovered in Nov., 1867, at Marengo, Illinois, and first brought to notice by Chas. Andrews of that place, who describes the tree as "standing in a neglected, unpruned orchard of scrubby, diseased, seedling apple trees, such as are seen all over the west. It formed a striking contrast, by its entirely healthy condition, sound, clean trunk and limbs, and perfectly fair fruit. The wonderful profusion of its highly colored, showy, crimson clusters, gracefully bending its long branches downwards, rendered it at once a rare and attractive object. It is believed to be about 18 years old. Up to the spring of 1868, it stood in a tough sward of June grass, unpruned and totally neglected. The foliage is dark green and abundant; leaves large, broad; shoots curved, vigorous, reddish brown, with the grey specks, bloom and scaly cuticle peculiar to the Siberian. The infloressence is also similar."

Its good qualities had been recognized during fourteen years of constant bearing, under the impression that it was "a small but rich seedling apple," of the common specie, the tree having never been visited by a practical horticulturist until November, 1867. The extremely firm texture of the fruit at that season, gave the impression that it would prove a good keeper, and the tree possessing every characteristic of the Siberian crab apple, showed at once that such an apple must be a great acquisition, especially for all northern sections where none but the hardiest Russian varieties of the common apple would survive, and where not a single winter apple was found. Facts since gathered prove that the Siberian crabs flourish at points much farther north than even the Duchess of Oldenburgh.

The group of Marengo Siberians are five in number, all found in the same vicinity, and doubtless having a common origin, viz: from seeds of the common cherry and red Siberian crabs sent from Vermont and planted at Marengo about twenty years ago.

They have been named respectively, "Marengo, Chicago, Coral, Winter Gem and Kishwaukee." The first three have been noticed in leading horticultural journals, and in the last edition of *Downing's Fruit and Fruit-trees of America*, they are thus described:

"MARENGO."—Fruit, large for its class; bright warm red on a yellow ground; flesh yellowish white, crisp, juicy, mild, pleasant sub-acid. In eating from mid-winter to late in the spring.

"CHICAGO."—Fruit, conical; rich, warm yellow with a vermillion cheek; flesh yellowish, crisp, sprightly, juicy, rich, mild sub-acid, almost tender, *excellent*. Season, December to March.

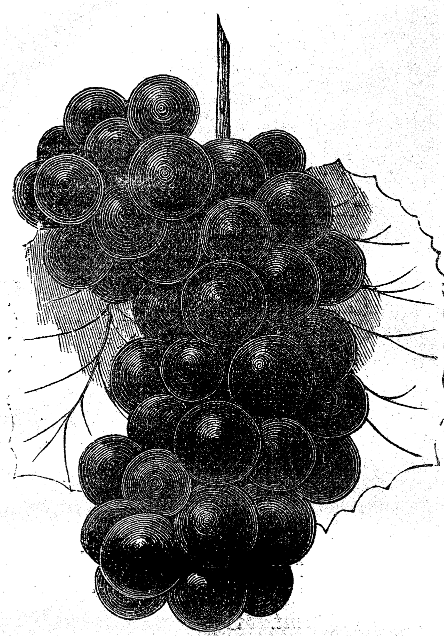
"CORAL."—Fruit small, similar to 'Chicago' in appearance, quite crisp, sprightly, sub-acid, keeps till February or later.

"THE WINTER GEM."—Is about one and a fourth inches in diameter, very handsome, deep red or purple on a rich yellow ground; heavy bluish bloom; flesh yellowish white; juicy, tender, rich, mild sub-acid, quality best; use, ornament and dessert. Season, January to March.

"KISHWAUKEE."—Large, one and three-fourths inches in diameter, bright golden yellow, spotted with russett dots; flesh yellow, crisp, agreeable, acid, rich; quality good; use cooking. Season, February to May.

The Marengo is the largest of this group or about two and one-eighth inches in diameter.

THE JANESVILLE GRAPE



originated with F. W. Louden of Janesville, Wisconsin, from seed saved at the Rock Co. Fair, in 1858, fruiting the third year from the seed. The vine is healthy, perfectly hardy, of strong luxuriant growth, and very productive, ripening about the middle of August; bunches medium, compact, and shouldered; berries large, round, black, covered with a light bloom; flavor sprightly, not very rich; fair, but not first-rate; producing a first-rate red wine, (not quite equal to the best European grape, as is claimed for most new candidates), but possessing characteristics greatly surpassing many of the kinds now in cultivation; enduring the severe cold of the past seven winters without protection, bearing abundantly each year. The state society offered a premium for the best seedling grape, fruit to be shown for three successive years. At the fall exhibition of 1868, the premium was awarded to the Janesville, as the best and worthy of cultivation, and christened by the president as the "Janesville," from the city of its origin.

The demand for new seedlings has had the effect to put the whole horticultural fraternity on the *qui vive* for new Siberians, and already some scores have been figured and described by our leading pomologists in various horticultural journals. At this fair there are on exhibition forty-seven varieties by actual count. Among these are some new fall sorts of decidedly high merit as dessert fruits, especially Plumb's Nos. 1 and 2, which are delicious, sub-acid, fine grain and tender; also Brier's Sweet, by A. G. Tuttle, which measures two inches and a quarter in diameter, very sweet and rich.

We congratulate the whole country on the addition of these peculiarly hardy fruits to the list of our staple luxuries. The demand for such fruits will not be confined to particular regions. They are valuable in every section, and especially so in the extreme northwest. The only, and we may say the great danger, lies in running after these sorts too exclusively, and to the neglect of some others much better, which in some cases might be substituted; but even in this case, the Siberian sorts will serve a good purpose, namely, as stock to work the other varieties on; so with all fidelity to the one great object in view, a plentiful supply of fruit for the masses, we say press on, import, plant seed, hybridize, or anything else, no matter what or how, so that we have good fruit, aud that in abundance.

LOCAL HORTICULTURAL SOCIETIES.

MADISON HORTICULTURAL SOCIETY.

The annual meeting of the Madison Horticultural Society was held Friday evening, November 12, at the rooms of the State Agricultural Society, president Leitch in the chair.

The treasurer, Geo. A. Mason, Esq., made a report, embracing the following statement of the finances of the society: Amount on hand December, 1868, in cash and U. S. bonds, $508.59. Receipts during the year, $295.57. Expenditures during the year $352.18. Balance on hand, $451.98, of which $400 is in U. S. bonds.

The election of officers for the ensuing year was had with the following result:

President —W. T. Leitch.

1*st Vice President.*—D. Worthington; 2*d Vice President.*—T. Brown.

Directors.—Dr. Joseph Hobbins, J. T. Stevens, Dr. N. J. Moody, John Gripper, H. M. Lewis.

Treasurer.—Geo. A. Mason.

Corresponding Secretary.—Dr. Joseph Hobbins.

Recording Secretary.—T. D Plumb.

Committee on Fruits.—Dr. N. J. Moody, Col. G. W. Farrington, J. T. Stevens.

Committee on Flowers.—J. Gripper, R. L. Garlick, Edw. Thompson.

Committee on Vegetables.—John N. Jones, Gen. N. F. Lund, L. Jones.

Committee on Premiums.—Gen. N. F. Lund, J. Gripper, Dr. N. J. Moody.

Committee on Finance.—T. Brown, Dr. Wm. Hobbins, H. M. Lewis.

It was resolved to hold monthly or fortnightly meetings during the winter months for discussions. The next meeting was appointed for Friday evening, November 26, at which time the by-laws are to be revised.

OSHKOSH HORTICULTURAL SOCIETY.

OSHKOSH, WIS., January 22d, 1870.

O. S. WILLEY, Esq,
Secretary State Horticultural Society:

DEAR SIR:—In response to your recent request, I take pleasure in communicating a few items of information relative to the progress, etc., of the Oshkosh Horticultural Society.

During a considerable portion of the past year, regular weekly meeting were held for discussions upon various legitimate topics, the most of which were well attended, and proved to be not only well calculated to maintain an interest in horticultural pursuits generally, but to develop much *practical* and consequently *profitable* information in the various departments of fruit raising and especially in the culture of strawberries, grapes and plums, which with us may be regarded as specialities. Indeed, our success with the first two of these has been such, both as to quality and quantity, as would warrant us, we think, if we were so disposed, in challening competition with any other section of our noble state.

During the year we held *two* exhibitions, and both with gratifying results. Owing to unaviodable circumstances, our summer "strawberry and floral exhibition" was held one week too late, consequently much of the fruit was past its prime; nevertheless, we had a fine show, and one which gave a marked impetus to our community in the right direction. The fall exhibition was a grand and complete success. Taking into account quantity, number of varieties, and quality of fruit exhibited, and more particularly grapes, apples and pears, it was the unanimously expressed opinion of impartial and competent judges, that it outrivaled any former exhibition in the state, save and except those of the State Horticultural Society. These exhibitions were entirely *free*, both to visitors and exhibitors, and the premiums offered were not limited to our own county, but open to competitors. The total number of premiums given was fifty-two (52), ranging in value from $1.00 to $5.00; a part of which were given as special premiums by some of our business men, the remainder, and all other expenses being paid out of the funds of the society. While, however, this "*free*" plan has resulted in increasing the *popularity* of the society, it has proved a heavy tax on its members, and hence we propose charging a small admission fee at all future exhibitions

We now number a paying membership of 44, and with a good prospective increase, and unabated zeal; we propose, while heartily co-operating with all, to rank with the foremost in our state, as a society of students aud laborers in the grand field of horticultural science.

OFFICERS OF 1869.

President—James Brainard.
Vice-President—O. H. Harris.
Corresponding Secretary—I. J. Hoile.
Recording Secretary and Treasurer—Jacob Fowle.
Executive Committee—James Brainard, I. J. Hoile, J. H. Osborne, B. Haskell and T. Evans.

OFFICERS OF 1870.

President—Hon. G. W. Washburn.
Vice-President—J. H. Osborne.
Corresponding and Recording Secretray—I. J. Hoile.
Treasurer—Jacob Fowle.
Librarian—Miss N. Fowle.
Executive Committee—Hon. G. W. Washburn, I. J. Hoile, J. H. Osborne, Geo. Hyer and J. M. Rollins.
Committee on Floriculture—Mrs. G. W. Washburn, Mrs. L. B. Reed and Mrs. Geo. Hyer.

Yours Truly,

ISAAC J. HOILE,

Crresponding Secretary Oshkosh Horticultural Society.

KENOSHA HORTICULTURAL SOCIETY.

KENOSHA, Jan. 24, 1870.

MR. O. S. WILLEY:

DEAR SIR:—The officers of the Kenosha Horticultural Society for the coming year are as follows:

President.—S. Galt.
Vice President.—N. R. Allen.
Secretary.—Mark Dresser.
Treasurer—S. Y. Brande.

We are in a more flourishing condition than we have been at any time since our organization, with one exception. Some few persons who had little taste in such matters joined the society at first and have since declined to pay their annual dues and are no longer members. But nearly as many new mem bers have been elected so that we number but few less than during the first year. In all other respects our condition is excellent. The *Western Farmer* did not come to hand, and we do not know when your exhibition will take place, etc., etc. We should have sent some *Pears* and *Apples.* I had a sample of Flemish Beauty Pears which I designed to send. I did not know that you were the secretary, or should have written to you. My Flemish Beauties are now too much decayed to send. It is common for that variety to keep till January in good condition. Respectfully yours,

MARK DRESSER,
Secretary Kenosha Horticultural Society.

P. S. We should be pleased to receive a copy of your annual report; did not get one last year.

JANESVILLE HORTICULTURAL SOCIETY.

JANESVILLE, WIS., Jan. 13, 1870.

O. S. WILLEY, Madison:

DEAR SIR:—In reply to yours of the 10th inst., will say that our present officers remain the same as last year:

President.—Dr. J. B. Whiting.
Vice President.—S. G. Williams.
Secretary.—F. S. Lawrence.
Treasurer.—S. W. Smith.

I have no correspondence worthy of publication. Yours horticulturally,

F. S. LAWRENCE.

MILTON, WIS., FARMERS' CLUB.

The first annual exhibition was held in college hall, the evening of November 1, 1869, in one of the large reception rooms adjoining the hall. The exhibition embraced several fine collections of apples and pears, both grafted and seedlings; nine collections of sealed fruits and preserves; eleven collections of flowers and house plants; a fair assortment of the choicest vegetables, with some miscellaneous articles to amuse the juveniles.

The chief attraction of this exhibition was the collection of apples which drew the second prize at our state fair, for local society exhibition in horticultural department. During the evening the crowd were called to order to listen to an excellent address by Hon C. G. Williams, of Janesville, who had the undivided attention of a large audience for half an hour.

The desired end of this exhibition was attained, by securing a good working membership, and inaugurating the society in its work, by bringing the people together at the outset to hear a full exposition of the programme of the society, and thus far the citizens have given a hearty sanction to the objects of the association.

Second monthly meeting, December 6, 1869, met in college hall. This being the first meeting for discussion, the following order of business for the regular monthly meetings was adopted:

1. Call for questions.
2. Communications.
3. Discussions.
4. Subject for next meeting.
5. Miscellaneous business.

Under this order, the following questions were proposed for consideration, which we append with a brief synopsis of the remarks and proceedings.

"The folly of planting trees without adequate protection, and the necessity of some effective laws to restrain cattle from running at large."

Besides the protection of shade trees, "The cleanliness of our village and the release from a constant source of anxiety to the planters," it is the duty of this club to urge prompt action. "The college grounds cannot be protected by the ordinary means." A committee was appointed to report upon this subject at the next meeting, and following this to report on the subject of "comparative value end longevity of our shade trees, with a list of varieties desirable," also to report upon "the varieties, condition, and sources of supply."

For future discussion: "Fruit trees—protection from their enemies, the small animals and bark lice." "Pruning and grafting." "Mode and time." "Deep and shallow culture." "What agricultural papers to take." "Cooking food for stock, and the best mode." "The use of land plaster and other chemical manures, also comparative value of top dressing and deep manuring." On this last subject president Whitford is to present a paper at some future meeting. "The legitimate bearings of grape culture on the cause of temperance," with a paper by Dr. E. A. Calkins. "Can we produce our own sweetening, and the culture of the sugar beet for this purpose," is put down for a prominent place on the list of subjects, and the secretary was requested to procure facts bearing on the subject, for the consideration of the society.

"Factory dairying" was put upon the list for the next meeting, and a competent committee named to report upon the same for the consideration of the club, and the establishment of such an institution will be carefully considered.

The goodly number present, and the nature of the questions presented for further discussion, give promise of a series of very interesting meetings during the ensuing year.

J. C. PLUMB,
Secretary.

SUMMARY OF METEOROLOGICAL OBSERVATIONS FOR 1869,

TAKEN AT THE UNIVERSITY OF WISCONSIN.

MONTH.	THERMOMETER IN OPEN AIR.			BAROMETER, HEIGHT REDUCED TO FREEZING POINT.			RAIN & SNOW.		FORCE OR PRESSURE OF VAPOR IN INCHES			PERCENTAGE OF SATURATION.			Amount of cloudiness.	PERCENTAGE OF WINDS.			
	Max.	Min.	Means.	Max.	Min.	Mean.	Am't of rain & melted snow in gauge in inches.	Depth of snow in inches.	Max.	Min.	Mean.	Max.	Min.	Mean.		SW & S.	NW & N.	NE & E.	SE & S.
January.....	42.0	-11.0	23.7	29.559	28.206	28.961	2.69	16.25	2.54	.027	.124	100	63	94	4.8	53	25	16	6
February...	50.5	—1.0	22.9	29.464	28.452	28.932	2.35	8.00	.301	.042	.123	100	57	89	6.2	28	44	16	12
March......	59.0	—8.0	25.5	29.659	28.162	28.947	0.49	5.00	.433	.001	.143	100	2	85	5.0	28	42	16	14
April........	63.0	12.5	36.7	29.467	28.371	28.868	2.72	6.00	.462	.069	.236	100	28	75	5.8	32	27	27	14
May.........	81.5	35.0	54.4	29.259	28.392	28.830	4.90	....	.812	.165	.376	100	31	73	5.6	26	26	39	9
June........	78.5	48.0	62.5	29.199	28.240	28.868	6.24	....	.838	.229	.517	100	41	74	4.6	59	29	4	8
July........	80.0	59.0	69.5	29.689	28.242	28.951	3.63	....	1.029	.425	.655	97	54	73	3.8	53	27	4	16
August.....	89.0	54.0	66.9	29.417	28.385	29.014	5 92	....	1.270	.359	.642	100	30	79	4.8	20	31	32	17
September..	81.0	39.0	61.8	29.400	28.798	29.033	2.68	....	.745	.169	.403	94	40	73	4.6	29	22	5	44
October.....	71.0	16.5	37.7	29.361	28.570	28.954	0.66	....	.429	.053	.178	100	25	65	4.3	43	39	00	18
November...	60.0	11.0	30.6	29.342	28.341	28.862	2.05	12.00	.335	.071	.141	100	51	82	6.8	25	48	11	14
December..	39.5	—2.5	22.3	29.565	28.514	28.993	2.64	12.00	.232	.040	.113	100	69	89	6.7	37	31	9	23
Sums.......	....	....	....	....	....	....	36.97	60.25	....	....	....	....	....	....	....	....	....	....	....
Means......	66.25	21.0	42.8	....	....	28.934	....	....	....	....	.304	....	....	79	5.2	36	32	17	16