Transactions of the Wisconsin State Agricultural Society, with portions of the correspondence of the secretary. Vol. III 1853

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TRANSACTIONS

OF THE

WISCONSIN STATE AGRICULTURAL SOCIETY,

WITH PORTIONS

OF THE

CORRESPONDENCE OF THE SECRETARY.

VOLUME III.—1853.

MADISON:
BERIAH BROWN, STATE PRINTER.
1854.

ADVERTISEMENT.

HEREWITH, the undersigned presents to the Farmers of Wisconsin, the Third Volume of the TRANSACTIONS OF THE WISCONSIN STATE AGRICULTURAL SOCIETY.

Like its predecessors, he sends it forth with anxiety, and in like manner, he bespeaks for it at their hands a generous sympathy and a favorable consideration. That it contains Papers of marked value and excellence, is his belief; and if in this belief, he is sustained by the judgment of his fellow-citizens, and especially of that class for whose benefit he is laboring, then will the ends for which those labors were undertaken be fully met.

With the sending forth of this, his labors in the preparation of the Annual Volumes of the Transactions of the Society will close, and in taking leave of those, in whose behalf he has been so long engaged, he desires to tender to them the assurance, that the many kindnesses he has received at their hands, will not be forgotten, and though he may not longer serve in his present capacity, yet his services shall never be wanting in that which promises advancement to Industrial Pursuits.

He retires from his present position with the gratifying consciousness that he has endeavored faithfully to do his duty, and in this conviction, he feels a proud satisfaction, believing that though he may not have accomplished all that could have been desired, yet in what has been done he has not greatly erred.

To those gentlemen who have so kindly responded to the calls made upon them in the preparation of this Volume, he feels that his warmest acknowledgments are due, and as such they are most cordially tendered.

ALBERT C. INGHAM.

STATE AGRICULTURAL ROOMS,
Madison, January, 1854.

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OF

THE WISCONSIN STATE AGRICULTURAL SOCIETY

FOR 1853.

PRESIDENT.

ELISHA W. EDGERTON, Summit.

VICE PRESIDENTS.

BERTINE PINKNEY, Rosendale. NATH. B. CLAPP, Kenosha.
JEREMIAH E. DODGE, Potosi.

CORRESPONDING AND RECORDING SECRETARY.

ALBERT C. INGHAM, Madison.

TREASURER.

SIMEON MILLS, Madison.

ADDITIONAL MEMBERS OF THE EXECUTIVE COMMITTEE.

HIRAM BARBER, Juneau, HENRY M. BILLINGS, Highland.
MARTIN FIELD, Mukwonago. SAMUEL S. DAGGETT, Milwaukee.
MARK MILLER, Janesville.

EX-PRESIDENTS EX-OFFICIIS MEMBERS.

ERASTUS W. DRURY, Fond du Lac. HENRY M. BILLINGS, Highland.

LIFE MEMBERS, 1853.

ABBOTT, CHAUNCEY, Madison.
ATWOOD, DAVID, Madison.
BILLINGS, HENRY M., Highland.
BIRD, IRA W., Madison.
CHASE, ENOCH, Milwaukee.
DAGGETT, SAMUEL S., Milwaukee.
DAVIS, NATHAN P., Fitchburgh.
DELAPLAINE, GEORGE P., Madison.
DODGE, JEREMIAH E., Potosi.
DRURY, ERASTUS W., Fond du Lac.
DURKEE, HARVEY, Kenosha.
EDGERTON, ELISHA W., Summit.
ELMORE, ANDREW E., Mukwonago.
FAIRBANKS, ERASTUS, St. Johnsbury, Vt.
FARWELL, LEONARD J., Madison.
FERGUSON, BENJAMIN, Fox Lake.
FIELD, MARTIN, Mukwonago.
HOLT, DAVID, Madison.
INGHAM, ALBERT C., Madison.
LAWTON, JOSEPH G., Green Bay.
MACY, JOHN B., Fond du Lac.
MILLS, SIMEON, Madison.
MITCHELL, ALEXANDER, Milwaukee.
PALMER, HENRY L., Milwaukee.
PINKNEY, BERTINE, Rosendale.
ROGERS, JAMES H., Milwaukee.
TENNEY, HORACE A., Madison.
THOMAS, MAJOR J., Fond du Lac.
WEBSTER, MARTIN, Fox Lake.
WEED, CHARLES, Madison.
WHITTLESEY, THOMAS T., Pheasant Branch.

CONSTITUTION

OF THE

WISCONSIN STATE AGRICULTURAL SOCIETY.

ARTICLE I.—OF THE NAME AND STYLE OF THE SOCIETY.

The style of this Society shall be the "WISCONSIN STATE AGRICULTURAL SOCIETY." Its objects shall be to promote and improve the condition of Agriculture, Horticulture, and the Mechanical, Manufacturing and Household Arts.

ARTICLE II.—OF THE MEMBERS.

The Society shall consist of such Citizens of this, and other States, as shall signify in writing their wish to become Members, and shall pay on subscribing not less than three dollars, and annually thereafter three dollars; and also of Honorary and Corresponding Members.

The Presidents of County Agricultural Societies, or a delegate from each, shall, *ex officio*, be Members of this Society. The payment of twenty five dollars, or more, at one time, shall constitute a Member for life, and shall exempt the donor from annual contributions.

ARTCLE III.—OF THE OFFICERS.

The Officers of the Society shall consist of a President, three Vice Presidents, (one to be located in each congressional district,) a Recording Secretary, a Corresponding Secretary, a Treasurer, an Executive Committee to consist of the Officers above named, and five additional Members, together with the three Ex-Presidents of the Society whose terms of service last expired, three of whom shall constitute a quorum, and a General Committee, to consist of one Member from each county, organized for judicial purposes.

The Ex-Presidents of the Society, not Members of the Executive Committee, shall constitute a Board of Councillors, to which may be referred for consultation and advice, all questions that may from time to time arise, in the decision of which the Society may in any manner be interested.

ARTICLE IV.—OF THE DUTIES OF THE OFFICERS.

The Recording Secretary shall keep the minutes and have charge of the books of the Society.

The Corresponding Secretary shall carry on the correspondence with other Societies, with Individuals, and with the General Committee, in furtherance of the objects of the Society.

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 Recording Secretary, and shall make a report of the receipts and expenditures at the annual meeting in May.

The Executive Committee shall take charge of and distribute or preserve all Seeds, Plants, Books, Models, &c., which may be transmitted to the Society; and shall have also the charge of all communications, designed or calculated for publication, and, so far as they may deem expedient, shall collate, arrange and publish the same, in such manner and form as they shall deem best calculated to promote the objects of the Society.

The General Committee are charged with the interests of the Society in the counties in which they shall respectively reside, and will constitute a medium of communication between the Executive Committee and the remote Members of the Society.

ARTICLE V.—OF MEETINGS AND ELECTIONS.

There shall be an Annual Meeting of the Society on the third Wednesday of May in each year, in the Village of Madison, at which time all the Officers shall be elected by a plurality of votes, with the exception of the General Committee, who may be appointed by the Executive Committee, who shall also have power to fill any vacancies which may occur in the Offices of the Society during the year.

Extra meetings may be convoked by the Executive Committee—ten Members shall be a quorum for the transaction of business.

ARTICLE VI.—OF THE ANNUAL CATTLE SHOW AND FAIR.

The Society shall hold an Annual Cattle Show and Fair, at such time and place as shall be designated by the Executive Committee, who shall prepare a Premium List, appoint Viewing Committees, and award the Premiums at the same. It shall be the duty of all the Officers to attend the Annual Cattle Show and Fair.

ARTICLE VII.—OF AMENDMENTS.

This Constitution may be amended by a vote of two-thirds of the Members attending any annual meeting.

STATE AGRICULTURAL ROOMS,
MADISON, January 28th, 1854.

I certify that the above and foregoing is a true and correct copy of the Constitution of the Wisconsin State Agricultural Society.

ALBERT C. INGHAM, Secretary.

LIBRARY ADDITIONS, 1853.

SMITHSONIAN INSTITUTION, Washington, D. C.—Smithsonian Contributions to Knowledge, Vols. I. II. III. IV. V.

AMERICAN INSTITUTE, New York City, N. Y.—Transactions for the Years 1846, 1847, 1848, 1849, 1850, 1851. Also Catalogue of Library.

Hon. BENJ. P. JOHNSON, Secretary, Albany, N. Y.—Transactions of the New York State Agricultural Society for 1852.

Prof. WM. W. MATHER, Secretary, Columbus, Ohio.—Report of the Ohio State Board of Agriculture 1851.

Dr. GEORGE SPRAGUE, Secretary, Columbus, Ohio.—Report of the Ohio State Board of Agriculture 1852.

JOHN C. HOLMES, Esq., Secretary, Detroit, Mich.—Transactions of the Michigan State Agricultural Society 1852.

His Excellency Governor JOSEPH A. WRIGHT, President, Indianapolis, Ind.—Transactions of the Indiana State Agricultural Society 1852. 50 copies.

Hon. SILAS H. HODGES, Commissioner, Washington, D. C.—Patent Office Report, Mechanical, 1852.

Hon. CHARLES MASON, Commissioner, Washington, D. C.—Patent Office Report, Agricultural, 1851. 50 copies.

ALBERT C. INGHAM, Madison.—Dr. William Darlington's Agricultural Botany. Also Owen's Geological Survey of Wisconsin, Iowa and Minnesota.

Hon. CHAS. D. ROBINSON, Secretary of State, Madison.—Session Laws and Journals of the Legislature 1852.

WILLIAM DUDLEY, Esq., State Librarian, Madison.—Laws and Journals of the late Territory of Wisconsin from 1836. Also Laws and Journals of the State of Wisconsin from 1848. 50 vols.

JOHN WARREN HUNT, M. D., Madison.—Wisconsin Gazetteer 1852.

FREDERICK McCREADY, Esq., Publisher, New York City, N. Y.—The Working Farmer 1849, 1850, 1851, 1852, 1853.

LUTHER TUCKER, Esq., Albany, N. Y.—The Country Gentleman 1853.

DANIEL LEE, M. D., Rochester, N. Y.—The Genessee Farmer 1853.

D. D. T. MOORE, Esq., Rochester, N. Y.—Rural New Yorker 1853.

Warren Isham, Esq., Detroit, Mich.—Michigan Farmer 1853.

Charles Betts, Esq., Detroit, Mich.—Horticultural Gazette 1853.

John S. Wright, Esq., Chicago, Ill.—The Prairie Farmer 1853.

Mark Miller, Esq., Janesville.—Wisconsin Farmer 1853.

Prof. George Buckland, Toronto, C. W.—Canadian Agriculturist 1853.

John S. Warden, M.D. Cincinnatti, Ohio.—Western Horticultural Review 1853.

Hon. B. P. Johnson, Secretary, Albany, N. Y.—Journal of the New York State Agricultural Society 1853.

John C. Holmes, Esq., Secretary, Detroit, Mich.—Journal of the Michigan State Agricultural Society 1853.

John Favill, M. D., Madison.—The Home Journal 1853.

Robinson & Brother, Green Bay.—Green Bay Advocate 1853.

Samuel Ryan, Esq., Appleton.—Appleton Crescent 1853.

Royal Buck, Esq., Fond du Lac.—Fountain City Herald 1853.

George Burnside & Co., Oshkosh.—Oshkosh Democrat 1853.

Flavius J. Mills, Esq., Sheboygan.—Lake Journal 1853.

J. H. Wells, Esq., Berlin.—Marquette Mercury 1853.

R. A. Bird, Esq., Ozaukee.—Ozaukee County Times 1853.

Rufus King & Co., Milwaukee.—Daily Sentinel 1853.

William E. Cramer, Esq., Milwaukee.—Daily Wisconsin 1853.

S. M. Booth, Esq., Milwaukee.—Daily Free Democrat 1853.

C. Clement, Esq., Racine.—Racine Advocate 1853.

George H. Paul, Esq., Kenosha.—Kenosha Democrat 1853.

Minor & Skinner, Watertown.—Watertown Chronicle 1853.

E. B. Quiner, Esq., Watertown.—State Register 1853.

H. D. Barron, Esq., Waukesha.—Waukesha Chronotype 1853.

Beriah Brown, Esq., Madison.—Daily Argus and Democrat 1853.

David Atwood, Esq., Madison.—Daily State Journal 1853.

E. C. Hull, Esq., Beaver Dam.—Republican 1853.

Charles Billinghurst, Esq., Juneau.—Burr Oak 1853.

LETTER

From the Corresponding Secretary of the State Agricultural Society.

STATE AGRICULTURAL ROOMS,
MADISON, January 28th, 1854.

SIR—In accordance with the requirements of an Act entitled "An Act for the Encouragement of Agriculture and its kindred Arts in this State," approved April 2d, 1853, I have the honor herewith to transmit the Third Annual Report of the Wisconsin State Agricultural Society.

Very respectfully,
Your obedient Servant,
ALBERT C. INGHAM,
Corresponding Secretary.

To HIS EXCELLENCY WILLIAM A. BARSTOW,
Governor of the State of Wisconsin.

LEGISLATIVE.

STATE OF WISCONSIN,
IN SENATE, January 30th, 1854.

A Message from His Excellency the Governor was announced, and being received from the hands of his Private Secretary, GEORGE P. DELAPLAINE, Esq., was read as follows, to wit:

EXECUTIVE DEPARTMENT,
MADISON, January 30th, 1854.

To the Senate:

I have the honor herewith to transmit to you the Third Annual Report of the Wisconsin State Agricultural Society, embracing its operations for the year ending December 31st, 1853.

WILLIAM A. BARSTOW.

Whereupon the said Message and accompanying documents were referred to the Committee on Agriculture.

STATE OF WISCONSIN,
IN SENATE. March 28th, 1854.

Mr. REYMERT, from the Committee on Agriculture, reported the following Resolutions, which were considered and unanimously adopted, to wit:

RESOLVED BY THE SENATE (the Assembly concurring)—That the State Printer be directed to publish, immediately after the close of the present Session of the Legislature under the direction of the Secretary of the State Agricultural Society, twenty five hundred copies of the Transactions of the Wisconsin State Agricultural Society for 1853, of which five hundred and seventy copies shall be for the use of the Members of the Legislature and the State Officers, and the remainder for the Society, and that those for the Members of the Legislature be sent to them by the Secretary of State, in the same manner as the Session Laws.

RESOLVED FURTHER, (the Assembly concurring,) That the Secretary of the State Agricultural Society be and he is hereby authorized and directed to procure the binding of these Volumes in an uniform manner with the Volumes already issued, and to procure the engraving of thirteen Plates illustrative of the Grasses, &c., of Wisconsin, to accompany the same, provided that the cost of the said Engravings and Binding, shall not exceed the sum of forty five cents per volume.

(Attest) SAM. G. BUGH,
Chief Clerk of the Senate.

STATE OF WISCONSIN,
IN ASSEMBLY, March 29th, 1854.

The above and foregoing Resolutions were concurred in by the Assembly.

(Attest) THOS. McHUGH,
Chief Clerk of the Assembly.

TRANSACTIONS.

TRANSACTIONS

OF THE

WISCONSIN STATE AGRICULTURAL SOCIETY.

REPORT OF THE EXECUTIVE COMMITTEE FOR 1853.

To the Legislature of the State of Wisconsin:

The Executive Committee of the Wisconsin State Agricultural Society, pursuant to the requirements of the "Act for the Encouragement of Agriculture and its kindred Arts in this State," would respectfully report:

That the advancement of Agricultural Science and Improvement throughout the State during the past year has been highly gratifying. A spirit of emulation has been excited among our farmers generally which promises the most happy results. Many new and important improvements have been introduced, theories tested, and practical truths developed, all tending to widen the range of present defective experimental knowledge and to increase and diffuse exact and reliable information upon the great fundamental principles which lie at the base of agricultural progression.

One of the chief difficulties incident to the settlement and cultivation of a new country is the lack of knowledge as to what productions are best adapted to its climate and best fitted for its virgin soil. This information is only to be obtained from experience—and this to be effective must be a recorded experience—an accumulation of facts preserved from year to year, in a form accessible for reference and filled for general distribution, so that each cultivator of the soil may have before him, to govern his action, all the light which the experience of others in the same department has thrown upon the subject. The accumulation of such information, in a form fitted for preservation, is the chief aim of this Society; and the amount thus early obtained from the liberality and intelligence of our agriculturists, and through the wise forethought of the State as displayed in aiding the effort, cannot but afford matter of congratulation to all who have at heart the best interests of Wisconsin.

The prejudice which has sometimes prevailed against the use of knowledge thus obtained, often alluded to as mere "*book farming*," is fast moving away before the light of experience and universal education; and it is now generally understood and admitted that those who deride such information are none the worse off for its existence, while those who adopt and act from it are taking the lead in the acquirement and enjoyment of permanent and substantial agricultural prosperity. The information thus accumulated and preserved in the present is but the basis for the new discoveries and more enlarged conceptions of the future. The aid of scientific research, of labor-saving machinery, and of experimental knowledge, rightly applied, is fast elevating the profession of agriculture to that nobility which is its due; and we may confidently anticipate a time when, with increasing density of population, its peaceful pursuits will be regarded as among the most intellectual, when its drudgeries performed, in great part, by skilful mechanism, and when the happy results of well-conceived and successful experiments shall have conferred upon mankind new and increased means of happiness, elevating him to that higher and nobler destiny for which he was originally intended.

To hasten this result has been the special object had in view during the labors of the Society for the past year; and it is not without congratulation that the members of the Executive Committee review the operations of that time.

The third Annual Cattle Show and Fair of the Society was held at the city of Watertown on the fourth, fifth, sixth and seventh days of October, 1853. The grounds selected for the occasion were situated upon the west side and immediately adjacent to Rock River, commanding a fine view of the rapidly growing city, with its water power, mills and factories, its fine business blocks and its neat and tasteful dwellings, surrounded, as a gem, with a setting of native forests, rich with the varied hues of autumn, and broken here and there by the busy hand of improvement.

Six acres were enclosed with a high board fence, within which were ranged the various enclosures for horses, neat cattle, swine and poultry; while upon the more elevated ground in the centre were pitched the three large and commodious tents of the Society, gaily decorated with flags and streamers. Arranged about these was ample space for the display of the various agricultural implements and mechanical devices, while scattered about the grounds were groups of fine old oaks, adding beauty to the scene and refreshment to the visitors.

The weather throughout was fine, the sky clear, and the air mild. The attendance was large, and was estimated at ten thousand persons. The display, though not so large as in the previous year, when the Fair was held in the vicinity of the city of Milwaukee, was yet large in view of the location, and was entirely satisfactory.

In some of the departments, especially in that of Fruit, the show far outran the expectations of the most sanguine, and abundantly demonstrated the capability of Wisconsin to take rank among the first of the fruit growing States.

Taken as a whole, the Fair was eminently successful, and as shadowing the capabilities of our State in its infancy, it gave great promise of more than abundance in its matured years. One thing was especially noticeable, and that was, the quiet and good order that reigned throughout the whole scene.

In the other departments of the Society's labors the Committee feel that much cause for gratulation exists. The library of the Society has been increased, and arrangements are now in progress of completion which will add greatly to its value. These arrangements, without doubt, will be completed during the coming year, and the Society will then have in its own possession, most of the standard Works upon Agriculture and its kindred Sciences.

The Correspondence of the Society has steadily increased in extent and value, and among its results the Committee may name the papers accompanying this report. Some of these papers are works of no ordinary character, and works in which we, as citizens, may well feel a pride; a pride that we have citizens able and willing to prepare such papers, and a pride that we have a Society which thus early has, by inducing their preparation, shows its desire and its power to accomplish something beyond the beaten track of regular duty, and which not content with diffusing science, seeks also to develop new facts and to increase the stores of knowledge already opened to man.

The finances of the Society are in a sound condition, as will be seen by the report of the Treasurer, submitted among the accompanying papers. The expenditures made during the year were such only as were demanded by actual necessity, and such as could not be dispensed with. This is the most difficult part in the whole management of the Society's affairs, since the Committee are constantly reminded of the necessity for great economy, and this often while the opportunity for accomplishing much good is apparently within their reach, but which they are compelled to forego by the necessities of the case.

In conclusion, the Committee desire to tender their thanks to their fellow members of the Society for the kindness with which their labors have been met, and to assure them that no efforts on their part shall be wanting to aid their successors in the arduous duties they are about to undertake. Into their hands the members of the Executive Committee commit the Society, with a fervent wish that its past may be but a type of its future, or rather that its future may far transcend what its past has promised.

There is one fact of cheering import in regard to our population, and upon which high hopes may well be founded—it is that the great mass are young, or, at most, middle-aged men—men who, thrown together from all climes and conditions, are wedded to no prejudices that are not easily overthrown, and who, finding themselves in a new country, with a soil whose qualities are almost untried—a climate as yet but little understood, are impelled almost by necessity to break away from the fetters of mere mechanical effort, and to embark in a wide range of experiments to test the capacity of their adopted country for new or improved agricultural productions. This condition of things cannot but prove highly favorable in its ultimate results. Every successful experiment is an advance—a positive advance—in the acquisition of useful knowledge, and from these experiments we have much to expect. But to be valuable, the experiment need not of necessity be successful—so long as truth is aimed at, and so long as new conclusions are determined, so long is the experiment of value.

In conclusion, the Committee again congratulate the Society upon the success which has thus far attended its exertions, and again give the assurance of their abiding interest in its well being.

On behalf of the Executive Committee,

Respectfully submitted,

ALBERT C. INGHAM,

Corresponding Secretary.

MADISON, January, 1854.

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ANNUAL ADDRESS.

The Society was called to order at three o'clock P. M., on Friday, October 7th, A. D. 1853, being the last day of the Fair, by Hon. ELISHA W. EDGERTON, President, and after prayer by the Rev. MELANCTHON HOYT, of Watertown, the President arose and addressed the Society as follows:

Gentlemen of the Wisconsin State Agricultural Society:

We have great reason to congratulate ourselves on the establishment of the State Agricultural Society, and on the results flowing from its labors as evinced in these our Annual Exhibitions, regulated by a wise and judicious mode of action, and fostering a proper spirit of emulation to excel among the farmers and mechanics of our State. And not only to the agriculturist and the mechanic do our efforts of encouragement extend, but to the producer in every class of industrial labor, and also to the artist and to the lover of the fine arts; all, may here find a due appreciation of their works, whether of genius, of beauty, or of utility.

The great improvement which is so apparent in the various breeds of stock throughout our State gives us ample proof that the energies of our citizens in this department have been well directed; and from what we have seen, we may well believe that Wisconsin can now safely compete with her sister States in an exhibition of Horses, of Cattle, of Sheep, of Swine, or even of Poultry. This result we may, without assumption, attribute in a great measure to the efforts and operations of this Society, gathering together as it does, in an Annual Exhibition, the producers from all parts of the State, and affording an opportunity for mutual examinations of products, for comparison of qualities, and for interchange of experience, all tending to advancement and permanent progression. That such results may ever accompany the action of the State Agricultural Society is our fervent wish, and our efforts shall ever be directed towards the attainment of that end.

We should be ungrateful to a beneficent Providence if on such an occasion as the present, we should fail in expressing our feelings of deep gratitude for the abundant products of our harvests, and the continuance of the blessings of health which have distinguished our favored State during the present year. The rich reward of labor that has been so bounteously bestowed upon the farmer, and the increased product of the farm-yard, and the work-shop, as evinced by the contemplation of our Annual Exhibition, foreshadow the increasing greatness and prosperity of Wisconsin, and demands our heartfelt thanks to the All-Wise Giver of every earthly gift.

Permit me, Gentlemen of the Society, to repeat to you my warm congratulations on the occasion of our meeting at this, our Third Annual Cattle Show and Fair, and to express the hope that each year will add increased value to the beneficial effects of our Society. The power to do good in our department is certainly with us—let us not neglect the opportunity, but faithfully endeavor to do our duty and great will be our reward.

The President, in concluding, introduced to the Society Gen. William Rudolph Smith, of Mineral Point, who pronounced the Annual Address.*

ADDRESS OF GEN. WILLIAM R. SMITH.

It is certainly much to be regretted, my respected audience, that the gentleman to whom was assigned the province of delivering before you, on the part of our Society, the Annual Address, has been by unforeseen circumstances prevented from fulfilling his task. The absence of this address not only causes a void in our expectations, but deprives us of the benefits which would naturally flow from an exposition of the design, uses, and the results of the establishment of our State Agricultural Society.

Called upon, assuredly to me, unexpectedly, to supply an unfortunate deficiency in the proceedings of our Annual State Fair, by addressing to our very numerous friends now present, a few remarks pertinent to the occasion, I comply cheerfully, crude as those remarks may be

* The gentleman who was expected to have delivered the Annual Address was unfortunately detained, and from unavoidable causes prevented from being present.

considered; I sincerely hope that much of novelty, or of great interest, is not expected from me.

On similar occasions apologies are often made; sometimes they become necessary, and the trite one, that there is a want of the custom of public speaking, in the individual called on, may justly be resorted to; I do not say that such is the case with myself, but even if it were, surrounded as we now are by the products of the industry of our fellow-citizens in the various branches of domestic economy, agriculture, arts and mechanics, there are abundant themes to elicit observations which might be interesting when delivered by the most inexperienced person in addressing an audience, amply sufficient to call forth eloquence, to which I, by no means pretend.

We have before us the productions of the plough, the loom, and the anvil: the three great sources of the wealth of nations; and we may in all truth say, that young as we are in Wisconsin, in comparison with our sister States, we have already given good testimony of our industry, enterprise, and desire to improve all the advantages which our highly favored land presents to us.

I say our *favored* land—well may it so be called; throughout the wide extent of our country, there is no portion that more forcibly exhibits the beneficence of God to his creatures, in their dwelling places on earth, than Wisconsin. Our soil rich and productive; our climate pleasant and healthy; the country teeming with mineral wealth; the means of commercial intercourse perhaps unequalled, certainly unsurpassed by those of any State in the Union; we have abundant reason to rejoice that we have chosen Wisconsin as our home, the scene of our labors, the fruitful source of our prosperity.

The cultivation of the soil is the base of this prosperity; its productions supply the *materiel* on which is expended all the labor and ingenuity of man for the demands of luxury as well as of necessity. We all feel the value of the social elevation of the human race; if it were possible for man to be content in a solitary life, his wants would be few, capable of being supplied by himself, and confined to the bare support of animal existence. The formation of the social system necessarily brought with it new wants in its members, and created new fields for labor; to the actual were soon added the ideal wants, and luxury kept equal pace with necessity, in their demands on the industry of man. Arts and Sciences sprang into existence in proportion with the improvement of the social system, and its advancement from rudeness to order and beauty. The mechanic and the architect, the sculptor and the painter, were found in their several vocati ns, but no longer as mere tillers of the soil; the multiplicity of wants required by society, caused a division of labor, and a classification of the industrial hives from the cultivator of the ground, the producer of the indispensible, the support of human life, up through every branch of the mechanical arts, and the liberal sciences, to the mere student and lover of literature. Most valuable and honored in this classification appears the subduer of the soil.

The teeming mother of all wealth is the earth; all the absolute necessaries of life; all the luxuries that a refined state of society may demand in decorating the person or the property of man, spring from, or are nourished by, the earth. From the trees of the forest has been fashioned as well the rude wooden dibble by which man first broke the soil, to enable him to raise an esculent or a grain, as the highly improved plow and cultivator of the present day. From the forest came the material from which man contrived a primitive bench and a rough table; the same material now furnishes us the most splendid specimens of the mechanic's and the sculptor's art. From the rough cabin of unhewed timber to the splendid palace; from the hollowed log canoe to the majestic ship of commerce, from the plainest wooden trencher, or other necessary utensil, to the most elaborate specimen of the carver's taste, and the cabinet maker's ingenuity earth produces, and man the artificer improves.

Let us view this mother of wealth in another aspect; man may cease for a moment to till the earth for his daily sustenance; the division of labor has caused this lot to be cast upon other working conscripts; but man still explores his mother earth, and she produces to him, and for his use, the all-necessary and useful, as well as the precious and ornamental metals. From the bowels of the earth man digs and produces the ore, whose manufacture enables him to subdue the forest to his handiwork, to construct his articles of necessity in all his pursuits in life, and his objects of luxury and refinement, by which that life is rendered more easy and agreeable. By this ore he is enabled to journey with the speed of the wind, to annihilate time and space in the communication of his thoughts, and to disarm the thunder cloud of its terrors; in both cases the agent being the same, but in the one being advantageously used and in the other scientifically subdued. For all the uses to which iron, lead, copper, tin and zinc, with other inferior metals, may be put in the ingenuity of man, he is ever indebted to mother earth, and although less precious in their capacity to supply the wants of man, yet of great and altogether essential value as a medium in commerce, and a representative of value—man receives from earth her abundant products of silver and gold.

Is this all that earth exhibits as bountiful presents to the laborer and producer? far from it—earth has ever in her bosom exhaustless stores of that mineral which supplies fuel to the smelting furnace, and the household hearth, and puts in motion the steamship and the railroad caravan. This treasure of black-stones is not surpassed in its practical value even by the myriads of diamonds and other precious stones, which from time to time has been and yet may be given to the research of man. In a word, whether we look to earth as the bounteous source of our means of subsistence and the preservation of life, or as the great producer of all that renders life replete with pleasures, amenities and luxuries, we are bound to respect the laborer and the cultivator in the first place; and second only to them, the mechanic, the manufacturer, and the artist.

The riches of the earth are distributed with a lavish hand in our beautiful land of Wisconsin; they merely require the careful gathering, and their proper use and improvement, to ensure the prosperous condition of a happy and contented community. How we have endeavored to improve the advantages presented to us, the present assemblage of citizens, the occasion which brings them together, and the products of industry and art which they exhibit to each other, in praise-worthy emulation, may well furnish the answer. The State Agricultural Society has now held its three first Annual Fairs and Exhibitions of the productions of the soil, the results of industrial labor in the mechanical arts, and particularly in the improvement of the breed of all domestic animals. We may well be proud of the fine display around us of the improved stock of cattle, sheep and swine, more particularly may we boast of the specimens of the noble animal, the horse, which are annually displayed on our grounds; breeds for the draught, the turf, and the saddle. Look at our esculent plants, our fruits, and above, all our cereal grains; can they be surpassed in their excellent qualities in any part of our country? We think not; and these do not only bear their own evidence of the value of our soil and the industry of our producers, but they speak volumes in favor of the Institution of which we are proud to be members.

In the mechanical department, and in works of the liberal arts, we have an excellent display; in all the latest improvements in agricultural implements, and labor saving machinery, Wisconsin may well compete with her sister States, not only in their manufacture but also in their use. In fine, we may congratulate the Officers and Members of the Society that their efforts have hitherto been rewarded with every reasonable measure of success; long may such results continue, as the best stimulants to future exertions.

One word as to ourselves, as citizens of Wisconsin. We boast of our land, of its beauty, of its salubrity, of its fertility; we point out to the stranger who visits us, our infant State already chequered with railroads, and traversed with the wires of the telegraph; but above all, we proudly designate as the most distinguishing feature in our social and political system of government, our noble and magnificently endowed school system—a system of public education which if conducted and practised upon, in the true spirit and meaning of its design, will ever continue to be the foundation of the correct moral conduct of our future citizens, the source of their intellectual happiness, and the safeguard of their liberties as freemen. In the old world, the laborer and the schoolmaster are almost strangers to each other; such is the hard condition of poverty! With us, how different is the case with the rising generation, in every class and condition of life! the means of education are in the reach of all! Forever cherished, forever honored be the educational system of Wisconsin; ever protected, ever respected be the industrious tillers of its soil, and the active producers of its wealth.

WISCONSIN STATE AGRICULTURAL SOCIETY.

REPORTS OF COMMITTEES AND AWARDS OF PREMIUMS

Made at the Third Annual Cattle Show and Fair of the Society, held at the City of Watertown, on Tuesday, Wednesday, Thursday and Friday, 4th, 5th, 6th and 7th days of October, 1853.

CATTLE.—No. of Entries, 52.

Judges—S. Pearl Lathrop, M. D., Beloit; Martin Webster, Fox Lake; Baxter R. Colvin, Madison; Geo. Paddock, Milwaukee; Benjamin Ferguson, Fox Lake; J. Cory, Bachelor's Grove.

Best Devon bull (Sir Richard) four years old; Geo. W. Green, Beaver Dam, Diploma, and $5.

"Sir Richard was bred by Messrs. S. & L. Hurlburt, Winchester, Conn. He was got by Pioneer, out of Lady of the Lake, both thorough bred animals."

Best Devon bull (Dan) two years old; Martin Webster, Fox Lake. $5.

Second best Short Horn bull, four years old; Jas. McGorty, Eureka. $5.

Second best Short Horn bull, one year old; Wm. Harsh, Milford. $3.

Best cross bull (Colonel) three years old; Florus B. Cook, Johnstown. Diploma and $5.

"Colonel was got by a full blood Devon bull out of a full blood short horn cow."

Discretionary native bull, three years old; Rufus Laberee, Watertown. $2.

Discretionary grade bull, three years old. D. M. Aspinwall, Farmington. $2.

Second best native bull, two years old; William Knight, Black Hawk. $3.

Best bull calf (Major) six months old; Florus B. Cook, Johnstown. $3.

"Major was got by the imported short horn bull Rocket, who was got by Young Rocket by Currency; Currency was out of Venus by Cadmus; his dam was got by Moses."

Best native cow (Rosé) three years old; Hiram E. Coon, Palmyra. Diploma and $5.

Second best native cow, seven years old; William Knight, Black Hawk, $5.

Best grade heifer, nine months old; William Knight, Black Hawk. $3.

Best grade heifer (Jenny) two years old; Florus B. Cook, Johnstown. $5.

Best yoke working oxen, nine years old; John T. Bailey, Watertown. Diploma and $5.

Second best yoke working oxen, seven years old; Luther A. Cole, Watertown. $5.

Best yoke steers, three years old; William Jones, Watertown. $3.

Best yoke steers, two years old; Robert Crangle, Watertown. $2.

Best yoke steers, one year old; Solon Hall, Concord. $2.

Letter from the Chairman of the Committee:

"Beloit College, Dec. 25th, 1853.

"Dear Sir,

"It is with pleasure that I avail myself of your invitation to accompany the Committee's report on cattle with such remarks as the occasion seems to suggest, and the importance of the subject to require.

"Few subjects, at the present, more concern the interest of Wisconsin husbandry than the improvement of our cattle. Enjoying, as we do, facilities which are equal to most, and superior to many, of the States in our rich and extended prairies, furnishing us an abundance of pasturage; and by our extensive inland seas, and the already and soon to be completed railroads, giving us easy access to market, our State should soon rank with the first in the quantity and quality of its cattle.

"In the present demand for cattle, both for butchering and exportation, and in the circumstances which give surety of its permanency, our farmers have every inducement to direct their attention to the subject.

"With regard to the exhibition of cattle at the last State Fair, your committee had occasion to regret the smallness of the number of animals exhibited. They the more deeply regret this, as they are sure, that the representation ought not to be taken as a fair index of the interest felt throughout the State in the improvement of our stock. The cattle presented, however, without doubt, quite fairly represent the character and condition of the cattle of Wisconsin. It may not always be well that *only* the *best* of our cattle are exhibited on such occasions, if those which are not worthy of commendation receive their proper condemnation, or are assigned their proper place according to the opinion of the judges, while those which are worthy of commendation receive their just meed of praise.

"Out of the number of cattle exhibited—about fifty in all—there were some six or eight of different degrees of merit, from those which dwelt in the region of doubt whether or not they should be encouraged under the present demand for good cattle, to impress their own characteristics upon future generations, to those which were well worthy of serving in the important capacity of propagators of the race.

"Of this latter class your committee deem it proper to speak more particularly. We would commend to the examination of those who feel an interest in cattle breeding, a Devon bull, four years old, exhibited Judge Geo. W. Greene, of Beaver Dam; also a Devon bull, two years old, exhibited by Martin Webster, Esq., of Fox Lake. These two animals are own brothers, and exhibit to a good degree the surety and permanency of the peculiar points of a thorough-bred animal. They would also commend a full-blood Durham bull, exhibited by James McGorty, of Eureka. This animal is four years old and weighs 1830 lbs., presenting several of the good points of this particular breed, without, however, the perfection characteristic of most pure bloods. There was also a one year old bull presented by William Harsh, of Milford, which exhibited many of the excellencies of the Durham blood. A bull, a cross of the Durham and Devon, exhibited by F. B. Cook, of Johnstown, was a remarkable combination of some of the good points of both. Mr. Cook also exhibited a heifer of much merit. A pretty good cow, three years old, was exhibited by H. E. Coon, of Palmyra. The remaining animals, with the exception, perhaps, of two calves, your committee feel in duty bound, in justice to the high standard which should control the breeding of cattle among us, to recommend to the yoke and the shambles.

"It is quite manifest from the prevailing character of the cattle exhibited, that the points which go to make up the best animal, either for the yoke, dairy, or butcher's stall, are not generally known, at least are not sufficiently appreciated and regarded by those who are raising cattle, to stimulate them to make the requisite efforts to improve their stock. Too many inferior animals are suffered to run at large as bulls, and few farmers are sufficiently careful that their cows, and those of a select character, are served only by such males as are possessed of merit, and peculiarly adapted to breed well with them. This evil will doubtless continue, to a greater or less extent, while our present system of pasturing in common upon our open prairies continues. It is to be hoped that as the balance of our lands are enclosed, by those settling upon them, and are converted into farms, more attention will be paid to the improvement of cattle.

"A matter of much importance to the farmers in the present state of cattle culture among us, is the selection of good animals of the most improved breeds, from which to raise a stock of decided merit; what the breed shall be, depends upon the end sought to be obtained.

"There are three of these ends which should be kept prominently and distinctly before the minds of our cattle breeders—animals fitted for the yoke by their strength of bone and muscle, their power of endurance, their sprightliness of movement, their beauty of form and color—animals for the butcher's stall possessing early maturity, readiness to fatten, and surpassing in the quality of their flesh—and animals for the dairy, easy to be kept, gentle to handle, and which furnish an abundance of rich creamy milk. To the attainment of the first of these ends, we regard the Devons as being without a rival. They are beautiful cattle, of medium size, of deep red color, with rich yellow noses, the tip of the tail white, and their horns long and gracefully curved. To the attainment of the second of these ends, the Durhams and Herefords will contend with nearly equal claims for the honor. The former are heavy cattle, arrive early at maturity, fatten easily, and their flesh is beautifully marbled with fat; the latter are inferior, perhaps only in size, come to maturity early, are good and quick feeders, and their flesh of excellent quality. For the attainment of the last end, the Ayrshires and the varieties from the islands of the English channel, such as the Alderneys, Guernseys and Jerseys, together with our natives, will offer, according to the fancy of different individuals, their different values. If we were to recommend any one breed, which promises best to meet all these ends, or an animal for all work, (as we say of the horse), we should put first on the list the improved Short Horned Durham. This breed, in its dignity of form, early maturity, readiness to fatten, generally good milking property, seems to be indicated as the breed, if *one alone* is to be chosen, for the farmers of Wisconsin. We would not, however, recommend to our farmers, as a whole, any one breed exclusively, believing that the ends of cattle culture can be the most perfectly attained by a selection of different breeds for different purposes. The law of perfection by division of labor, so effective in mechanics, is equally applicable in this department of industry.

"Permit us to call the attention of our farmers to some other points which do not seem to be sufficiently understood; and first, the *terms* used to characterize the different ranks in the several divisions of Durhams, Devons, Ayrshires, &c., such as *thorough-bred, pure-blood,* and *full-blood.* The first two of these terms, signifying the same thing, are understood by good breeders of cattle to belong *alone* to animals of either of the above divisions which have NO MIXTURE of blood. A pure blood or thorough bred Durham has all and *only* Durham blood—and so of the other divisions. But the term *full-blood* is applied to animals of any of the above divisions which have three-fourths and upwards to any degree short of pure blood, of the blood of the division to which it belongs. All others, with a less fraction than three-fourths, are called *grades* and *crosses.*

"We would call your attention to the importance of the Society's early having some established standard by which to judge of cattle; in other words, a scale of *good points,* to the attaining of which it is desirable that our breeders of cattle should direct their efforts. This should be published with the *numerical* value of each point attached to it, that all may know what constitutes a perfect animal of the different breeds, in the estimation of the Society. The influence of such a standard could but be great and beneficial.

"Another point we would earnestly urge upon the consideration of our farmers: it is a better system of feeding and sheltering their stock. This is true culture. We say *system,* for the manner of doing it should be so arranged and prosecuted as not to violate important physiological principles, but we should avail ourselves of them for the easiest and cheapest attainment of the desired end, viz., perfect animals.

"A better system of breeding should be introduced and closely adhered to. In the first place, it is important that we should get distinctly before our minds a just conception of the animal we wish to produce—in other words—to know just what are its points. Then we have a pattern, in the mechanic's phrase, to work by. We are then prepared to select the animals from which to breed. These should possess, in the greatest number and perfection possible, the desired points, remembering that it is generally safer to breed from a *comparatively* inferior animal from a well bred herd of established pedigree throughout the ramifications of sire and dam, than from an *accidental* good one from an inferior herd or one of questionable reputation.

"In coupling these animals the imperfections of one should be matched by perfect points in the corresponding parts of the other.

"Guided by these and other principles which will readily suggest themselves to every thinking farmer, our exhibitions of cattle will be constantly improving from year to year, and we shall soon have occasion to be proud of our success and the character of our stock.

"These remarks have been extended to a greater length than was anticipated, yet there is much of importance left unsaid. Permit me to refer the reader to the monthly numbers of the Wisconsin and Iowa Farmer for the year 1854, where the subject will be found treated of more fully.

"We shall have accomplished our object in this communication, if we but succeed in impressing the importance of the subject upon the minds of our farmers.

Very truly yours,

S. P. Lathrop, M. D.

Chairman of the Committee on Cattle.

To Albert C. Ingham, Esq.,

Sec. of the Wis. State Agr. Society.

STALLIONS.—No. of Entries, 28.

Judges—Geo. O. Tiffany, Milwaukee; B. R. Hinkley, Summit; William H. Howard, Janesville.

Best stallion over four years of age (Badger Boy); A. F. Pratt, Waukesha. Certificate.

The first premium of the Society, having been awarded to Badger Boy at Milwaukee in 1852, and the same premium having been awarded to him the present year, under the rules of the Society, a certificate setting forth these facts was given to his owner.

For his pedigree reference is made to Vol. II of the Transactions of this Society. A. C. I.

Second best stallion over four years of age (Grand Turk); Daniel Blodgett, Beloit. $5.

Best stallion three years old (Young Yorkshire Morgan); Nelson Fryer, Cold Spring. $5.

Second best stallion three years old (Sir Henry); G. W. Williams, Oconomowoc. $3.

Best stallion two years old (Young Badger); Jared Patrick, Delafield. $3.

Second best stallion two years old (Rosendale); Bertine Pinkney, Rosendale. $1.

Discretionary premium (Sir Henry) five years old; G. O. Gunn, Beaver Dam. $3.

Discretionary premium (Vermont Morgan); T. J. Wood, Baraboo. Vol. Trans.

Discretionary premium (Sir Henry) seven years old; R. Caldwell, Oak Grove. Vol. Trans.

Discretionary premium (Turk Lion) four years old; Daniel Blodgett, Beloit. Vol. Trans.

Discretionary premium (Kentucky Hunter) six years old; L. Ferguson, Pierceville. Vol. Trans.

Discretionary premium (Old Sir Henry) sixteen years old; William Hobkirk, Waupun. Vol. Trans.

The committee in their report remark:

"In making decisions upon the relative merits of the horses presented for our inspection, we have awarded, in all cases, the first premium to the horse which possessed the greatest combination of speed, strength and action, believing that these qualities, when united with good anatomical conformation and proper nervous energy, compose the perfect animal of that species. The horses designated by us as, in our opinion, entitled to the premiums as offered, we consider possessed of the above qualities in an eminent degree; and while upon this subject we cannot refrain from expressing our very favorable opinion of Badger Boy, as a horse well worthy the attention of breeders of the road horse, as a native of our State and as a horse uniting *beauty, strength* and *speed,* superior to anything else presented for examination.

"We would also commend to the attention of the Executive Committee, as worthy of a discretionary premium, the grey stallion Vermont Morgan, owned by T. J. Wood, Esq., of Baraboo, which was exhibited to us while in the discharge of our duties, although not for premium, to our regret. We consider him superior to any other stallion here except the Badger Boy, in all those requisites which, in our opinion, constitute a perfect horse.

"Having performed a difficult and undesirable office conscientiously, and as we believe justly and fairly, we close our labors by submitting the above."

MATCHED, DRAFT AND SINGLE HORSES.—No. of Entries, 27.

Judges—William S. Turner, Watertown; Daniel Blodgett, Beloit; William Hobkirk, Waupun.

Best pair of matched horses; Isaac Howland, Janesville. Diploma and $5.

Second best pair of matched horses; Robert Fargo, Lake Mills. $5.

Best pair of draft horses; C. R. Taylor, Berlin. Diploma and $5.

Second best pair of draft horses; J. H. Woodruff, Fisk's Corners. $5.

Best gelding; Isaac Howland, Janesville. Diploma.

Second best gelding; W. W. Robinson, Ripon. $3.

Best mare, seven years old; H. W. Bronson, Lake Mills. Diploma.

Second best mare, eight years old; Jacob Weitzel, Brookfield. **$3.**

Best mare, four years old; W. C. Spaulding, Watertown. **Diploma.**

Second best mare, four years old; P. Hardin, Watertown. **$3.**

Best mare, two years old; H. W. Bronson, Lake Mills. **$3.**

Best pair of mules; N. B. Clapp, Kenosha. **$5.**

Mr. Hobkirk accompanies the report with the following remarks:

"In my estimation there is too little attention paid to the procuring of good brood mares. The horse is rightly called the noblest animal in the service of man, for though there are others of the brute creation whose carcasses are of infinitely greater value as food and as material for the manufacture of articles of daily use, it is the strength and sagacity of the horse that enables the farmer to perform with facility, many of the most important operations of agriculture, to say nothing of other and innumerable spheres where the labor of the horse, his patience, docility and aptness are brought into requisition.

"The number of horses in the United States, according to the most recent computations, is 4,325,652. The breeding has been so promiscuously carried on, and with so little regard to correct and scientific principles or rules, that the number of varieties is almost past computation. Some of these varieties, especially trotting horses and roadsters, are seldom surpassed in any country. One of the most important elements of success lies in the proper choice of brood mares. Never breed from a mare that is not well bred. By well bred, I do not mean having many crosses of blood, for many mares nearly and even quite thorough bred are very undesirable animals to breed from. In the true sense of the word, a well bred mare is one whose progenitors for many generations back have been carefully selected. The object should be to produce colts of an ambitious character and of good size, then if they should be unfit for fast work, they can at least do their share of labor on the farm. I know of no better test of success than this, viz: that the colt when it has lost a portion of its conventional value, should still retain its real usefulness. Always make strong, well-set forelegs a primary object. They should be placed forward so as to be an efficient support to the animal, and the shoulder ought to stand backwards in order to allow the legs liberty of action. The shoulder should be somewhat round and full, not thin and confined as many imagine. Never breed from either mare or stallion with a decidedly bad shoulder. An animal may dispense with almost every other point of excellence and yet be of some value, but if it has a bad shoulder it bears so thoroughly the stamp of worthlessness, that nothing else can make amends for that fundamental malformation. If your mare is tolerable in her shoulder but not very good, endeavor to find a stallion particularly excellent in this respect.

"The forelegs and shoulders being right, action usually follows; but this being a very important point do not take it for granted, but subject the matter to your strictest scrutiny. For my own part, I think so much of action in a horse, that the most fabulous combinations of beauty, breeding, temper and shape, would not induce me to buy one that did not possess this quality. It may be laid down as a general rule, that the horse ought, if possible, to be a better animal than the mare. Then there is the difficulty, even when a horse of tried excellence is found, of discovering whether his points and his blood are suited to the mare. The art and science of breeding first rate horses is not to be mastered without much thought, trouble and research. There is no royal road to it.

"He who wishes, in spite of every obstacle, to attain golden results, must adopt a course entirely antagonistical to the too common one of putting some mare, because he happens to have her, to some horse because he happens to come into his yard. He must never breed from a bad mare or a bad horse, nor must he grudge a few dollars spent in securing the best of either sex within his reach. A judicious outlay of capital will here assuredly not fail to reap the reward which has attended the improvement of every other description of stock."

LONG AND MIDDLE WOOL SHEEP.—No. of Entries, 11.

Judges—Allen H. Atwater, Oak Grove; Ebenezer Brigham, Blue Mounds; Stephen Moore, Watertown.

Best South Down buck, over two years old; N. B. Clapp, Kenosha. $4.
Best Leicester buck, under two years old; N. B. Clapp, Kenosha. $3.
Best three buck Lambs (South Down); N. B. Clapp, Kenosha. $3.
Best three Ewes (South Down); N. B. Clapp, Kenosha. $4.
Best three Ewe Lambs (South Down); N. B. Clapp, Kenosha. $3.

The Committee in their report remark:

"That the Leicester buck exhibited by Mr. Clapp is of fine size and perfect symmetry. They also speak of his South Downs as a breed of Sheep well worthy the attention of the farmers of Wisconsin, believing the profits of the farmer would be much greater if this breed was more generally introduced. Mr. Clapp's South Downs they regard as the best they have ever seen.

N. B. Clapp's Statement:

"Kenosha, February 16th, 1854.

"Dear Sir,

"You request me to furnish you with a statement of the general management of my flock, both in summer and winter, and my opinion as to the kind of sheep most profitable to the farmers of Wisconsin. For my views on the general management of sheep, I will refer you to my letter to you on that subject, dated December 27th, 1851, and published in the Transactions of the Wisconsin State Agricultural Society for that year. At that time my flock consisted of 500 fine wooled sheep. At present I am keeping but twenty-four—eighteen thorough-bred South Downs and six thorough-bred Leicesters. My management of these, wherein it differs from that of my former flock, is as follows:

"My lambs are dropped the last of March, or the first of April. My reason for this is, that South Down and Leicester lambs are much more hardy and less liable to chill than my former flock, and my ewes have an abundance of milk for their offspring at that time; and as the demand for bucks is greater than I can supply, by this early dropping they are fit for service in the coming fall, particularly the South Downs, which mature early.

"Another reason is, that the South Downs are great milkers, and if allowed to go to grass some days before yeaning, with a great flow of milk, their udders frequently become inflamed and require much care and milking both before and for a few days after dropping. This last difficulty not unfrequently occurs with the Leicesters, though not as often as with the South Downs. I wean my lambs about the first of August, or when about four months old, as I think they do better to be taken from the ewes at that age. After weaning my lambs I am careful not to allow my ewes to get too fleshy, as they are liable to do if they have good rich grass. The disadvantage of a superabundance of flesh is, that ewes in this condition often become barren. The difficulty is more likely to occur with the South Downs than the Leicesters. I commenced my flock of South Downs in the fall of 1850, by the purchase of six lambs, five ewes, and one buck. They were from the flock of Leonard Sheaf, of New Hamburg, Dutchess county, N. Y., and since that time I have made several small purchases from the best flocks in New York, which State, I believe, stands first in the Union for carcass sheep. My Leicesters, I purchased in the fall of 1852, of Elias L. Barlow, of Dutchess county, N. Y., who, I think, has taken, in the last five years, more premiums for long-wooled sheep at the New York State Fairs and those of the American Institute, than any other man.

"In the summer I keep my sheep on grass, and in the winter on good hay, both breeds fareing alike to test their relative merits. For two weeks before dropping, I feed each one daily half a pint of oats, or an equal amount of nutriment in other grain. After lambing, I feed the ewes once a day with carrots, cut fine, to those having twins, and full half of my South Downs and one quarter of my Leicester ewes are thus blessed. I give, in addition, a pint of wheat bran mixed with water, till well wet, and if the lambs get too large before their mothers go to grass, I add a little oat, corn, or barley meal to the bran.

"I sheared last spring twelve South Down ewes that raised lambs, and their fleeces clean washed weighed thirty-five pounds. From a buck of the same breed, two years old, I clipped seven and one quarter pounds of clean wool. The lightest fleece of four Leicester ewes weighed four and three quarter pounds, and the heaviest seven and a quarter.

"In answer to your request for my opinion as to the most profitable kind of sheep for the Wisconsin farmer, I will give it to you frankly and freely, and my reasons for the same, allowing you to judge of their weight and force. From my letter referred to, you can see that I have had considerable experience in fine-wooled sheep in this State. In New York, for several years, I was well acquainted with the long-wooled breeds, and in this country I have had five years experience in South Downs. Taking into consideration keeping, wool, and carcass, I give the latter breed preference to all others I have kept.

"As in my former letter I gave you the character of fine-wooled sheep, in this I will describe as closely, as lies in my power, the habits, peculiarities and profits of the two kinds I am now breeding.

"The Leicesters are large, fine looking, long-wooled sheep, and good hardy keepers. The average clip per head of this breed is about five pounds. Their wool is mostly used for combing purposes, as none but long staple will answer for this end. From this are manufactured Delaines and cloths of a similar texture, and the increased market for such goods has caused the supply of long wool in the United States to fall short of the demand. The consequence is, that it is eagerly sought after, and although coarse, has, I think, during the past year, been quoted in the Eastern markets as high as one-half and three-quarters blood Merino.

"The wethers at three years old, with good keeping, will furnish per head, on an average, from eighty to one hundred and ten pounds of mutton—often more. I saw one last fall, the property of E. L. Barlow, that weighed on foot 326 ℔s. This weight would give 200 ℔s. dressed meat. I have never weighed any of mine, except a buck lamb whose weight last spring when 85 days old, was 75 ℔s. At the age of three or four years their carcasses are undoubtedly heavier than those of any other kind of sheep. This breed, more than any other I have ever kept, requires good shelter in the winter, as their wool is long, thin, and free from oil, and consequently easily cut, and the fleece once saturated, from its length, requires a long time to dry.

"The average weight per head of the clip of a good South Down flock is about four ℔s. This breed will keep in good condition on a less amount of food than any other sheep I have ever kept. They are very prolific, full half of my ewes as stated above, bringing in twins. The offspring are very hardy, and I can say that I have never lost a young South Down lamb. The ewes are great milkers and exceedingly fond of their young. With good feed, they will bring two lambs to a condition fit for the butcher in four months. In June last, I weighed a South Down lamb, 85 days old. His weight on foot was 79 ℔s—two pounds more than the Leciester I mentioned above, and his carcass I think would have exceeded the proportioned difference in weight, as he was fatter and better matured. When six months old my single South Downs will average ninety pounds, and the twins seventy-five pounds, each. Such will command in Chicago, at any time, four cents per ℔.

"The wool of this breed of sheep is of medium quality, and is rated as middle wool, that is, between fine and coarse. It sold last spring for forty-seven cents per pound. And by adding the value of the wool and the price that the lambs will command from the butcher, upon which market you can always depend, you can see that the return is a very good one. But there is another, and I think more profitable way, of disposing of your surplus buck lambs, after selling what you can as breeders. Castrate them when young, keep them well till two and a half years old, by which time they will have given you two heavy fleeces, and then you have an animal that will command in New York market from $8 to $16, which, as will be seen by the market reports, is a common price for sheep of this breed and age. Their flesh, by epicures and all others acquainted with it, is pronounced superior to any other mutton, and consequently is quoted at the highest rates. Their wool is of a quality that is well calculated for domestic use.

"The Leicesters also can be turned to a good advantage by fatting the wethers for the New York market. They require a year longer to mature than the South Downs, from three to four years being necessary. At such an age they will weigh more than their South Down brothers, and will have yielded three heavier fleeces, but their mutton will not command as high a price, and more feed is required to bring them to such a condition, as they do not take flesh as readily as the South Downs.

"By the market report in the New York Tribune of last week, I saw that a lot of sixteen half-blood South Down wethers were sold for $18 per head; and I know of no country better adapted to bringing sheep to such a condition and market value than Wisconsin. We have the soil and energy, and all we want is the right kind of sheep.

"From my own experience, I can say that sheep can be transported from this State to New York for $1 50 per head, as I shipped last year over 400 head for that market. But, before we can get such sheep ready for transportation to the East, our country will be full of buyers ready to take them off our hands.

"Where the long-wooled sheep are raised they are much sought after, and that too when fat fine-wooled sheep are abundant; the mutton of the latter being much inferior to both Leicesters and South Downs.

"Yours truly,

N. B. Clapp."

To Albert C. Ingham, Esq.,
Sec. of the Wis. State Agr. Society.

MERINOS.—No. of Entries, 40.

Judges.—George C. Pratt, Waukesha; Simeon Ford, Watertown; John J. McAllister, Albion, N. Y.

Best French buck two years old; McAllister & White, Albion, N. Y. $4.

Second best French buck two years old; G. H. Canfield, Summit. $2.

Best French buck one year old; Horace Scoville, Lowville. $3.

Best Spanish buck two years old; George Paddock, Waterville. $4.

Second best Spanish buck two years old; James B. Jessup, Summit. $2.

Best Spanish buck one year old; George Paddock, Waterville. $3.

Best pen of three Spanish buck lambs; Edgerton & McCarter, Summit. $3.

Second best pen of three Spanish buck lambs; John Ferre, Oconomowoc. $1.

Best pen of three Spanish ewes, two years old; Edgerton & McCarter, Summit. $3.

Second best pen of three Spanish ewes, two years old; Horace Scoville, Lowville. $1.

Best pen of three Spanish ewes, one year old; George Paddock, Waterville. $3.

Second best pen of three Spanish ewes, one year old; Elijah Perrin, Oconomowoc. $1.

Best pen of three Spanish ewe lambs; Edgerton & McCarter, Summit, $3.

J. J. McAllister's Statement.

"Gaines, Orleans Co., N. Y., January 24th, 1854.

"Dear Sir,

"I have been for several years more or less engaged in the breeding and management of sheep. Last season I had on my farm over two hundred and fifty ewes; thirty of which were Spanish Merinos, pure blood, and the residue one-half and three-fourths French Merinos crossed with Spanish. They all received the same treatment as to feed, care, &c.

"My flock of sheep was managed in the following manner, which is the method usually pursued by me, and which, from my experience, I consider the best:

"They are kept in good pasture during the summer, with pure water and salt accessible at all times.

"The lambs are separated from their dams about the first of August, after which they are kept by themselves. I commence feeding my lambs about the 1st of October with shorts and oats, mixed half-and-half. I I give about half a gill per head daily, to put them in a condition for winter.

"About the middle of October I commence feeding the ewes with the same mixture, giving about a gill per head daily. The feeding is continued to both lambs and ewes till brought to the barn for winter: then if the condition of the sheep requires it, I increase the feed to one and one-half gill per day. When brought to the barn for winter, I divide them into flocks of from fifty to seventy-five, putting together those of nearly the same condition. This I consider very essential, as it enables me to graduate my feed better, and to supply it to those that require the most. It also relieves the feebler sheep from the necessity of struggling with the stronger. Occasionally, if circumstances require, during the winter I take from the hardier flocks the feeble and place them with those of like condition. To the more feeble I feed *more* daily, and graduate the feed as circumstances require.

"I have my yard so arranged, that each flock can find shelter under good dry sheds at all times. I have two racks for each flock, each rack sufficient to feed the whole flock at once, one under shelter and the other in the open air, at which they can feed according as the weather is stormy or fair. My yards I keep as dry as possible, littering them both in the open yards and under the sheds with dry straw, as often as becomes necessary, as I consider it important that the earth should be kept dry under the feet of the sheep. I keep good pure water and salt accessible to each flock at all times. I feed to them as much good hay as they will eat, preferring pure clover.

"I commence serving my ewes the middle of November, and finish by the middle of December, which brings the lambs from the 15th of April to the 15th of May.

"About the first of April I commence feeding my breeding ewes with carrots, cut fine, and mixed with ground oats and shorts, in equal proportions; feeding in clean troughs, from one to one and one-half gill per head daily, feeding more to those in feeble condition. I find this feed admirably adapted to increase the milk, so that the lambs have a supply from the first.

"Before serving the ewes I am careful to have them in fine condition; and I do not let my sheep leave their yards from the time of yarding until they are turned out to pasture in the spring, as I find they do better on dry feed only than when permitted to feed partly on grass and partly on dry feed.

"At lambing time I do not let the breeding ewes go out unless in warm, pleasant days, and then shelter them at night, at all times until the weather becomes warm. I use extra care at this time to keep the sheds and yards well littered with clean straw, so as to be perfectly dry under foot.

"Before turning them out of their yards in the spring all of my sheep are tagged; and, if necessary, their hoofs are trimmed to prevent disease of the feet. By tagging sufficient wool is saved to pay all extra expense, and the sheep do much better.

"During the dropping season my shepherd spends his whole time with the sheep, taking care of them and their lambs. As soon as the lambs are dropped, the ewe and her offspring are separated from those which have not lambed.

"I do not let my sheep out in the spring until the feed is sufficient for them to get their living without hay. I continue feeding grain for a short time after they are turned out to pasture, as the condition of the flock and the state of the grass may require.

"They are kept in pasture until washing season, after which they are kept in heavy swarded pastures from six to ten days, when the fleece is taken off.

"After shearing, I either dip the whole flock, lambs included, in a weak solution of tobacco juice, or else go over them with a preparation of oil, lampblack and umber, either of which will destroy the tick.

"The result of my management last season was, that I could discover no difference as to the amount of feed required by the Spanish Merino and the half and three-fourths French and Spanish. They wintered equally well and appeared all equally hardy, and they were all equally well washed; in fact, I made no difference in the treatment of them. They all dropped lambs in April and May. At shearing, the fleeces from the Spanish Merinos were kept separate from the others, and the wool from each carefully weighed. The average of my Spanish clip was six pounds ten ounces per head. My half and three-fourth French and Spanish sheared seven pounds one ounce average per head. The wool was of equal quality, for all of which I was offered $62\frac{1}{2}$ cts. per ℔. but did not sell.

"I did not winter any full blood French Merino ewes last season, though I had a full blood French buck, and have hitherto kept ewes of the same breed. The French are larger than the Spanish, and require rather more feed, but yield a much heavier fleece.

"From my experience, I prefer the French; but the full bloods are so high priced at present that but few are able to keep large flocks of that breed.

"From what is stated above, it will be seen that the French crossed with the Spanish are more profitable and preferable than the pure Spanish.

Yours with respect,

J. J. McAllister."

To Albert C. Ingham, Esq.

Sec. of the Wis. State Agr. Society.

Elijah Perrin's Statement.

"We are feeding our breeding ewes this winter at the rate of four quarts of oats, and the same amount of potatoes, for twenty-five sheep, per day. We give them good shelter and what hay and water they will eat and drink, and usually feed them from racks made expressly for that purpose. In the summer we let them have a good pasture, where they have free access to pure, fresh water.

"We salt them twice a week. We tag them all in the spring, before turning them out to grass; and wash them well five or six days before shearing. After the fleeces are taken off we wash or dip them, lambs and all, in a solution of tobacco, which rids them entirely of ticks.

"In the winter. sheep should have a warm, dry place, in which to shelter themselves from storms. Cold, sleety rains are much more injurious than the coldest winter weather, as they will sometimes remain wet for a number of days. Sheep when well housed during the winter will shear more wool, of a better quality, and require much less feed than those which are exposed to the inclemency of the weather. They should not be shorn until the season is sufficiently advanced to prevent their suffering from cold; and in all cases of storms, immediately after they have been shorn, they should be taken up and sheltered.

"In regard to the different breeds of sheep, probably, for mutton alone, the South Downs, or some other coarse wooled breeds, would be preferable; but all things considered, I prefer the Spanish or French Merinos, as they are not so much *inferior* for mutton as they are superior for wool, and I think they can be kept with less expense, especially the Spanish. For breeding purposes, they should be from two to six years old, heavy quartered, round in the rib, broad in the chest, low in the brisket, legs short and rather large, neck thick, nose broad, wool thick, long and fine. Such sheep, so far as my observation extends, keep the easiest—shear the heaviest fleeces—are least liable to disease, and consequently are the most profitable.

"I think it very essential that breeding ewes should be fed through the winter with some kind of culinary roots; potatoes, carrots, turnips or something of the kind, as it assists them very much in raising their young. It seems to be their nature to require something green as they will seldom eat much dry food when they can get to the ground.

Elijah Perrin."

CROSS BREEDS.—No of Entries 52.

Judges—George C. Pratt, Waukesha; Simeon Ford, Watertown; J. J. McAllister, Albion, N. Y.

Best buck, two years old; John Ferre, Oconomowoc. $4.

Second best buck, two years old; Horace Scoville, Lowville. $2.

Best buck, one year old; G. H. Canfield, Waterville. $1.

Best pen of three buck lambs; H. E. Coon, Palmyra. $3.

Best pen of three ewes, two years old; McAllister & White, Albion, N. Y. $4.

Best pen of three ewes, one year old; G. H. Canfield, Waterville. $3.

Geo. C. Pratt, Esq., Chairman of the Committees on Merinos and Cross Breed sheep, accompanied the reports of the Committees with the following letter:

"Waukesha, October 10th, 1854.

"Dear Sir,

"The exhibition of Merinos and Cross-breed sheep compared very favorably with the rest of the Exhibition, and must have been quite satisfactory to the wool growers present, when we consider that but few years have elapsed since wool growing commenced in Wisconsin; and it is but a very short time since the first attempt was made towards improvement in our flocks. Our experience, though short, has proved that sheep husbandry and wool growing is the most profitable business of the farm. The first thing the beginner should look for is that breed of sheep which will prove the most profitable. Wool growers in all parts of the United States, who have had experience, agree that the Merinos are the most profitable. I will admit that there are those among us who contend that the coarse-wooled breeds are more desirable, but this mistaken notion arises from the want of experience, and from the fact that wool buyers in Wisconsin have paid more in proportion to the value for coarse than for fine wool, and because they have usually kept small flocks. Now the Merino, as well as the coarse grades of sheep, will do much better in small flocks; but those who make wool growing a business must necessarily keep large flocks. In such cases they will find that the

Merinos will yield larger profits than the coarser grades. The Merinos have, by breeding and cultivation, been divided into varieties, some larger and carrying more wool than others ; some with finer wool and some with coarser. Size within moderate limits is not a matter of any consequence, nor is the amount of wool per head, provided the smaller sheep bears as much in proportion to its consumption of food as the larger, and as the greater animal of the same species consumes a proportionable greater amount of food than the lesser. The question, therefore, for the farmer to ask, is not how much wool will a given number of sheep produce, but how much wool will the yield of a given number of acres produce.

"Their size must be adapted to their feed. Shape is of much more consequence than size. It is this that indicates the constitution of the animal. A well formed sheep possess a round straight back, short straight legs, a round carcass, cylindrical rather than funnel shaped ; that is, carrying its depth and breadth into the fore quarter instead of tapering off in the shape of a funnel. The quality as well as the quantity of the wool is of the greatest importance. Merino wool ranges from the finest Saxon to medium. The Saxon sheep have ordinarily tender constitutions, because in their breeding, everything else was for a long time sacrificed to the quality of the wool. Merinos can now be found which equal ordinary grades of Saxons in fineness, and they are much thicker wooled and hardier animals.

"Economy demands that the wool be thick on the sheep, not only to make a good return for the food consumed, but as a protection against the weather. Pure bloods are much more desirable than grade sheep, but to attempt to stock our unoccupied farms exclusively with pure bloods, would be a matter requiring much time and expense ; and it is perfectly well known to all practical breeders that sheep of a desirable quality can be produced in three or four years, by crossing the best grade ewes with pure blooded bucks of the proper stamp. It would be well indeed to have a few pure blooded ewes to supply bucks and to gradually form a pure blooded flock. In procuring pure bloods, great care should, of course, be exercised to obtain those not only of individual excellence, but of absolute and undoubted purity of blood. This method of making up a good flock will be found much more economical and nearly as quick as to purchase, for pure bloods, whole flocks brought here from Vermont or

New York, at the present enormous prices. Sheep have been sold in this State, the present season, for from $15 to $30 per head, which are no better nor of purer blood than some of our best grade sheep. In some instances they are sheared as early as March or April, in order to show in September a remarkably long staple; and in others, the wool is left on the sheep about an inch long at the usual shearing time; and in such instances affidavits are certain to be exhibited to dissipate any doubts as to the alledged time of shearing. The clip of one year's growth of these imported sheep is better than that of some of our best grade flocks. Wool growers should be careful to select their best lambs for stock sheep. They should have particular reference to the shape of the animal and the quality, thickness, and length of wool. All these good qualities can be combined in a whole flock in three or four years, by proper attention in selecting out from year to year lambs suitable for breeders, as 'like begets like.' It was in this way that the French Merinos became a distinct class; and the wool growers in New York and Vermont are now making their flocks of Spanish Merinos yield from five to seven pounds of wool per head, whereas the same size and breed fifteen years ago would not afford two-thirds of that amount.

"It is not very uncommon now for a Spanish buck, weighing one hundred pounds, to shear ten pounds of well washed wool. There are instances where the Merinos have been made to weigh over three hundred pounds, and yield a fleece weighing over thirty pounds; but such are cases where more time and expense have been devoted than would be found profitable, with larger flocks. They are kept housed and blanketed most of the time, and are not washed but often oiled over, so that it would be difficult to judge whether dirt or wool predominated. The probability is, that wool grown in this way costs more than a dollar per pound. Those who are breeding those large, or French Merinos, do not find a ready sale for them at home, (as the wool growers in Vermont generally adhere to the Spanish,) and are therefore compelled to bring them West, where men of smaller experience are struck with their beautiful appearance, and at once purchase them at enormous prices; thinking that with such care as our sheep ordinarily receive, as beautiful animals can be easily raised. Experience, however, will teach them, as it has others, that sheep of medium size are the most profitable.

"From the unparalleled success that has attended the efforts of the wool growers of our State, I cannot but believe that Wisconsin is destined, above all her sister States, to be the great producer of that staple.

"Truly yours,

"Geo. C. Pratt."

To Albert C. Ingham, Esq.,

Sec. of the Wis. State Agr. Society.

SWINE.—No. of Entries, 32.

Judges—James Burling, Green Lake; Luther A. Cole, Watertown; Florus B. Cook, Johnstown.

Best boar, two years old; L. Thayer, Concord. $4.

Second best boar, two years old; James Revell, Watertown. $2.

Best boar, one year old; W. Knight, Black Hawk. $3.

Second best boar, one year old; H. E. Coon, Palmyra. $1.

Best breeding sow, two years old; John W. Gray, Oak Grove. $4.

Second best breeding sow, two years old; David T. McClaughey, Black Hawk. $2.

Best pair Suffolk pigs, six months old (imported); S. B. Edwards, East Troy. $2.

Best pair Essex pigs, six months old (imported); S. B. Edwards, East Troy. $2.

Second best two sow pigs; L. Thayer, Concord. $1.

Best five pigs, two months old; John W. Gray, Oak Grove. $2.

Second best five pigs, three months old; H. E. Coon, Palmyra. $1.

James Revell's Statement.

"My hogs are of the Berkshire breed, which I prefer, as being the quickest for market, easy to keep, and as producing more pork and bacon than any other. When properly kept they are at all times fit for the butcher, and are sure to weigh, when two years old, from five to seven hundred pounds as an average.

"For feed, I invariably use cooked food or grain ground and soured, and am satisfied that there is considerable saving by so doing, as I certainly think there is great loss and waste in this country by feeding with raw corn—I also put some charcoal in the trough every week.

"There is no doubt but that the quality of the Berkshire pork is superior to any other, as the fat is firm like the brisket of beef, whereas the meat of all white hogs is lardy and soft, at least that of such as are thrifty or quick to fatten. I have had the breed since 1826, and in 1849 I brought it to this country.

JAMES REVELL."

JOHN W. GRAY'S STATEMENT:

"The sow upon which I received the premium is of native breed. Her pigs, upon which also the premium was awarded, are one quarter Suffolk. The sow was two years old last May, and kept the first summer on milk, wintered on corn and carrots. During the second summer she run in a timothy pasture, having nothing but grass, until the time of farrowing, (July 29th), after which she was fed upon oat and barley meal and milk until the pigs were two months old, when they averaged seventy pounds weight each. 1

"I think that some of our best formed large native hogs, or crosses between them and the Leicesters, are preferable to any of the small breeds. I am satisfied, that in proportion to the amount of food consumed, they will produce as much or more pork, which will also command a higher price in market than that of the smaller varieties. They are also more easily controlled by our rail fences; but their greatest recommendation is, that the pigs may be fattened at eight or ten months of age to a weight of two or three hundred pounds without the trouble and expense of wintering.

"There appears to be greater defects in the rearing and management of swine than of any other class of domestic animals. Pigs are raised from small young half-starved sows, and are often bred in and in until leanness and weakness become hereditary, and thus a stock of hogs which may have had its origin in a fine blooded pair of pigs, purchased at a high price, by the system of inbreeding commenced to preserve the stock pure, and of breeding from young sows to obtain a rapid increase, runs into a breed which, in the third or fourth generation, bears no resemblance to the original parentage. 2

"If sows were not allowed to breed until they had reached maturity, a healthy vigorous offspring would be the result, receiving sufficient nourishment from the mother to keep them in a thriving condition until old enough to take to other food.

"In crossing, care should be exercised to supply any defect in one animal by a union with another, possessing the quality wanting in the first. By following a judicious system of crossing and breeding from full grown healthy stock, there is no difficulty in keeping up a good breed of hogs.

JOHN W. GRAY."

S. B. EDWARD'S STATEMENT:

"The pigs exhibited by me and which received the premium were one pair of the improved Suffolk and one pair of the Essex breeds, and were brought into this State by me last spring, and were from the imported stock of L. G. Morris, Westchester county, N. Y.

"During the fifteen years that I have resided in Wisconsin, I have tried the different breeds that I could obtain here, to wit: Native, Sussex, Leicester and Suffolk.

"Of the Native breed it is not necessary to speak.

"The Sussex I consider too coarse, and too long in arriving at maturity to be profitable or satisfactory.

"The Leicesters I kept for several years and found them profitable, and considered them the best with which I was acquainted, until I tried the Suffolks. This latter breed is white, of medium size, with very little hair, thin soft skin, light bones and fine meat. They are remarkably easy keepers, and can be made to weigh from three to four hundred pounds with less feed and expense than any other breed I have ever tested.

"The Essex I have not had for a sufficient time to speak of from my own knowledge, but should think they are similar to the Suffolk in keep, size, &c., but are black and rather more perfect in form.

"Hogs should be at least a year old before used for breeding purposes, as if bred from, before arriving at maturity, the offspring will be less strong and diminished in size. I do not breed in and in, as I believe by so doing any breed will deteriorate and become comparatively worthless.

"I think that the great reason why a breed of hogs which at first gives perfect satisfaction, will, after a time, become unpopular, is from the practice of the system of breeding from young stock and of breeding in and in, until the breed becomes degenerate, or, according to the ordinary expression, 'run out.'

"Breeding sows, should, during pregnancy, be kept separate from other hogs, but not confined so as to want room for exercise, and fed moderately until within a few days before farrowing, when their food should be increased. For a week or so after farrowing they should be fed light, then their food should be raised and they be allowed all the slops they can eat. Boars should be kept in a good thrifty condition, but not fat. I wean pigs when about two months old, and feed them sufficient to keep them hearty and constantly growing until they are put up for fattening. Hogs should be provided with a clean warm shelter, and the cost of providing such will be more than saved from the expense of their feed.

"Ground feed I consider much better than unground, and believe one bushel of grain ground and cracked nearly equal to two bushels in its raw state.

S. B. Edwards."

POULTRY.—No. of Entries, 7.

Judges—Professor S. P. Lathrop, Beloit, Chairman.

Best lot of Shanghais; James B. Judd, Waupun. $2.

Best lot of crosses—Shanghai and Chittagong; Charles Smith, Waupun. Discretionary $2.

PLOWS AND PLOWING MATCH.—No. of Entries, 16.

Judges—Allen H. Atwater, Oak Grove; B. R. Hinkley, Summit; George O. Tiffany, Milwaukee.

Best sod plow for stiff soil (Michigan Double); Edgerton & McCarter, Summit. Bronze Medal.

Best corn plow; Richard E. Ela, Rochester. Bronze Medal.

Best centre draft plow; J. W. Spencer, Watertown. Bronze Medal.

Best breaking plow; Richard E. Ela, Rochester. Bronze Medal.

Best green sward plow; Richard E. Ela, Rochester. Bronze Medal.

Best plow, with improvements; Thomas Oliver Waupun. Bronze Medal.

Best plowing with horses; Lewis Lewis, Summit. Silver Medal.

Second best plowing with horses; E. Herrick, Hustisford. Bronze Medal.

FARMING IMPLEMENTS.--No. of Entries, 28.

Judges—D. J. Powers, Madison; Denison Worthington, Summit; H. B. Hawley, Milford.

Best milk pans and strainer; A. F. Cady, Watertown. Vol. Trans.

Best fanning mill (Badger State); Richard E. Ela, Rochester. Bronze Medal.

Best dash churn and butter tubs; J. Crow, Centre. Vol. Trans.

Best double farm wagon; Joseph Hoeffel, Brookfield. Bronze Medal and Vol. Trans.

Best corn cultivator; John Post, Saline, Mich. Bronze Medal.

Best revolving horse rake; Randolph Brown, Utica. Bronze Medal.

Best six hay rakes; S. H. Ford, Watertown. Vol. Trans.

Best sett silver plated buggy harness; J. M. Riker, Janesville. Diploma.

Best manure and hay forks, and hoes; Sewell Keyes, Watertown. Bronze Medal.

Best cheese press; M. A. Hackley, Belleville. Vol. Trans.

Best railroad horse power; W. D. Bacon, Waukesha. Certificate.

Best separator or winnower and thresher; W. D. Bacon, Waukesha. Diploma.

DAIRY.—No. of Entries, 7.

Judges—Talbot C. Dousman, Waterville; Gardiner Gallup, Fox Lake; Mrs. E. W. Edgerton, Summit.

Best twenty-five lbs. of June butter; Jonathan Cory, Bachelor's Grove. Sett of Silver Tea-spoons.

Best forty lbs. of butter; Jonathan Cory, Bachelor's Grove. Silver Medal.

JONATHAN CORY'S STATEMENT:

"During the past season I milked sixteen cows, eleven of which were heifers two years old each—with their first calves. They are of the common breed of the country. I have been prevented from trying some of the choicer breeds of the day, by the expense attendant upon their purchase and transportation, and consequently cannot judge of the comparative merits of the different breeds. In selecting my cows for their milking properties, I have been guided in a very great degree by a small treatise on milch cows, written by M. Guenon. I am confident that the rules laid down in that book are generally to be depended upon. The cows are pastured in the summer on the native prairie grass, and in the fall on timothy grass. I can see no difference in the quality of the milk or butter made from either, while the prairie grass is green and tender; but as soon as the prairie grass begins to turn yellow, it loses its flavor very soon, and I then use timothy pasture, which is the aftermath or second growth. In the winter I use timothy hay mostly, feeding no grain, except a little bran, which is given once a day to those cows that drop their calves before the grass starts in the spring; but I am careful to feed plenty of hay, and give the cows free access to good water. I raise all the calves, feed them new milk a few days, and then skimmed milk until they are four or five weeks old, when I feed them buttermilk. I I think it more profitable to feed the buttermilk to calves than to pigs, and they soon learn to drink together from a trough, so that it is no more trouble to feed them than to feed pigs. The cows are milked regularly twice a day; the milk is then strained through a wire strainer into pans that hold a pailful each, and set, in warm weather, in a cool cellar, where the milk is allowed to stand uncovered till it becomes thick; it must then be churned soon, for if it stands too long the cream will become soured; it is then put into the churn, milk and cream together, until the churn is filled about half full, I then put in from one pail to three pails full of cold water; our churn holds one and one-half barrels, and is a common dash churn; I then put in warm water till it can be churned without much frothing; I use no thermometer, the water serves to thin the milk so as to require less labor to separate the butter from the buttermilk; I usually churn about three quarters of an hour, using an inclined wheel power for churning, propelled by a sheep. When the churning is done, the butter is taken out and washed through two and sometimes three waters; it is then salted to suit the taste, with fine ground Liverpool salt of the Ashton brand, as we think that kind is the best we can get; it is then worked over and set aside till the next morning, when it is again worked over and packed in firkins; when the firkins are full we lay on a thin cloth, then about half an inch of salt, and pour on water and examine it occasionally to see that the brine does not leak out; we use no coloring matter, or any other substance, except the salt. In order to make good butter it is necessary to pay strict regard to cleanliness throughout, from the time of milking the cows to the packing of the butter; in the hot weather, a very important item is, to scald the churn and the milk pans thoroughly and dry them in the open air every day. I cannot inform you how much butter we made during the past season, as we have kept no account of what was used in the family; we sold sixteen firkins of eighty pounds each, in the city of Janesville, mostly at eighteen and three quarter cents per pound. I think the dairy business can be made profitable in Wisconsin on any farm that is well watered, but not otherwise, as it is absolutely impossible for milch cows to do well unless they are supplied at all times with plenty of good water.

JONATHAN CORY."

Best single cheese; E. Herrick, Hustisford. Sett of Transactions.

E. HERRICK'S STATEMENT:

"My experience in dairying in Wisconsin has not been as great as in New York; in that Stale I milked forty cows for several years, finding it the best agricultural business I could pursue. I have been in this State only three years, during which time I have milked fifteen cows; and I believe it to be the best business in this State to which a farmer can turn his atttention; for the products of the dairy here uniformly command a high price, with a ready home market. My cows are not such cows as I would recommend for a dairy, but they were the best I could get at the time of purchasing. I have made on an average over two hundred pounds of cheese from the milk of each cow, besides making some butter in addition, and raising their calves. I sold my cheese the first year for nine cents per pound, the second year for nine and a half cents; this year I sold the first of October for eight cents. My cows have netted me about twenty-four dollars per head. I strain my milk at night in a tin vat surrounded by water, the tin vat being enclosed by a larger wooden vat; I then stir the milk until it cools. In the morning I skim the cream from the milk; heat it, stir the cream until perfectly melted, and then mix thoroughly with the milk in the vat. Immediately before adding the rennet I warm the night's milk by passing steam through the water in the vat, and when at blood heat I add rennet sufficient to bring the curd, in thirty or forty minutes—when the curd forms, it is cut up with a knife or curd-cutter. I then allow it to stand for five or ten minutes, until the whey rises on the top of the curd, I then break it carefully with my hands. When the whey has risen sufficiently I dip it off and put on a strainer—I dip off what I can—then break it up with my hands carefully, and then let in the steam again; and so keep wheying and breaking it up until it is scalded sufficiently. I then salt it and then put it into the press. When it has been pressed six or seven hours it is turned over, and remains in the press until the next cheese is ready. It is then taken out and bandaged, and then greased and turned every day until a rind is formed, after which no grease is needed, but the cheese should be turned and rubbed every day. I would recommend the Devons as the best cows for the dairy, because they best endure the cold storms and hard winters. The Durhams are a good breed of cattle, but they require more care and better keeping than the Devons. In Wisconsin we are so destitute of sheds and barns that we, of necessity, want cows that can withstand the inclemency of our winters. For pasturing I prefer timothy and clover—white clover is the best—I sowed some and it has done remarkably well. I am of the opinion that the dairy business will be good for several years, for we have a good home market now; and when home markets are glutted we can send to the Eastern markets, and sell cheaper than Eastern farmers can afford what they manufacture.

"E. Herrick."

The Committee in their report express their regret that the great agricultural State of Wisconsin should have imposed upon them a no more arduous duty than that of examining two firkins and four jars of butter, averaging about forty pounds each, and six whole cheeses.

Concerning the samples exhibited, they say—"the lot of fresh butter exhibited by Mr. Cory is of superior quality, and reflects much credit upon the maker. The sample of June butter also exhibited by Mr. Cory is a very good article; and though all the buttermilk has evidently been worked out, and the butter is sweet, still there is a peculiar taste to it that is not right, and results from exposure to the air, or is caused by being kept in a poor cellar. Of the other samples on exhibition, one was not sufficiently worked, and one was too much salted. The Committee are well aware that this important branch of domestic husbandry was not duly represented at this Annual Fair of the Society, and they hope, for the credit of the State and the dairymen in it, that hereafter there will be larger exhibitions of the products of this department. The representations from the dairy are exhibited with little other expense than that of transportation, which is more than counterbalanced by the advantage of a market, for there is no place where premium or good butter commands so high a price, or meets with so ready a sale as it does at the Fairs—either State or County; and where can the maker become so generally known? Butter of as good quality (if not quantity) can be made in Wisconsin, if the same labor is bestowed and care is expended upon it, as can be made in the States of New York or Ohio, and will command as good prices here as the article does there, just as soon as the maker's reputation is as well established.

"That, as a State for extensive dairy purposes, Wisconsin is not as well adapted as some of the Eastern States, the Committee will not deny, but when connected with the other branches of farming, we contend that the making of butter in this State, pays as large a profit for the capital invested and the labor bestowed as in any other; indeed unless some of the products are consumed on the farm and returned to the land by way of manure, the profits will soon be on the wrong side of the ledger, and the owner have a worn out tract of land as a legacy for his children.

"One of the disadvantages in this State, for an extensive dairy business, is the severe droughts to which we are annually subjected, and which operate especially against the successful manufacturing of cheese, which, to insure success, requires a large number of cows, and as near as can be equal quantities and qualities of milk; but the making of butter can be carried on with profit on a smaller scale, because the butter from one cow can be made as good as that from a dozen; and the farmer having his business divided, consequently does not suffer as he would if it were exclusively dairy.

"Another disadvantage we labor under, but which is being fast remedied and can be altogether, is the want of green feed early in the spring and late in the fall, for it is well known that though our wild pastures (with a large range) are very nutritious while in perfection, still they remain so only about two months in the year—June and July—and after the first appearance of frost in the fall, are entirely worthless. But this is soon overcome by seeding the land to the cultivated grasses—timothy, red-top, and clover; and when this is generally done we will be much better off than we are now, under the almost universal system of crop after crop, spring wheat after winter wheat, sometimes burning the straw, and often moving the sheds and stables to save the labor of drawing away the manure. It is an old and true adage that continual dropping will wear away a stone, and it is equally true that continual cropping will wear out the best farm in the State. We would urge the farmers of Wisconsin, or those who do it, to abandon the present excessive system of cropping, to seed down their lands and keep more stock of all kinds—cattle, sheep, horses, hogs, or either of them, as the peculiarities of the farm may seem best adapted. Very abundant and nutritious feed is obtained by sowing rye in August, or as early as it can be done, and pasturing it during the fall; it can also be pastured until the first of May in the spring, without injury to the growing crop, and we believe spring feeding to be a decided benefit.

"We think we have shown that one of the disadvantages under which we labor can be remedied, and by so doing it would be a great benefit to the country. The other (droughts) and from which our Eastern neighbors sometimes suffer likewise, is more than made up by the cheapness of our land in comparison. In extensive dairy sections in the Eastern States they are getting rich making butter and cheese, on lands worth from forty to one hundred dollars per acre; and if we cannot successfully compete with them in making large cheese, we can in making butter and raising stock, besides all the grain which should be raised on the farm. If one cow will make fifteen dollars worth of butter, raise a calf, and keep a pig during the summer months, aside from the benefits of the manure made from her, without interfering with the usual amount of grain raised on the farm in this country, will it not afford as much profit as the same cow kept in an exclusive dairy country, on land worth three times as much, and yielding in cheese thirty dollars? for we believe both to be a fair average, though often excelled both here and there on well managed farms.

"One establishment in the town of Genessee, county of Waukesha, has purchased, and shipped East, this season, five tons of butter, and has sold an equal amount in Milwaukee at an average price of fifteen cents per pound, making three thousand dollars paid out in one neighborhood for this one article; and we venture to say that the books at that station, on the Milwaukee and Mississippi railroad, will show as large shipments of grain as from any station on the road, to which the same extent of country is tributary. The collectors' returns in Milwaukee show that ninety-two thousand pounds of butter were shipped from that port this season, and one-tenth of that amount was bought at one store in the country, does not that speak well for that country!

"The expense of transporting a pound of butter from Lake Michigan to New York or Boston, is from one-half to one cent per pound. The cost of transporting a bushel of wheat to either of the above places is from twenty to forty cents, being in one case about one-twelfth part of the value, and in the other about one-third; showing conclusively that the greater the value of the product, the less the per cent profit on cost, and all that is saved in transportation goes into the pocket of the producer —this is a strong argument against the all-grain growing system of farming.

"Of the best method of making butter, the Committee will not express an opinion; they hope that some one more competent will do so—but they will say, that cleanliness is one great important requisite, beginning with the milking of the cow, and following through all the various operations until the butter is packed. The buttermilk must all be worked out of the butter, and salt sufficient to season, and *not* to *save*, worked in; if this is done, and the butter kept from the air, in a well ventilated cellar, it will keep until wanted for sale or use.

"The cheese on exhibition was not *White-Oak*, neither was it as good as genuine *Hamburgh*. The fact is however established, that six cheeses, weighing in all one hundred pounds, were made in the State, which shows that cheese can be made in Wisconsin, and should be, at least, to such an extent, as to prevent the importation into the country, if not into our cities, of cheese from abroad. This is not the case now, though we hope it soon will be. The Committee have been unable to ascertain the amount of cheese imported into the State during the past season, but they still know it to be large—far too much so for the credit of our State."

Letter from F. S. Eldred, Esq.

We have received the following Letter from Mr. Eldred, giving his views and experience in cheese making:

"Johnstown, Dec. 20th, 1853.

"Dear Sir,

"In compliance with your request, which I received a few days since, I will give a little of my experience in cheese making, which you may use as you think best for the advancement of agriculture and the interest of our Society.

"In all the departments of the dairy, neatness should be observed—in taking the milk from the cow—in manufacturing it into butter or cheese—in the care of the butter or cheese—and no less in carrying the products to market. This neatness attracts the attention of the purchaser, procures a reputation and a ready sale, and should be thoroughly practised from the commencement to the end of the process of manufacture.

"Then first, the milk must be perfectly pure, with all the cream on it, to make good cheese. For a tub, I use a wooden vat, six feet long, two feet wide and fourteen inches deep. This is set on three legs, two placed one-third the distance from the end, the other at the end and so arranged that it can be drawn out and pushed in at will, so that I can raise or lower one end of the tub for the purpose of drawing off the whey. Inside of this tub or vat is another of tin, with a space of one inch and an half between it and the outer one, and the inner four inches higher than the other, and raised by cleats running lengthwise, one inch from the bottom. A funnel tube is fixed in the bottom near the lower end of the wooden vat through which the whey may be drawn off. This vat is large enough to contain the milk of thirty good cows.

"At night, when the milk is taken from the cows it is strained into the tin vat. The best way to keep it over night is, if a running stream of water can be brought, by logs or pipes, into the cheese house, to have it run into the outer vat till it fills and runs over, and thus keep a constant flow through it the whole night. This will keep the milk perfect if the water is cold, say at 40° Farenheit. The next best way is to fill the vat pretty full with water into which a quantity of ice is put. The third way is to put water alone into the vat.

"In the morning the cream is taken from the milk and mixed with twice the quantity of milk fresh from the cow.

"The next thing is to warm it, which is best done by a steam generator made for the purpose, similar in shape to an engine boiler. These are used commonly in central New York. I have substituted a small cauldron kettle, smaller than a barrel, set in a good brick arch, so arranged that the fire will pass completely around it before escaping into the chimney. In the kettle I have a lid fitted tight with a lead pipe starting from the centre of the cover crooked so that the other end will go into the water vat. To this pipe is attached a steam cock and another pipe, so that the steam can be turned with ease into a tub of water for the purpose of heating it to wash the cheese utensils. If a steam cock cannot be obtained readily, the pipe may be cut and wound with a cloth covered with white lead by which a joint will be formed, and thus the pipe can be turned at pleasure from the vat to the tub. The fire once started, and the steam pipe connected with the water vat, the water will soon raise to the temperature of 86°, which is the proper heat for the rennet. The morning's milk is then strained in, and the cream and milk that have been mixed warmed to 100°, or until perfectly dissolved, and then added to the night's and morning's milk in the vat, and the whole stirred well, then sufficient rennet is added to bring it to a curd in forty minutes.

"It is then allowed to stand until the curd will cleave from the side of the vat upon placing the finger in it, which should be in an hour after the rennet is put in. The curd is then cut into pieces, three quarters of an inch square, with a knife made for that purpose out of fine brass wire, and worked moderately with the hands for fifteen or twenty minutes. The steam is then again turned into the water, to raise the temperature slowly, and the curd worked carefully the whole time it is heating until it reaches the temperature of 104°, which requires an hour. The steam is then turned off and and the curd stirred occasionally for half an hour longer, or until it will 'squeak' a little when placed between the teeth, and then allowed to settle. The whey is then drawn off, as low as possible, by a syphon. The water is then let out of the vat through the hole made for the purpose, and at the same time cold water turned on until it is reduced to a temperature of 86°. The vat is then raised by the slide leg and retained so by a pin through the leg, and the remainder of the whey drawn off. During this operation the curd is to be stirred occasionally to prevent it from adhering together, which should not be permitted after it is once separated by the wire knife. If worked rightly the coarsest of the pieces will be no larger than peas. When drained a tea-cup full of salt is added to every fifteen pounds of curd. When the salt is thoroughly worked in and the curd free from lumps, it is then ready for the press. It is of no consequence *how* a cheese is pressed if the whey is only got out of it. Twelve hours is sufficient for this. The cheese should be turned in an hour and a half after it is put into the press, and again about six hours after this. A bandage of light sheeting is then put on, coming over the edge of the cheese an inch, and gathered with a coarse thread. The cheese when taken from the press is greased with butter made from whey, in the same way as common butter.

"This is all the greasing that is needed, unless the cream has been taken from the inside; which, if done, is an irreparable injury, although the cheese may, in other respects, have been properly made.

"The cheese should be turned and rubbed every day.

"I will here say, under the head of general rules, that the milk must be perfectly sweet; if not, the swill-barrel is the best place for it, as it is only time and labor thrown away to attempt to make good cheese out of it. A thermometor is also necessary, for no two cheeses can be made alike without it.

"When a *good* cheese has been made, it is highly advantageous to note the process. Experience is as necessary for proficiency in this branch of rural husbandry as any other.

"From a cow, kept on tame grass, three hundred and fifty pounds of cheese can be made in a season, which commands from seven to eight cents per pound.

"This quantity can be increased by improving our cows as milkers. It is not uncommon in Central New York to make six hundred pounds from a cow; and I have cows in my dairy that will yield more than that. Our feed is as good and as abundant, and the only difficulty is in procuring cows.

"Respectfully yours,

"F. S. ELDRED."

To ALBERT C. INGHAM, Esq.,
Sec. of the Wis. State Agr. Society.

FLOUR AND HONEY.—No. OF ENTRIES, 7.

Judges—TALBOT C. DOUSMAN, Waterville; GARDINER GALLUP, Fox Lake; Mrs. E. W. Edgerton, Summit.

Best barrel of flour; L. A. Cole, Watertown. Diploma.

Best ten pounds of honey; E. B. Quiner, Watertown. Bronze Medal.

Best bee-hive; Joseph A. Carpenter, Waukesha. Vol. Trans.

GRAINS AND SEEDS.—No. OF ENTRIES, 21.

Judges—THOMAS HISLOP, Milwaukee; J. C. HOWARD, Lake; H. B. HAWLEY, Milford.

Best sample of (Soules) winter wheat; Leonard Coleman, Summit. $1.

Best Connecticut seed leaf and Cuba tobacco and cigars; H. B. Hawley, Milford. Silver Medal.

Best sample of Indian corn; James T. Walklin, Eagle Center. $1 and Sett Trans.

Best sample of winter wheat; Simeon Ford, Watertown. Second Vol. Trans.

Best bale of hops; Charles Avery, Concord. Sett Trans.

JAMES T. WALKLIN'S STATEMENT.

"I cultivate my corn land in the following manner: I plow my land in the month of May, and plant my corn about the 12th or 14th of the same month. In preparing the ground after plowing, and before planting, I harrow the land smooth, and then lay out my furrows four feet apart, each way. When the corn is about six inches high I cultivate it both ways, with a common cultivator, and then with a plow and one horse I go through the field, plowing from the hills of corn each way. After this I again plow in the same manner, except that in this second plowing, I throw the soil towards the corn. I think this process causes a much greater yield. The average yield of my corn, which is the Yellow Dutton was sixty bushels per acre. The land upon which it was grown has had twelve different crops of grain taken from it, and has never had any manure applied to it, though it is still a rich soil. It is a black sandy loam two or three feet in depth, succeeded by yellow clay fifteen feet in depth, and limestone gravel afterwards. As I cut my corn before the frost injures it, I think the stalks used for fodder for my cattle will pay the expense of the crop, which I estimate at six dollars per acre. By this calculation, which I believe to be correct, I have left, after payment of the expenses, my corn, which is worth fifty cents per bushel.

"JAMES T. WALKLIN."

CHARLES AVERY'S STATEMENT:

"I have been in the hop culture thirty years in New York and three in Wisconsin. I prepare my land in the spring as soon as the frosts will permit, plowing deep. I plant my roots, previously cut in pieces, six inches in length, one and one-half to two inches deep, eight feet apart each way, and put manure, covered with earth, in each hill.

"The first year I plant corn among the hops. The next spring, as soon as the frost is out of the ground, I dig around the hill permitting but little sprouting. I set two poles twenty-four or twenty-five feet long to each hill, and train two vines up each pole. If the season is early I put up the second set of shoots. From fifty to seventy loads of manure is applied to each acre of ground. Good corn soil is the most suitable for hop raising. Last year I harvested five acres; this year I am cultivating eleven acres; six of which are on bottom land, and promising to yield an abundant crop. The five acres last year gave me on an average one ton of hops per acre, which I consider an ordinary yield with good care. The cost of cultivation, I think, is about six cents per pound. For drying, I use kilns lined with brick, heated with coal, which I prefer, and giving as I believe a better color and flavor, costing no more than stoves and pipes, which many use.

"I commence picking the first of September. Last year I employed, on the five acres, sixteen girls for two weeks and three days. Their wages were from two to four shillings per day with board. I dry and press my hops in bales containing about two hundred pounds each. I use rope presses. I sold the yield of my five acres for fourteen hundred dollars. I consider the hop crop as sure as any I ever raised. It can be kept up for ten or twenty years with good management.

"The greatest growth I ever knew, was twenty eight hundred and eighty eight pounds raised from one acre by H. P. Potter, Madison County, N. Y., still manure being applied to the land.

C. AVERY."

VEGETABLES.—NO. OF ENTRIES, 23.

Judges—THOMAS HISLOP, Milwaukee; J. C. HOWARD, Lake; H. B. HAWLEY, Milford.

Best six heads of cabbage; Michael Pomerville, Watertown. Vol. Trans.

Best peck of Bermuda potatoes; William R. Smith, Mineral Point. Vol. Trans.

Best twelve ears of seed corn; Edgerton & McCarter, Summit. Vol. Trans.

Best sample of seed corn; Mrs. Eliza Finch, Oak Grove. Vol. Trans.

Best Sincia squash; R. M. Meigs, Ottawa. $1.

Best sample of imperial red potatoes; D. M. Aspinwall, Farmington. Vol. Trans.

Best sample of orange carrots; Walter Pease, Jr., Watertown. 1st Vol. Trans.

WILLIAM R. SMITH'S STATEMENT:

"The potatoes exhibited by me, and upon which the premium was awarded, are from some early potatoes raised this last spring in the island of Bermuda, W. I., and sold in the Philadelphia markets in the early part of May.

"They were brought to Wisconsin by myself, and planted on the eighth of June.

"The product of each hill is unusually great. The potatoes are still growing, the tops being yet green and of uncommon length of vine. The seed potatoe is as fresh as when the cutting was put in the ground.

"I am unable to tell what will be their yield, as they are not yet raised from the ground. They are of most excellent quality for the table. I consider this potatoe as a new and most desirable acquisition.

"WM. R. SMITH."

The Committee in their report remark, "that the display and varieties in the departments which came under their supervision, were somewhat limited. This is the more to be regretted, as for the last two years the State of Wisconsin has given unmistakeable evidence of its unrivalled capabilities as a grain producing country, and the interest commensurate with its importance should be attached to this branch of our agricultural resources.

"The deficiency alluded to, however, the Committee are inclined to account for in two ways—first: the expense and inconvenience of transporting these products from a distance; and second, a diffidence and timidity on the part of many to exhibit unless possessed of something rare or extraordinary.

"The exhibition of wheat, though limited, contained not one inferior or indifferent sample—indeed the quality of all, both winter and spring, would do credit to any State in the Union. The Committee had no small difficulty in making the awards, the samples being so nearly alike in point of merit.

"Of Indian corn, only one exhibitor has entered the required quantity for competition, the others entering a *few ears* each. The latter entries, though some of them contain superior grain to the former, are consequently disqualified for competition. The Committee, therefore, made the award in favor of the former.

"There was only one sample of barley entered—well colored, but not very plump. Also one of oats, of only medium quality.

"Red clover seed—only one sample was exhibited—rather above medium quality, and evidently well harvested. The exhibitor of this article is entitled to no small degree of credit for its production. In the opinion of the Committee, information as to the managing and comparative profitableness of the crop would be valuable, as it might lead to a more extensive cultivation of clover for *seed* in this State; especially when they consider the large amount that is annually brought from other States to supply our market. Let it be looked to in time. We have a wide country west of us that will soon need a large supply of this article.*

"Of hops, one bale was exhibited, the quality and packing of which was unexceptionable.

"One beautiful sample of Stowell's evergreen corn was presented. This is evidently a variety superior to most kinds of sweet corn, and likely to become a favorite with connoisseurs.

"The vegetable department presented little requiring particular comment. Although containing some individual specimens of high merit, it also contained many *spurious* varieties, showing a want of proper care in saving or selecting the seeds thereof. The most spirited and successful exhibition in this department was that of potatoes.

Many beautiful specimens were presented, some of which were entirely unknown to the Committee, who, in absence of their owners, were unable to judge of their respective merits. One very fine sample was especially interesting, from the fact of their being the second crop this year, the first having been raised in Bermuda, West Indies, and the second at Mineral Point, by Gen. William R. Smith.

DOMESTIC MANUFACTURES.—No. of Entries, 11.

Judges—Dennison Worthington, Summit; Mrs. E. W. Edgerton, Summit; Mrs. J. E. Dodge, Potosi.

Best ten knots of woolen yarn; Mrs. Sophia Schuschard, Delafield. $2.

Best ten yards of rag carpet; Mrs. John W. Cole, Watertown. $2.

Best three varieties of woolen yarn; Simeon Ford, Watertown. (Discretionary) $2.

* See Vol. II. Transactions, page 63.

NEEDLE, SHELL AND WAX WORK.—No. of Entries, 67.

Judges—Dennison Worthington, Summit; Mrs. E. W. Edgerton, Summit; Mrs. J. E. Dodge, Potosi.

Best Ottoman cover; Miss Ellen M. Hayes, Palmyra. $1.

Best variety of worsted work; Mrs. Stoppenbach, Watertown. $1.

Best worked collar; Mrs. Wm. McNaughton, Delafield. $1.

Best worked handkerchief; Mrs. Pagnin, Watertown. $1.

Best patched quilt; Mrs. A. H. Atwater, Oak Grove. $1.

Best white quilt; Mrs. George Surdam, Watertown. $1.

Best silk bonnet; Mrs. A. Ainsworth, Watertown. $1.

Best lamp mat; Miss Ellen M. Hayes, Palmyra. $1.

Best pair of wrought slippers; Mrs. I. W. Bird, Madison. $1.

Best knit tidy; Mrs. W. McNaughton, Delafield; $1

Best crochet work; Miss Pagnin, Watertown. $1.

Best ornamental shell work; Miss Marianne Dillon, Fitchburgh. $1.

Best specimen of wax flowers; Fred. Warner, Watertown. $1.

The judges report that the quality, variety and quantity of articles submitted to their inspection, furnished gratifying evidences of industry and skill on the part of the exhibitors; and gave to them an arduous, though pleasing duty, in selecting those deserving of the premiums.

The fine display of handicraft in this department gives assurance that, while the soil has been cultivated and invited to yield its valuable products, the fair hands of wives and daughters have been usefully engaged in furnishing the house with the comforts and elegancies of refined life.

FLOWERS.—No. of Entries, 33.

Judges—Thomas Hislop, Milwaukee; Mrs. D. Worthington, Summit; Mrs. John W. Cole, Watertown.

Best collection of house plants; Mrs. John W. Cole, Watertown. $2.

Second best collection of house plants; Mrs. E. A. Gilman, Watertown. $1.

FRUIT.—No. of Entries, 47.

Judges—E. B. Quiner, Watertown; R. Demming, Kenosha; O. G. Ewings, La Grange.

Largest and best variety of Apples; John Bell, Gardener's Prairie. Silver Medal.

VARIETIES EXHIBITED.

Winter Russet.	Canfield Sweeting.	Hooker.
Golden Russet.	Pumpkin Sweeting.	Cramm.
Boston Russet.	Slug Sweeting.	Wellington.
Roxbury Russet.	Tolman Sweeting.	Lord Nelson.
Cheeseborough Russet.	Round Sweeting.	Cornish Gilliflower.
Steele's Red Winter.	Green Sweeting.	White Gilliflower.
Ortley Pippin.	Spice Sweeting.	Black Gilliflower.
Twenty Ounce Pippin.	Spitzenburgh.	Red Gilliflower.
Summer Pippin.	Round Spitzenburgh.	Scoloped Gilliflower.
American Pippin.	Flushing Spitzenburgh.	Sweet and Sour.
Glory of York Pippin.	Esopus.	Ohio Pound.
Holland Pippin.	Yellow Bellflower.	Fall Wine.
Newtown Pippin.	Tool's Indian Apple.	Baldwin.
Blenheim Pippin.	Liberty.	Autumn Swaar.
Camburnathan Pippin.	Dutch Coddling.	Winter Swaar.
Ribstone Pippin.	Sweet Bow.	Red Baldwin.
Monstrous Pippin.	Summer Queen.	Carthouse.
Spotted Pippin.	Queen Ann.	Red Canada.
Priestly Pippin.	R. I. Greening.	Dumelow's Seedling.
Fall Pippin.	Sweet Greening.	Foxley.
Pomeroy.	Munchi's Crab.	Buckerman's Pearmain.
Pomme Gris.	Hugh's Virginia Crab.	Winter Pearmain.
Doctor.	Golden Beauty Crab.	Red Romanite.
Colvert.	Golden Beauty.	BlackVirginiaRedStreak
Phœnix.	Red Siberian.	Cider Red Streak.
Fameuse.	Seek-no-further.	Styre.
Rambo.	White Seek-no-further.	Twenty Ounce Apple.
Tolman Sweet.	Green Everlasting.	Wine Sap.
New Engl. Green Sweet.	Surprise.	Unknown.

"I cultivate my fruit by root grafting in the following manner: I put the apple seeds from which I intend to raise the root in a small pit, together with sand, to be frozen during the winter. Early in the spring, I sow them in drills two feet apart. In the fall, I take the largest of the plants out of the seed bed, cut off the tops and lay the roots, together with the scions that I wish to propagate, which I also select and cut in the fall, in a pit with sand, covering them up securely from the frost.

"I commence grafting about the first of February, taking out of the pit in the morning enough of roots and scions to last through the day. I cut the roots in pieces two and one-half inches long, and the scions four inches. I graft the roots and scions together, and plant them in a box fourteen inches wide and twenty-two inches long, filled with earth which has been secured from frosts, leaving two inches of the scion out of the earth and putting five hundred in a box. I then place the box in the green-house and the plants soon commence growing. About the first of May I transplant them to rows two feet apart with a space of eight inches between the plants. By this time they have grown from one to five inches. I keep them clear by hoeing and weeding until fall, when, before there are any hard frosts, I take them up and bury them in trenches and cover them up for the winter. The next spring I plant them in rows four feet apart one way and ten or twelve inches the other, and, as during the previous summer, I keep the ground free from weeds. The following spring I prune them for the first time—this I do before the buds starts much.

"After letting them stand in the nursery rows four or five years, I transplant into the orchard all whose age and growth will admit. Their first limbs are now from four and a half to five feet from the ground. The limbs of many of my trees of this size last fall, when full of apples, bent to the ground and covered a space of twenty-five feet in circumference. They commence bearing freely when from six to eight years old from the graft. From each of several trees twelve years old I gathered, last fall, over twelve bushels of apples. Had the grafts been on stocks, as some recommend, I would not have had half the yield. I prune every spring until no more shoots come out from the bodies of the trees, but never cut off the tops of any of the leading branches, letting them follow the guidance of nature, thinking the sooner they run up to their limit the better.

"I do not believe in cutting and pinching off the tops of trees, though considered by some highly advantageous. There is no danger that they will blow down from excessive height, unless planted too closely together, as nature will provide roots proportionate to their wants and exposure; and the fruit, though the contrary is often urged, is less liable to be blown off from the long and gently swinging limb, than from the short, stiff, and stunted branch, that stubbornly defies the breeze. If the tops of trees are cut off, the head will fill up with wood, and an additional necessity for cutting will thus arise. The knife should be kept away, except where branches cross and rub. I wash my trees with a mixture of soap suds twice as strong as it comes from the wash tub, and unleached ashes, adding two quarts of the latter to each pail full of the former, and putting it on and brushing with a short hard broom until the trees are clean and smooth. This I do in the month of June. All the manure I ever used was a bushel of leached ashes, that three or four years ago I put around each tree.

"My soil is a dark loam, with a slight admixture of sand and resting on coarse gravel. It has been under cultivation for fifteen or sixteen years.

"It is my decided opinion that root grafting, when properly managed, is the best method of cultivating the apple, from the fact that nineteen out of twenty of the scions thus grafted form their own roots, and consequently make sound trees. Much depends, however, upon after management, for if left unprotected during the first winter they will receive an irreparable injury, the wood becoming dark and the pith black and dead. Stock grafts suffer from the same cause. If the stock is thrifty and strong, the growth will be too rapid, and by spring will be killed down a foot or more. It then takes a new start; the buds near the bottom of the scion look somewhat healthy, but as they approach up to the dead top they appear sickly, and the last few buds will open but to die, and before the middle of summer, perhaps, half of the new growth is dead, and I doubt whether that which is left is sound and healthy. I will not say that all stock grafts exhibit the effects I have described, but those I have examined in Wisconsin show this appearance to a greater or less degree. The second year's growth is liable to the same difficulties and hindrances as the first.

"Root grafts being protected the first winter and planted in the spring will not grow too rankly or rapidly if the ground is not too richly manured, and I think their wood ripens earlier in the fall and comes out better in the spring than those that have been planted two years, whatever may have been their genealogy.

"There are many different opinions as to the most proper time for pruning, some say May and some June. I prune in the spring, before the buds open, the sun then hardens the wood and prevents bleeding. Some years ago I pruned some trees the last of May or first of June, and they bled the whole summer, and some never stopped until they were dead. Allow the bleeding to continue all summer and the bark will be covered with a black rust which in time will kill it.

"Root grafts grow slow when there is no large root to crowd them. The ground should be just rich enough to supply their wants. By the slow growth a stocky tree is formed, by their standing on their own roots a sound tree, and by twice transplanting a great many roots are produced which are sure to live when the tree is transferred to the orchard.

"I know that I differ from many of my brother nursery men, but I think I am correct in my practice.

JOHN BELL."

Second largest and best variety of apples; Joseph D. Clapp, Milford. $3.

VARIETIES EXHIBITED.

Seedling.	Bell Flower.	Fall Wine Sap.
Cranberry.	Pine Apple Sweet.	Seek-no-further.
Rambo.	Smith's Cider Apple.	Holland Pippin.
Unknown.	Gilliflower.	Pear Apple.
Baldwin.	Fall Stripe.	Milan.
R. I. Greening.	Red Romanite.	Wine Apple Seedling.

Best five varieties of apples; Theron Plumb, Milford. $4.

VARIETIES EXHIBITED.

Jackson.	Baldwin.	Blue Pearmain.
Adams' Fall Sweeting.	Queen Ann.	Newtown Greening.
Cranberry Pippin.	Dorchester.	Big-stem.
Sweet Gilliflower.	Pine Apple Sweeting.	White Sweeting.
Fall Stripe.	Cabases.	Winter Seek-no-further.
Smith's Cider Apple.	Fameuse.	Black Vandevere.
Winter Pearmain.	Belmont.	

"My trees are twelve years old, planted in a clay soil, which I cultivate in the common manner, by plowing and hoeing. I apply long manure. The number of my trees is one hundred and fifty, chiefly grafted, and winter varieties. They have not been troubled by insects.

THERON PLUMB."

Best seedling; E. R. Adams, Ixonia. Sett of Trans.

We have received the following communication on the subject of apple culture.

"Otter Creek, Jersey Co., Ill., Jan. 12th, 1854.

"Dear Sir,

"I herewith send you a few suggestions on the practice of transplanting and cultivating apple trees.

"For the orchard I select dry, timber land; plow and cross plow the ground before setting out the trees in such a manner as to make small mounds, not less than two rods square, to obviate the danger of their suffering from the wet, running the finishing furrows so as to carry off the water. I then choose trees of two and three years growth in the nursery; prepare the pits or holes sufficiently large to admit the roots without doubling or bending; trim off all bruises and splits, and then plant them but little deeper than they stood in the nursery. I put no manure of any kind around the roots the first season. I cultivate corn, potatoes or beans, but no small grain, on the ground. Each succeeding spring, for six or seven years, I dig up the ground a little around each tree, and apply a peck of pulverized manure, distributing it equally, and covering it up with the removed earth. I use no stable or other fiery or coarse manure. At the same time I cut off all shoots or sprouts. I keep a sharp look out for the bug or borer, that often eats his way to the heart of small trees, and force a plug of dry wood into the opening he has made, and the injury will soon be healed. I also watch for signs of the grub, cutting after him with a sharp knife, and filling up the injuries with strong soft soap. If the grub has entered deep I follow him with a wire lance.

"When the trees of an orchard do not prove to be of a good variety, bud or graft in scions of an known and approved fruit, unless the tree is too large; in which case, dig it up.

"When the tree is not over three inches in diameter, I pursue the following course: I insert the bud, and after it is known to be alive I cut downward each way from a point a little above the bud, and take out a strip of bark, leaving directly opposite the bud a piece of bark one quarter of the circumference of the trunk. I do this to throw sap into the bud. The next spring I cut the tree off in the scores made by removing the bark. The first year I allow the shoots that may spring from the roots to grow. I have had a two years' growth from a bud put in and treated in this manner, bear and retain until fully ripe, two hundred and fifteen apples. I have also inserted grafts into stumps cut off below the surface of the ground, covering the stumps and part of the grafts with moist earth, and the growth of one year has been seven feet. Trees that have been transplanted eight years, and cultivated as above described, have yielded an average of eighteen bushels of apples each.

"Yours with much respect,

———."

To Albert C. Ingham, Esq.,
Sec. of the Wis. State Agr. Society.

PEARS.

Best six varities of pears; John Bell, Gardners Prairie. Silver Medal.

VARIETIES EXHIBITED.

Charles of Austria.	Beurre de la Motte.	Grey Monsieur Jean.
Bleecker Meadow.	Artillac.	Autumn Bergamot.
Urbaniste.	Summer Thorn.	Early Rousselet.
Buffum.	Catillac.	Royal Blush.
Ambrosia.	Princesse Virgalieu.	Colmar.
Prince St. Germain.	White Doyenne.	Steven's or Gurnsey.

"My pears are treated in the same manner as my apples, with the exception, that I graft in roots standing in the ground.

JOHN BELL."

Best three varieties of pears; B. P. Cahoon, Kenosha. $3.

VARIETIES EXHIBITED.

Stephen's Genessee.	Winter Nelis.	Andrews.
Passe Colmar.	Brown Beurre.	Louise Bonne de Jersey.
Beurre Diel.	White Doyenne.	

Best single variety of pears (Flemish Beauty); James B. Judd, Waupun. $3.

"My location is on the border of a prairie, my garden being surrounded on the north, east, and south, by a grove. The soil is a deep, dry alluvial clayey loam; the clay not predominating. My bearing trees have been set seven years from the nursery. I am not sure whether they were grafted above the ground or budded, but think they were budded upon pear stocks. The cultivation has been principally done with the hoe, and without cropping. I have applied animal manures both fermented and liquid, as also ashes, soap-suds and bones, and this present autumn I top-dressed the ground with chip manure. I am not in favor of deep planting as a rule, but prefer to have the depth of planting increase slightly from year to year, by cultivation and manure. Top grafting or budding, upon good seedling stocks, I regard as much preferable to root grafting. I have fruited and tested thoroughly but two varieties of pears in Wisconsin, and cannot therefore speak from experience in regard to the success of other varieties. Of these, the Flemish Beauty, for which I received the premium at the late State Fair, I can most confidently recommend as combining all the qualities desirable for a pear of its season. It is hardy, grows rapidly, and is very prolific with fruit, large and delicious. To enjoy its richest flavor, it requires ripening in the house, and should be taken from the tree before it parts readily from the bough. It ripens about the last of September or first of October. My trees have fruited every year since they commenced bearing, the produce increasing each year. The first year I had five pears, the second year about sixty, fifteen of which weighed nine pounds, and this year I gathered something over one hundred.

"The Autumn Bergamot I have fruited for two years with good success, and can recommend it as worthy of general cultivation. It is hardy, grows rapidly and is very prolific. The fruit ripens with me about the first of September. I have several other varieties, many of which will probably fruit during the coming year. From my experience thus far, I am satisfied that Wisconsin is one of the best States in the Union for successful fruit growing, and, with proper attention, we may soon equal in abundance of choice fruit our brethern of the older States.

JAMES B. JUDD."

PEACHES.

Best exhibition of peaches; J. C. Howard, Milwaukee. $3.

VARIETIES EXHIBITED.

Orange. Yellow Malacatoon. Teton de Venus.

"I can say nothing from personal experience of root grafting, as tongue or whip and cleft grafting are the only methods that I have practised. I have cultivated my fruit more by budding than grafting, and prefer it for several reasons. It is much quicker and easier, and buds are more likely to grow, and there is not the trouble of preserving grafts, which I consider more of an art than grafting itself; and should the bud fail, the stock is less injured. There is nothing new or peculiar in my practice, and I only give it because it has been successful, and may be of more benefit than learned theorizing.

"I transplant my trees to good, deep and well plowed land. I prefer high and dry soil for all kinds of trees, especially for pears, peaches and cherries, also a Northern descent. The poorest land we have seems well adapted to the growth of fruit trees. The space between apple and pear trees should be about two rods. Lately I have followed the plan of setting them forty feet apart, and planting plums and peaches between them. In transplanting I dig the holes large and deep enough to give plenty of room for the roots to grow a year or two both perpendicularly and laterally, and throw the top soil out by itself where I can get it when wanted. I place the tree a little deeper in the ground than it stood in the nursery, so that when the earth has settled around it, it will stand as it did before transplanting. If the roots are dry from being long out of the ground, I make a thin mud, with water and earth, and dip them in immediately before planting the tree, then stretch them out, even to the full length of the small fibres, and sprinkle and pack the top soil carefully over them with my hands, until they are well covered. I then throw in the remainder of the earth, treading it down slightly, just before the hole is filled, leaving the top loose and mellow.

"Mulching may be good, but it is expensive and hardly necessary. In trimming the tree, previous to setting, which is very important, I am always careful to trim in proportion to the amount the roots are lessened by taking up, being sure to leave the root full as large as the top, endeavoring to have the balance which nature has established between root and top as perfect as possible. I keep an eye upon them for a while after they are set if the season is dry, and if I perceive any withering I cut away more top, sometimes nearly or quite the whole of it, according to the nature of the case. Staking is unnecessary if the trees are grown right in the nursery and are well set, that is, if they do not stand too thick in the nursery, and are not trimmed too much while there, (I scarcely ever trim the nursery), and the earth in transplanting is well packed around the roots. But should a tree, from any cause, require staking, the stake should be driven obliquely to the trunk and fastened to the tree with a band of straw. I have cultivated my orchard with crops requiring hoeing, having observed that young orchards seeded with grass or small grain do not grow well. I have used all the manure made on my farm in my orchard, keeping it as much as possible away from the roots of the peach trees, and never using any among the roots of a tree I am setting. I allow my trees to top out low, and avoid trimming as much as possible, and at the same time keep them in good shape. I do not permit the branches to crowd and chafe each other.

"As to the varieties best adapted for general cultivation in Wisconsin, I can say but little. As far as productiveness and quality both are concerned; all the plums I have raised, perhaps a dozen or more varieties, have done extremely well. My pears have also yielded well. I have a few cherry trees, both native and grafted. The native, I believe, have produced good crops every year—the grafted have occasionally failed. My apple trees are beginning to bear, but are yet too young to determine which are the most productive varieties. The fruit of all kinds is extremely fair, and no variety that I have tried seems ill adapted to this country. I have seen no orchards in the State old enough to enable me to form an opinion as to the productiveness of the different varieties. Peach trees of all kinds grow well here, but seldom bear a full crop. I believe, however, that there has been no year since my trees were old enough to bear in which I have had no peaches.

"I have been particular in describing my manner of transplanting, for the reason that much of the success attending the raising of an orchard depends on the manner of setting, as well as in the quality of the nursery trees which should be thrifty with large roots and tapering stems.

J. C. HOWARD."

Second best exhibition of peaches; M. L. Burdick, Milwaukee. $2.

PLUMS.

Best and greatest variety of good plums; George P. Pfeffer, Pewaukee. $3.

"The plums exhibited by me were grown upon scions of two years growth, grafted or budded into native or wild plum stocks. At the time of grafting, the stocks were from one and one half inches to two inches in diameter, and the scions were set about five feet above the surface of the ground. The trees have now fine handsome heads, and this year were literally covered with fruit. I had about thirty plum trees which fruited this year; of these, two were five years from the graft and have fruited three years; ten are four years old, and have fruited two years; seven are three years old, and have fruited one year; and eleven are two years old, and came into bearing this year. All of these trees were grafted or budded above the ground as already mentioned. The entire crop this year was not far from thirty bushels, of which I sold eighteen bushels at an average price of three dollars and fifty cents per bushel, making sixty-three dollars—aside from the value of the remainder which were dried, preserved, &c. I had eighteen varieties in fruit this year ripening as follows: *latter part of July*, Jaune Hative, Prune Racine; *August*, Imperial Gage, Green Gage, Horse Plum, Lombard, Bleecker's Gage, Yellow Gage, Washington, Red Egg; *September*, Fotheringham, White Perdrigon, Red Perdrigon, Blue Perdrigon, Yellow Egg, Autumn Gage, Duane's Purple Gage, German Prune or Quetsche; most of these varieties were exhibited by me at the State Fair. I have in all thirty-seven varieties in my garden, of which the nineteen remaining varieties will probably fruit next summer. I can then give you a more extensive comparative statement of the hardiness and profits of the different varieties. The soil upon which they are grown is yellow clay, rather stony, with about two inches of surface soil of black vegetable mould. It is plowed to the depth of ten inches, with good after-culture, as I grow upon it market vegetables, potatoes, beets, ruta bagas, turnips, cabbages, &c. I apply common barn yard manure to it every second year, and in the places where ruta bagas and turnips are to be planted I use five bushels of leached ashes with one half peck of salt to one-eighth of an acre of land. This is put into the drills when planting, and seems to be beneficial to pear trees and gooseberries, which both do well with me. In the spring of 1851, I bought some three or four thousand seedling plum trees, of one summer's growth, which were sent out from the East, intending them for stocks to graft upon. I planted all but about two hundred in very rich mucky soil, in nursery rows, for the purpose of having them grow fast. In August of the same year, to my great disappointment, all the leaves fell off and their season's growth apparently ceased, but in the forepart of September they leafed out again and continued their growth until winter, when most of them died. Those that lived exhibited the same effects the second summer and died the following winter.

"By watching closely during the second summer, I found that in July the leaves began to look somewhat rusty, and soon discovered small holes through them, apparently pierced by an insect, but I could not find any. I informed a brother nurseryman of these facts, and he said that it was probably the effect of a disease with which the trees were afflicted before they were brought to this State but which did not appear, as they were taken up in the fall, and kept in a cellar until spring, away from frost, and that the same disease existed in Eastern nurseries.

"The two hundred trees that I reserved were somewhat larger than those first planted. I set them out in my garden in a bed prepared for ruta bagas. They grew well and I budded them the following August, and nearly all grew, and they are now large enough to transplant into orchards. Ten or twelve buds died, but the disease did not appear.

"I planted, in both places, some native stocks brought from the woods, into which I grafted when setting them out in the spring. These never showed the least signs of disease, are now the largest of my trees, and are full of blossom buds. I think they will be exceedingly hardy as I have not lost by any disease whatever, a single tree from the thousand grafts in native stocks.

"I have seen, in the Town of Merton, a plum orchard, of fifty or sixty trees, that were planted in 1846 or 1847. The trees were of different varieties, brought from Rochester, N. Y. They were well managed for three or four years, but since that time, the farm passing into different hands, they have been neglected, and nearly all are now completely covered with the black knot. Some of them are dead, while others of the living are so covered with the knot that the limbs hang down from the weight.

"But two exhibit no signs of the disease, and of what variety they are I cannot say, as I have never seen fruit on them. These two trees are twice as large as any of the others, and generally blossom, but the fruit is cut off, probably by the curculio.

"Some object to my practice of grafting in the top, alleging that the tops will grow much more rapidly than the stocks, and thus be liable to break down. This I prevent by slitting the bark and heading in the long shoots in the spring; and if the crop of fruit is greater than the limbs can sustain, I tie each branch to the one opposite with basswood or hickory bark, thus obviating all danger of their splitting down. This I do in June, after the curculio season. In the spring I head in the top to balance the tree, and if it inclines a little I slit the bark of the hollowing side, giving a vent to the sap, and thus accelerating the growth of that side. If the tree is not balanced to my satisfaction by this course, I attach, by a piece of bark, a weight of stone or wood to a limb already fastened as above to one opposite. This will allow the tree to sway in the wind, and in one or two years it will be perfectly straight.

"The advantages of my practice are, that the trees bear fruit the second year; that they can be set between apple or pear trees in the orchard, until the latter require all the space, and that they bear every year unless the fruit is cut off by very late frosts, which can be prevented by mulching in the winter.

"You ask my views on the question of root grafts as contrasted with top grafts. In answer, I will give you the result of my observations. There are two orchards in this neighborhood, both planted in 1847. The trees of one, sixty in number, were budded and bore last year seventy bushels of the largest and finest apples. They have borne fruit three years, and only one tree out of the original number is missing, and that was killed by plowing. The trees are vigorous and healthy, and the orchard promises to be one of the finest in this section of the country. The trees of the other orchard, one hundred in number, were grafted in their roots. Some of them grew rapidly, others scarcely at all, and in three years ten had died. On examining these I found black spots on the partially healed ends of the limbs that had been cut off, and that the heart was dozy and rotted with a white rot to the ground, and that even the roots were thus affected. In the fourth year, three of the remaining trees had split open from the ground up, about two feet. In the fifth year two, and in the sixth, three more exhibited the same appearance. During this time, some five or six had borne fruit. Last year they yielded from forty to forty-five bushels of apples; but two of the bearing trees, English Russets, split down, and the heart was found to be affected in the same manner as the first ten were that died. Of the ten that split open, there are but three alive; and these are among the largest and finest in the orchard. In it can be seen trees of all sizes, from the necessity of replacing each year the dead with new trees.

"Both orchards were alike well taken care of.

"I think I can safely say, that those trees that are grafted or budded a short distance above the ground are more sure and hardy than those grafted in the roots. They are not as liable to crack open from the effects of the frost, because root grafts send out roots above the union and grow rapidly, forming a large pith and tender wood, which often does not harden before winter; and from being full of sap is in great danger of being injured by the frost. This injury occurs either in the bursting asunder or splitting of the tree, or else from causing it to exude a gum or varnish from the spots left bare by the pruning knife. On this last account many nurserymen discourage pruning.

"My opinion is, that our best fruit trees, of whatever kind, should be budded or grafted on native or seedling stocks, from one to three years old, and from six to twenty-four inches from the ground; since most of the diseases manifest themselves at or near the surface of the ground, and the grafting on native stocks will render them more hardy and better suited to our climate.

"All fruits that ripen by the first of October, I consider well adapted to the climate of Wisconsin, provided their wood also ripens by that time.

"Below is a list of varieties that have succeeded well here:

APPLES.

Summer Apples—Sweet Bough, Early Harvest, Summer Rose, Summer Queen.

Fall Apples—Fall Pippin, Gravenstein, Jersey Sweet, Maiden's Blush, Porter, Rambo, Spice Sweet.

Winter Apples—R. I. Greening, Esopus Spitzenburgh, Golden Russet, Seek-no-further, Twenty Ounce Pippin, Vandevere, Canada Reinette, Northern Spy, Hubbardston Nonsuch, Baldwin, Yellow Bell-flower, Peck's Pleasant.

PEARS.

Summer Pears—Bartlett, Bloodgood, Dearborn's Seedling, Tyson.

Autumn Pears—Flemish Beauty, Seckel, Oswego Beurre, Louise Bonne de Jersey, White Doyenne, Beurre Diel, Buffum.

Winter Pears—Easter Beurre, Winter Nelis, Passe Colmar, Beurre d'Aremberg, Columbia St. Germain.

"Quinces thrive well, only in marl-soil or in a hard sub-soil. Nearly all plums do well except the late varieties.

"Some early varieties of peaches, such as Early Nutmeg, Early Sweetwater, Early Kensington, Crawford's Early, Early Red Rareripe, Early York, Early Strawberry, succeed well on wild plum stocks. They require a thin poor soil and the top of a knoll, or the north east side of a hill is the best location for them. When the ground is frozen in the fall the surface around the trees should be covered with chaff, saw-dust, or coarse litter, to the depth of three feet, until late in the spring, as the January thaws ordinarily start the buds which are killed by the succeeding cold weather. To raise peaches this protection is necessary.

"Cherries.—The Heart and Bigarreau varieties are very tender and require the same care and attention as peaches. The Dukes and Morellos are more hardy and the germ of the bud does not start as early as in the tender varieties. The Mayduke and Plumstone Morello are among the best. I saw last season only two varieties of apricots that fruited. They were the Moorpark, a very fine large fruit, and the purple or black apricot about as large as the horse plum. This fruit needs the same protection as the peach. Isabella and Catawba grapes also require protection on account of the late spring frosts. The Clinton variety generally does well. It is hardy and does not demand protection.

"Only a few kinds of gooseberries succeed here on account of the mildew. The Houghton Seedling, one of the best varieties, avoids this and does well. I raise the white and red Antwerp raspberries successfully. The Fastolf and Franconia canes freeze down in the winter.

"Almost all kinds of currants do well with a little attention.

"Of strawberries, the English Scarlet, Hovey's Seedling and McAvoy's Seedling succeed the best.

"Truly yours,

George P. Pfeffer."

To Albert C. Ingham, Esq.,

Sec. of the Wis. State Agr. Society.

Second best and largest variety of plums; E. B. Quiner, Watertown. $2.

QUINCES.

Best twelve quinces; John Bell, Gardner's Prairie. $2.

GRAPES.

Best exhibition of grapes; E. W. Edgerton, Summit. $3.

Second best exhibition of grapes; D. Blodgett, Beloit. $2.

MELONS.

Best exhibition of melons; E. F. Weld, Palmyra. $2.

PAINTINGS.—No. of Entries, 4.

Judges—Gen. William R. Smith, Mineral Point, Chairman.

Best crayon drawing; Mrs. E. J. Mosely, Oak Grove. $1.

Best oil painting; A. M. Morrison, Fort Atkinson. $1.

MISCELLANEOUS AND DISCRETIONARY.—No OF ENTRIES, 94.

Judges—CHARLES D. ROBINSON, Green Bay ; J. C. FAIRCHILD, Madison ; Gen. WILLIAM R. SMITH, Mineral Point.

Best parlor and cook stoves ; A. F. Cady, Watertown. Bronze Medal.

Exhibition of rape seed lamp oil ; Heber Smith, Watertown. $2.

Lewis' screw cutter ; Augustus Day, Detroit, Mich. Diploma.

Model of a wool press ; G. H. Canfield, Waterville. $2.

Best wash tub ; J. Crow, Center. $1.

Box of saleratus ; Jonathan Piper, Ixonia. $2.

Child's coffin ; H. P. Lester, Oconomowoc. $1.

Box of candles ; Willans & Grange, Watertown. $2.

Hinkley's patent elastic suspension bed bottom ; D. Van Derin, Milwaukee. $2.

Double barreled shot gun ; John P. Howard, Madison. Diploma.

Specimen of printing and printing materials ; Rufus King & Co., Milwaukee. Diploma.

Specimen of blank books ; Henry Niedecken, Milwaukee. Diploma.

Saw arbor ; J. W. Spencer, Watertown. $1.

Atkins' self-raking reaper and mower ; Chas. Davis, Chicago. Diploma.

Case of lightning rod points, &c. ; J. P. Poinier, Detroit, Mich. Vol. Trans.

Centre bridge tram block ; Ebenezer Brigham, Blue Mounds. Vol. Trans.

Pair of boots ; T. H. Buckingham, Janesville. Bronze Medal.

Portable Cider Mill, Corn Sheller, Cheese Press and Wool Packer, combined ; Daniel Kellogg, Saline, Mich. Diploma.

Family Carriage ; Charles Genung, Aztalan. Diploma.

SPECIAL MEETING, MAY 25, 1853.

Pursuant to a call issued by the Executive Committee, and in accordance with previous and public notice, the Wisconsin State Agricultural Society met at the State Agricultural Rooms, in the Capitol at Madison, on Wednesday, May 25th, A. D. 1853.

At 11 o'clock A. M., in the absence of the President and Vice Presidents, the Society was called to order by Albert C. Ingham, Corresponding Secretary, who, after stating that a Constitutional quorum of members was in attendance, read the following extract from the Charter recently granted by the Legislature of the State of Wisconsin to the Society, viz:

"§4. For the purpose of organizing said Society under this charter, and for the transaction of such other business as may come before it, the Executive Committee of the Soeiety may call a meeting of the same, at such time and place as they may deem proper, first giving due notice thereof."

And also the following extract from the records of the Executive Committee had in pursuance thereof, viz:

"At a meeting of the Executive Committee of the Wisconsin State Agricultural Society held at the Society's Rooms, in the Capitol at Madison, on the 11th day of February, A. D. 1853, on motion of Hon. Hiram Barber, it was

"Resolved, That the Corresponding Secretary be requested to call a meeting of the Society, to be held at Madison, on Wednesday, May 25th, A. D. 1853, for the purpose of completing the legal organization of the Society under the Charter, and for the transaction of other business; said meeting to be called as provided by Statute."

And also the following notice, and proof of publication, viz:

AGRICULTURAL NOTICE.

There will be a meeting of the Wisconsin State Agricultural Society, at the Society's Rooms in the Capitol, at Madison, on Wednesday, May 25th, A. D. 1853, at 11 o'clock A. M., for the purpose of acting upon the Charter recently granted by the Legislature, and for the transaction of such other business as may come before the Society.

By order of the Executive Committee,

Albert C. Ingham,
Corresponding Secretary.

Madison, Feb. 11th, 1853.

STATE OF WISCONSIN, }
Dane County. } ss.

John Griffith, being first duly sworn, saith that he is a printer in the office of the Wisconsin State Journal, a weekly newspaper published at Madison, the capital of said State, and that the advertisement, of which the above is a copy, has been published in said paper for four successive weeks commencing on the first of April, 1853.

JOHN GRIFFITH.

Subscribed and sworn before me, this 17th day of May, 1853.

ALBERT C. INGHAM, Notary Public.

Which several papers having been read,

On motion of Hon. Simeon Mills, of Madison, Samuel S. Daggett, Esq., of Milwaukee, was called to the chair.

The Charter of the Society was then read as follows, to wit:

"AN ACT to incorporate the Wisconsin State Agricultural Society. The people of the State of Wisconsin represented in Senate and Assembly do enact as follows:

"Section 1. The Wisconsin State Agricultural Society is hereby declared a body corporate and politic, and by that name it shall be known in all courts and places whatsoever.

"Section 2. The objects of the Society being to promote and improve the condition of Agriculture, Horticulture, and the Mechanical, Manufacturing and Household Arts, it shall be allowed for those purposes only, to take, hold and convey real and personal estate, the former not exceeding in value ten thousand dollars.

"Section 3. The said corporation shall possess all the powers and privileges conferred, and be subject to all the liabilities imposed upon corporations by the revised statutes of this State, so far as the same may be applicable.

"Section 4. For the purpose of organizing said Society under the Charter, and for the transaction of such other business as may come before it, the Executive Committee of the Society may call a meeting of the same, at such time and place as they may deem proper, first giving due notice thereof.

"Section 5. The said Society may continue to use and occupy the south east corner room in the basement of the Capitol until otherwise ordered by the Legislature.

"Section 6. This act shall take effect and be in force from and after its passage, and may be amended, altered, or repealed, by any future Legislature.

HENRY L. PALMER, Speaker of the Assembly.
DUNCAN C. REED, President *pro tem.* of the Senate.

Approved February 9th, 1853.
LEONARD J. FARWELL.

STATE OF WISCONSIN,
Secretary's Office,

I, Charles D. Robinson, Secretary of State of said State, do hereby certify that I have compared the foregoing with the original enrolled act deposited in this office, and that it is a correct transcript therefrom, and the whole of said original.

[L. S.] In witness whereof I have hereunto set my hand and affixed the great seal of said State, at the Capitol in Madison, this 13th day of April, A. D. 1853.

CHARLES D. ROBINSON, Secretary of State.

And the same having been read at length.

On motion of Mark Miller, Esq., of Janesville, it was resolved, that the Charter just read be accepted as the Charter of this Society.

The Corresponding Secretary then laid before the Society several amendments to the Constitution of the Society which had been drafted by the Executive Committee, at its meeting held February 11th, 1853, and which were read at length, and on motion of F. G. Tibbitts, Esq., of Madison, unanimously adopted.

On motion of Hon. Simeon Mills, of Madison, the Constitution, as amended, was then unanimously adopted as the Constitution of the Society under the Charter.—(For Constitution, see page 3.)

On motion of Hon. Ira W. Bird, of Jefferson, the Society then adjourned *sine die.*

SAMUEL S. DAGGETT, Chairman

ALBERT C. INGHAM, Secretary.

FINANCIAL EXHIBIT.

Statement of the Receipts, Expenditures, Disbursements and Financial Condition of the Wisconsin State Agricultural Society for the year ending December 31st, 1853.

INCOME.

From Life Members	$170 00	
,, Annual Members	124 00	
,, State of Wisconsin	1,000 00	
,, Miscellaneous sources	1,095 60	
,, Balance in Treasury Dec. 31, 1852	33 77	
,, Cash to balance	118 80	
		2,542 17

EXPENDITURES.

For Premiums	$415 00	
,, Expenses of the Fair	152 22	
,, Postage and Express charges	88 01	
,, Salaries	800 00	
,, Printing and Binding	115 30	
,, Library and Museum	70 13	
,, Transactions	285 66	
,, Tents	376 27	
,, Miscellaneous Expenses	239 58	
		$2,542 17

Excess of Expenditures over Income . $118 80

SIMEON MILLS, Treasurer.

We, the undersigned President and Secretary and Ex-Officiis Auditing Committee of the Wisconsin State Agricultural Society, do hereby certify that we have carefully examined and compared the foregoing statement with the books of the Society, and find the same full and correct, and the amounts therein given correctly stated; and we further certify that we find on file, vouchers for each and every item of expenditure therein given.

ELISHA W. EDGERTON, President.
ALBERT C. INGHAM, Secretary.

Madison, January 14th, 1854.

CORRESPONDENCE.

COUNTY AGRICULTURAL SOCIETIES.

COLUMBIA.

The Executive Committee of the Columbia County Agricultural Society met on the 14th day of June, 1853, at Wyocena, and decided to hold a Cattle Show and Fair, at that place, on the 28th day of September of the same year.

The Fair was held according to the appointment of the Executive Committee; and considering the short space of time intervening between the appointment of time and place and the holding of the Exhibition, the result was highly creditable and gratifying.

The number of entries amounted to fifty-seven, and were as follows: Horses, ninteen; Cattle, nine; Sheep, four; Hogs, five; Grains, two; Carpets and Blankets, five; Needlework, seven; Painting, one; Fruit, two; vegetables, two.

The premiums awarded to the successful competitors amounted to seventeen dollars in money; and in addition to that, eighteen volumes of Transactions of the Wisconsin State Agricultural Society, and thirty Diplomas were distributed.

The receipts of our Society, composed entirely of fees paid for membership, most of those being received on the day of the Fair, amounted in all, as the fund of the last fiscal year, to $30 00

The expenses are as follows :—	Premiums . . .	$17 00	
	Printing	11 00	
	Total		28 00
Leaving a balance in the Treasury of the Society of			$2 00

As the Executive Committee, at their meeting in June, made no arrangements for that purpose, we had no essay read nor address pronounced at our Fair.

At the annual meeting for the election of officers for the year 1854, the following gentlemen were duly chosen, viz :—President, Hon. Joseph Kerr, East Randolph.—Vice Presidents, Jesse Van Ness, Lodi; James T. Lewis, Columbus.—Secretary, Henry Converse, Wyocena.—Treasurer, F. C. Curtis, Rocky Run.—Executive Committee, James C. Carr, Fall River; Reuben McFarlane, Portage City; William Wiley, Centerville; J. F. Hand, Rocky Run; and Daniel S. Bushnell, Wyocena.

The Circuit Court of the county of Columbia was in session on the day of the Fair, and the attendance at the Exhibition was probably greater on that account than it would otherwise have been; nevertheless the friends of the Society were much encouraged and incited to renewed exertions to subserve the important objects which the organization seeks to attain. The horses exhibited were most of them very good, and would compare very favorably with those of any portion of the State. The cattle presented were fine specimens of the native crossed with the Durham breed. The sheep displayed were from the flock of E. H. & H. Scoville, of Lowville, and as specimens of the French and Spanish Merino they were probably unsurpassed by any in the State.

The aggregate of entries for exhibition was good, and gave general satisfaction.

Messrs. Morrison & Co. had on exhibition some steel and cast plows which were very superior articles, the best I have seen in the State.

Yours truly,

HENRY CONVERSE,
Sec. of the Columbia Co. Agr. Soc.

To ALBERT C. INGHAM, Esq.
Sec. of the Wis. State Agr. Society.

DODGE.

Dodge and Jefferson counties organized jointly an Agricultural Society, and held their Fair, for 1852, at Oak Grove, in Dodge county.

On the 22d of January, 1853, the Dodge County Agricultural Society was organized at the Court House, in the village of Juneau, and George W. Green, of Beaver Dam, was chosen President; Martin Webster, of Fox Lake, Vice President; Ephraim Perkins, of Juneau, Secretary; and Joel Rich, of Juneau, Tressurer.

The first exhibition of the Society was held at Juneau, on the 13th of October, 1853, and was completely successful.

The attendance was large, the display magnificent, and the effect cannot fail to be highly beneficial to the agricultural interests of our county. There were ab ut three hundred entries and about one hundred dollars were distributed in premiums. The receipts amounted to $121 75, and the disbursements, including premiums, were $113 75.

Our prospects are extremely encouraging, and the benefits resulting from the operations of the Society will be manifest throughout the county. The Society is young, but we are confident that its means of usefulness will increase with each succeeding year.

The annual election was held at the Court House, in Juneau, on the 12th of January, 1854, and resulted in the election of the following officers for the ensuing year:—President, Geo. W. Green, Beaver Dam; Vice President, T. B. Sterling, Iron Ridge; Secretary, E. C. Hull, Beaver Dam; Treasurer, Joel Rich, Juneau.

ADDRESS OF HON. SAMUEL L. ROSE, OF BEAVER DAM,

PRONOUNCED BEFORE THE DODGE COUNTY AGRICULTURAL SOCIETY, AT ITS FIRST EXHIBITION HELD AT JUNEAU, OCTOBER 13, 1853.

Gentlemen of the Dodge County Agricultural Society:

Called most unexpectedly to address you on a subject somewhat foreign to my usual sphere of duties and engagements, I am not a little embarrassed in attempting to speak before so large and intelligent a body of my fellow citizens upon the subjects and objects of our association; but willing at all times, and in all suitable ways, to contribute my mite to further its great and paramount objects, I have consented to lend my feeble efforts in this behalf.

Convinced most thoroughly, as I am, and as all must be who reflect that among all the claims presented for our serious consideration, societies of this description, if properly organized and judiciously conducted, are calculated to yield a larger return, a richer harvest and more positive advantage, for their cost, than any other of kindred character, I cannot feel other than a deep and abiding interest in their welfare and success.

Especially ought we, of this most highly favored and promising county, to endeavor, by mutually exciting a laudable emulation and a desire for the acquisition, cultivation and dissemination of information amongst ourselves, not only to preserve the exalted and most enviable rank we hold among our sister counties, but to make yet nobler and more effectual advances in our agricultural and industrial pursuits.

How extremely gratifying it must be to pioneer settlers of this yet new country, as they this day turn their eyes backward but a little and survey the past, reflect upon the present, and contemplate the future. They may challenge the production of a parallel in this or any other State of this broad and beautiful West. Fifteen years ago, and numbering all that claimed habitation within the limits of the county, only *thirty-eight* could be found. Thirteen years ago and only sixty-seven had made their homes in this county, while to-day it is safe to estimate it at not less than *twenty-six thousand* of as hardy, industrious and intelligent a people as can be found in any of the older States of the Union. We mark the change in the past with astonishment, and wonder what the fathomless future may develope. The history of that past which we have as a guide, gives only a faint conception of the great unknown future opening upon us, and to open upon those who are soon to follow after us. From that *past,* as we cast our eyes but a little farther backward, we can see that events big with interest to ourselves and our successors press rapidly in *its* footsteps.

The history of this Western Country is without a parallel in the annals of the world. It stands forth by itself unapproachable in its beauty, fertility and the rapidity of its settlement and subjugation to civilization and subserviency to the necessities and luxuries of life. Indeed we cannot find words to express our admiration as we contemplate these either singly or collectively.

Nature has here lavished her richest charms on every hand in luxuriant profusion. A sky of unsurpassed brilliancy; a climate as nearly faultless as any in our latitude, and a soil, whose surface is spread out in most inviting loveliness, deeply and richly laden with the most precious elements of productiveness, have not failed to present their attraction, and win to our soil occupants from the most desirable portion of community in the older and more densely occupied portion of the East, with a rapidity that has at once surprised and rejoiced the most sanguine friends of our new and rising State. But yesterday, where now are beautiful and highly cultivated farms, was seen a boundless stretch of green and unbroken prairie, clad in the wildest and richest garniture of nature. Where but so recently the white man had never trod, now cities and villages teem with happy throngs of contented inmates. Where but a few short years was an almost boundless extent of wilderness, known only as the wild haunts of beasts of prey and the untutored savage, now stretch out countless acres groaning under the precious burden of a well cultivated soil. Through the then trackless wilderness is laid the iron road, binding us in common bonds—over which is daily borne not only the rich productions of our virgin soil, but thousands rush to greet their once far distant, but now near friends, who have been left behind to prosecute the active business operations of life, or to seek other new and distant homes in the yet more distant West, which, before another twelve month, may teem with busy villages, and thriving and cultivated farms. Where to-day naught is heard but the solitary waterfall, the howling wolf, the screeching panther and the cackle of the wild fowl, in another year may be heard the merry whistle of the plowman, the hum of industry and the sound of the "church going bell!"

This is emphatically an age of wonderful, nay startling improvements and advances in the development of all the arts, refinements and improvements of life. The farmers of our country should be the last men in the world to be behind the times. Facilities for business of every kind, in its mode and application, are daily multiplying on every hand.

But recently a long and weary year would have been consumed by the emigrant seeking a home in what then was deemed the far distant West, now a single week will suffice to transplant him among us, in his new home, and surround him with all his earthly possessions. Then months might be consumed in communicating and receiving the most important intelligence—now the most distant friend can communicate his thoughts to us on the wings of the lightning. Cultivated and enlarged genius, and a growing spirit of enterprise, have accomplished the great improvements of the day.

At the very foundation of all our national and individual prosperity, lies our agricultural interests—and certainly, the agricultural should be nothing behind the very foremost in all the great improvements of this improving and progressive age. The avocation of the farmer is, allowing me to judge, at once the most useful, the most important, and the most honorable of the various callings of life. It should, and may be, rendered the most pleasant, and most productive source of wealth. But if this is to be attained, and it certainly is attainable, the farmer must keep pace with the great improvements of his day and generation. The means of enabling him to do so are at hand, and negligent indeed will that man be who does not seek to embrace them.

The farm and the farmer's house may be, and I doubt not frequently are, rendered the place of all others on earth the most inviting and enchanting; but to accomplish this, intelligence and thrift must be among its inmates. In this department of life, more than in any other, the former is an almost sure precursor of the latter, not only in intelligence and education in the particular business or avocation indispensable to success—but a refined and cultivated mind, at this day so easily attainable, is equally indispensable to enable us to make either profitable or pleasurable employment of the stores with which success may have crowned our efforts.

On this particular subject it is perhaps not my particular province to dwell; but I cannot avoid intimating as I pass, that at this day and in this enlightened age, when facilities are so universal and so cheap, for the acquisition of at least a thorough knowledge of the English language, and of the ordinary sciences, there is no sufficient apology for ignorance in either of these particular departments of education, and though perhaps those of us who are now on the active stage of life will be allowed to claim more liberal indulgences in our own behalf, we will not, nor will our children be allowed to claim it for themselves. The day, when ignorance in the rising generation can be winked at, is forever passed away—and those who neglect the proper culture of the minds of those of the rising generation given them in charge—will be looked upon as grossly guilty of violating the most sacred trust ever committed to their charge.

Prominent in their efforts and influence, in correcting and improving society in this respect, as well as in almost all others, are state, county and town agricultural, horticultural, and industrial societies. If those who should do so, sustain them, and as they should, their influence will necessarily be felt through a much larger circle, and more nearly amongst the entire community than if emanating from any other source whatever. This, coupled with the fact that the entire association of these influences is so intimately connected with the every day occupation, business and interests of those to be principally and primarily affected by them, renders them far more effectual in accomplishing this most desirable and important end. True, the great primary object of these associations is for the interchange of thought and knowledge upon the subjects of agriculture, horticulture, and the mechanical arts—and in this connection, they are by far the most potent agents to be employed. Of this no one can doubt. But their influences do not and cannot stop here. A spirit of inquiry once awakened, dies not away on the particular object of that special subject of inquiry. It becomes a living, breathing, moving and growing principle—extending and expanding to embrace all within the range of its vision.—And it is needless to suggest that the spirit of laudable and commendable emulation here excited, enters not a little into the impelling power, pushing us forward in the pursuit of knowledge. That "knowledge is power"—is a trueism too stale and common-place to need repetition. Equally true is it that knowledge is great gain, and if not wealth, it is the key which in the hands of industry and science, more than any other, unlocks and opens up to us all the exhaustless treasures of earth. It is the talismanic wand which in the hand of the artizan brings to view the hidden beauties, treasures and perfections of the art, and draws within the reach and grasp of its possessor the choicest blessings so lavishly bestowed for our common good.

These associations, like a great and exhaustless reservoir, become the common receptacle of all the knowledge of this entire fraternity, out of which each may draw an amount equal to the aggregate, for his individual advantage, and yet the source is neither exhausted nor diminished. It is a market place of exchange of this most valuable commodity, where each member obtains all of which his fellow is possessed, and retains undiminished all of his own stock. Certainly this must be a most profitable barter. No place presents greater facilities for the cultivation and display of good taste, or for personal enjoyment, than the home of the farmer. In no other division of either the industrial or professional pursuits of life, are its votaries allowed such uninterrupted domestic seclusion and relief from the perplexing cares, and numerous vexations, trials and disappointments of life which ever attend its more public, and consequently more dependent and servile employments.

If there are, in what are sometimes called the learned professions, a cognomen which should be forever abolished by way of distinction, more brilliant exhibitions of genius, popular laudations, the gratification of political aspirations and desires for distinction, professional or otherwise, there are by no means, and I say it without fear of contradiction, those more substantial elements of domestic or personal enjoyment, which alone can result from a contented and satisfied mind. The most successful school of the human mind, for the cultivation of these most desirable qualities or elements foı happiness, is the discharge of the varied duties, nay pleasures of the well conducted farm, farm-yard, garden and fruit-yard. That man who, in the exercise of sound judgment upon the honest convictions of unbiased reflection, should be left free to choose the pursuit of his life, if surrounded with the necessary health and means to enable him to succeed, could not fail, I think, to arrive at this conclusion.

The glittering baubles, gaieties, frivolities, and personal triumphs of life may charm and bewilder for the time, but they can never yield that rich harvest of contentment which alone is found in that most comprehensive word, Home. The shouts of the populace, and the cheers of the approving and flattering auditors may gladden the heart and exhilarate the feelings of the aspirant for public favor, but if possessed of those truly refined and ennobling feelings, which fit him for public trust, he will be strange indeed if he does not, like a Webster, prefer greatly his Marshfield; or like a Clay, his Ashland; or like a Jackson, his Hermitage; or like a Jefferson, his secluded and retired Monticello, to all the glitter and gladiatorship of the floor of the Congress of his nation. Who would not prefer the music of bleating flocks and lowing herds to the storms of political strife? and the music of loving voices, in his own quiet home, to all the sycophantic and senseless gratulations of a boisterous and heartless throng?

For one, I could not, would not claim a prouder descent than from the blood of the yeomanry of America. I would ask no greater boon than their invaluable approval and confidence, and would entertain no higher or loftier aspirations, than to seek to merit that approval and confidence. Let farmers but respect themselves and their high and praiseworthy calling, as *they* and *it* are in fact respected, and *half* the great work of their entire success as a class of community is perfected. Let them only apply the means in their own hands for their own advancement and elevation, and the great work is *all* performed.

Powerfully auxiliary to this association, if not indeed superior to it, are limited or more strictly local organizations in the several towns, or a collection of towns and communities adjacent. These should be formed and their maintenance regarded as a duty, most religiously to be observed. The frequent commingling of thought, and comparison of the successes of each other, in any given branch of business, would not only greatly improve and increase their agricultural knowledge, but would tend to promote more extensively the cultivation and dissemination of other branches of useful knowledge and information, running out into all the ramifications of society, and yielding to ourselves and to the rising generation the rich fruits of a well spent youth in mature years, so certain to result from well formed plans and designs for future usefulness.

Let no one feel that the general objects of these organizations are beneath or unworthy of his notice. Such an one has wonderfully mistaken, in his conceptions, the nature of true dignity. If he desires to be useful to himself and his own, and aid in greatly increasing the aggregate wealth, improvement and prosperity of community, this is, and must be, his most successful field of operations. The farmer alone is the producer. It is he alone that adds any thing to the great sum total of earthly wealth.—Not that I would by any means undervalue the usefulness or importance of any other profession or calling. Yet in comparison with the farmer, all others are entirely secondary, and although necessary and indispensable, they can of necessity do nothing comparatively towards increasing the aggregate wealth of our nation. If, then, the farmers, the producing classes of community, are the great sources upon whom community so largely depends for its present and permanent prosperity, how important that all the lights—of art, experience and science—should be brought to bear in their behalf, not only for the advantages which shall result to them individually or collectively, but as a matter of national and sectional policy.

I cannot dwell, or even enter upon the detail of plans for the future prosecution of our enterprise, so auspiciously begun. That should and must come from abler and fitter hands. More immediately from your own ranks, as farmers, can be called hundreds in our own county, who can do this subject that substantial justice which neither time nor ability have allowed me to undertake. But if, in the infancy of this great project, I may in the future be permitted to indulge in the pleasing reflection that I have, in any manner contributed to its success, I shall feel that I have not lived in vain—that the world, though perhaps in many respects the worse, is, at least in some, the better for my having lived in it.

If from this beginning, the fathers and mothers, sons and daughters of this community shall be encouraged to persevere in well doing, then the few hours which I have been permitted to devote to the imperfect arrangement of these few desultory and disjointed thoughts will not have been spent in vain. Some small portion of that large debt of gratitude due from one so unworthily indulged with so large a share of your kindness, liberality and preferment, will be paid in a manner most satisfactory and gratifying to myself. Let the unexpected success with which these our beginnings have been attended, serve as encouragements to stimulate us to yet greater efforts in well doing.

With this days' exhibition of industry, agricultural skill, and improvements, all must be greatly pleased. It is only a harbinger of that with which the future is so richly laden. If our county is to preserve its present rank, "as the first agricultural county in the State." it will needs be at the expense of continued industry, enterprise and the acquisition and diffusion of useful knowledge, and its faithful application in the field, the farm-house, and the work-shop. A superabundance of all these *elsewhere,* will not, *cannot,* accomplish the object. The work is all our own. I know those I address too well to doubt its fulfillment.

FOND DU LAC.

The Fair of the Fond du Lac County Agricultural Society was held at the city of Fond du Lac, on the 27th and 28th days of September, A. D. 1853. There were two hundred and twenty three entries for exhibition, being a large increase over those of the preceding year. The exhibition was well attended notwithstanding the forbidding state of the weather, which doubtless prevented the attendance of many. The total receipts of the Society were $174 86.

The address was pronounced by C. B. Hawes, Esq. of East Randolph, and is spoken of as a very able effort pointing out, in a practical way, the road to improvement in agricultural science.

GREEN.

In this county an Agricultural Society has been formed, and its first Fair held, during the month of September, 1853. A report of its proceedings has not been received, though it is believed that its Fair was very successful.

JEFFERSON.

In this county a Society was organized in the early part of the year, and a Fair appointed to be held at Fort Atkinson during the month of September. At this Fair there was a good attendance, and much interest manifested. No report, however, has been received of the proceedings.

The officers elect for the ensuing year are as follows:—President, Milo Jones, Fort Atkinson; 1st Vice President, Peter Harsh, Milford; 2d Vice President, Justice Carpenter, Palmyra; Treasurer, George P. Marston, Fort Atkinson; Corresponding and Recording Secretary, S. C. Writer, Fort Atkinson; Executive Committee, C. Bartlett, Milford; H. H. Wilds, Koshkonong; John Wentworth, Koshkonong; N. P. Parsons, Cold Spring; George Blanchard, Lake Mills; Girard Crane, Oakland; —— Dey, Hebron; Myron Smith, Sullivan; Eneas D. Masters, Jefferson.

KENOSHA.

No report has been received of the operations of this Society for the year 1853, though it is believed to be in a flourishing condition. The Fair was held in the month of September, and is represented as having been highly successful. Hon. Nathaniel B. Clapp, of Kenosha, is the President of the Society for the year 1854.

RACINE.

The annual meeting for the election of Officers for the Racine County Agricultural Society was held at the house of Jesse D. Searles, in Yorkville, on Monday, January 3d, 1853.

The meeting having been called to order by J. Mott Titus, Esq., of the town of Racine, Ezra Birchard, Esq., was chosen President pro tem.; D. D. McEachron, Vice President pro tem.; Albert G. Knight, Recording Secretary pro tem.; and James Russell, Jr., Corresponding Secretary pro tem.

On motion of J. Mott Titus, the Society proceeded to the election of officers for the year 1853.—Hon. Stephen O. Bennett, of the town of Raymond, was elected President; Wm. Ballack, of the town of Dover, Vice President; Daniel D. McEachron, of Yorkville, Treasurer; Philo White, of the city of Racine, Corresponding Secretary; and Albert G. Knight, of the city of Racine, Recording Secretary; with an Executive Committee composed of members from each town in the county.

The third Annual Fair of the Racine County Agricultural Society was held on the 28th and 29th days of September, in accordance with the appointment of the Executive Committee. This Fair was not, perhaps, quite as successful as the two preceding ones, attributable, doubtless, in some degree to a dissatisfaction which prevailed, in the western part of the county, at the location of the Fair, which was not central, and partly to the fact that the farmers were more delayed with their work than usual, owing to the difficulty of procuring help, caused by the demand for labor on our rail roads and other public works. The attendance on the second day was quite large; the people, however, came more as spectators than as contributors to the general display.

The exhibition of horses and cattle was very good, and of an excellent quality, comprising a number of colts, of two and three years of age, which would be creditable to any section of the State. Much competition prevailed among the owners of cattle, and there was quite a large representation of the pure breeds on exhibition. As by our premium list no distinction was made between different breeds of cattle—all breeds having an equal chance according to their true merits; the Durham and Devon cattle came directly in competition as imported blooded stock; and it was found by the report of the committee that the Durham was the favorite breed—that breed invariably taking the first premium and the Devons the second.

The display of sheep was not large, but those on exhibition were of a superior quality. The Leicesters were very large and well formed, the owners deserving much credit for procuring stock of such superior quality with which to improve our flocks. J. W. Freelove exhibited some very superior French bucks and ewes, which will, no doubt, prove a great acquisition to our county. There were one hundred and thirty four entries in the different classes for competition, besides a large number in the ladies' department, from which we have not the returns. This department has for the two years last past been under the exclusive control of the ladies, they receiving a small admittance fee to the Hall in which their contributions are exhibited, and awarding the amount received in premiums as they think proper. The amount received by them in 1852 was about twenty five dollars, and about the same at the last Fair; this feature in our Society appears to give very general satisfaction.

The number of entries at the Fair of the preceding year was one hundred and fifty four—making a difference of twenty in favor of the previous exhibition. The premiums awarded and paid amounted to sixty four dollars, in addition to forty copies of the Transactions of the Wisconsin State Agricultural Society.

The Executive Committee made the experiment at the last Fair, for the first time, of awarding a copy of the above Transactions in lieu of a small cash premium, and it succeeded, giving very general satisfaction to the successful competitors.

The address was delivered by Gen. Champion S. Chase, of Racine, and was well received by the numerous listeners.

We feel encouraged and strengthened in the belief of the beneficial effects of the Society at the present time; and have high anticipations of its progressive usefulness.

At our first Annual Fair there was a very good exhibition of stock of various kinds, as far as regards numbers, but we could boast of but very few of the improved breeds; at the last Fair, however, the tables were turned, and blooded stock—the Durhams and Devons—formed a large proportion of the cattle exhibited, and, as before remarked, many were superior animals of their kind. As it is the sole intention of organizations of this kind to improve the standard of agriculture by exciting the pride of the farmer in procuring the best seeds and fruits, imparting useful information regarding their proper adaptation to the soil, and their most successful mode of culture, besides stimulating the farmer to the rearing of choice stock; we can but believe that the vast improvement in agricultural products and blooded stock, as evinced by our last Fair, is attributable in a great degree to the efforts of our Society.

The receipts of our Society for the past year have been about one hundred and forty dollars. We are not able to report the exact amount, as the Treasurer did not attend our annual meeting and present his report as is customary.

The following is a list of the officers for the year 1854:—Henry Collins, Caledonia, P. O. Racine, President; Charles McEachron, Yorkville, Vice President; Eliphalet Crane, Racine, Treasurer; Charles Clement, Racine, Corresponding Secretary; John F. Gray, Whiteville, Recording Secretary.

S. O. Bennett, President.

ADDRESS BY GEN. CHAMPION S. CHASE.

DELIVERED BEFORE THE RACINE COUNTY AGRICULTURAL SOCIETY, AT ITS THIRD ANNUAL FAIR, SEPTEMBER 29, 1853.

Gentlemen:—As your President has stated to you, owing to a misunderstanding in regard to the respective duties of the officers of your Society, scarcely a week has elapsed since I was first solicited to address you on this the occasion of your Annual Fair. This fact alone will relieve your minds from any fear that I am about to inflict upon you a lengthy essay upon farming, even had I the ability or disposition so to do—and much less will you expect from me any occult theorizing, or attempt at profound reasoning, on the great and I believe now well defined science of agriculture. Still, having been bred a farmer myself, it has afforded me not a little pleasure in the last few days to fill up the leisure left to me out of the duties of my present profession, with endeavoring to arrange a few thoughts upon the subject which particularly interests us at this time, so that I could present them in a manner to meet your approval and thus to make them in some degree, however small, of benefit to you, the industrial citizens of our county.

Taking actual observation of other instances of promiscuous gatherings of equal size with this in our State, as the criterion by which to judge, and we shall find that all of the New England States, New York, Ohio, and Pennsylvania—yes probably all of the Middle States, most of the Western and some of the Southern States, as well as England, Scotland, Ireland, Germany, Wales, France, Norway, and perchance, a dozen other foreign countries are represented here to-day by their sturdy sons and fair daughters—men and women who have experimentally tested the old adage—"where there is a will there is a way," by leaving home, friends, and all the charms of their native lands, to seek their fortunes in this, the far off West—this, may we not without boasting say, Garden of the World. Here, we meet on common ground—live under the same free government, enjoy alike the immunities and privileges of American citizenship; here "sit under our own vine and fig tree, with none to molest or make us afraid."—Freed, as far as may be, from oppressive taxation and the direct bearing of the burdens of the government—permitted by liberal laws to choose our own rulers in our own way—every man, however humble by birth, an heir to the highest official position in the land—religious liberty and the freedom of speech and the right to petition the government for a redress of grievances guaranteed to us by the Constitution, what more could the most exacting man ask to make him contented with his temporal lot, or lead him to believe that of all the various occupations of life the pursuit of agriculture, amid all these privileges, when properly followed, is at once the happiest, the highest, and the most ennobling calling man can adopt.

The intermingling of Nations, as we find it in this western country, and the ultimate and consequent intermarriage of their various descendants, is doubtless calculated by the fixed laws of nature, to benefit our race and to make it not only physically, but intellectually, greater and still more powerful. Then for our own good as a nation as well as from a principle of hospitality, which we have ever been wont to cherish and exercise towards all exiles from countries swayed by despotism, let us welcome to these western shores, the oppressed of all lands who come to seek an honest livelihood and enjoy the benefits of religious and civil liberty.

No standard of wealth and social refinement is too high for the people of this country to aspire to, with industrious and temperate habits, with their productive fields and increasing flocks and herds, and last but not least, with their present system of common schools open to all, and freed as far as possible from the stigma of caste, where the poor as well as the rich may come to improve their mental natures. What if languages as numerous as the confusion of tongues at Babel are heard there at first, at last, like so many rivulets from the hill-side, they mingle into a vast and mighty stream, that but one voice can control, and that

> "The ENGLISH, great and glorious tongue,
> That Chatham spoke, and Milton—Shakspeare, sung."

No business at the present day yields a better or a surer profit than farming, though in this, as in other pursuits, there may be injurious competition. Too many in one region may enter upon the cultivation of the same kind of crops, producing when successful, such an abundance in the common market, that the price is materially lessened; and when not successful, all sharing alike the troubles attendant upon a failure. Every farmer should give attention to the raising of a variety of crops, at least one kind that his neighbor does not. It is well known that till within a few years, farmers in this section of country gave their attention almost exclusively to the culture of wheat. For several years a partial failure in the crop reduced them to an extremity. Farms were mortgaged, and every means used to get a living and still retain the homestead. Truly a hard lesson to be learned by experience, but in this case, as in most others, it was the best school master. Necessity drove agriculturists into the raising of a variety of crops, and the rearing of stock; and now they are reaping the abundant benefit of this experience.

We need no greater evidence of the truth of this assertion than the show here to-day. It speaks for the farmers of our county no mean encomium. No part of our State can produce finer horses, cattle, sheep, hogs and fowls than these. Some of them have been procured at great expense and trouble. To that farmer who is willing to spend his time and money introducing the best specimens of imported stock, and the best varieties of grain and fruit, belongs no small meed of praise.

This is an age of progress—not alone confined to the dissemination of new theories and the blotting out of old ones in the moral, social and political world, but as well in the scientific discoveries and real advancement that has been and is being made among and by the laboring classes. Here and there have arisen among them individuals who have learned to appreciate the dignity of labor, and the beuefit of the aids and helps which arise from the creative talents of man. And is he not of incalculably more benefit to our State who spends the gifts his Creator has bestowed upon him, in studying out the best methods to ameliorate the condition of the laboring classes, by putting in their hands the means of securing the greatest profits with the least labor, than is the other who is incessantly talking of the hardships inflicted upon the laborer, and the difficulties under which he strives, without once attempting practically and by his own efforts to ameliorate his condition? Every man who discovers a way to produce a greater result with less labor, is a benefactor of his race. No class of men have so great an opportunity to make improvements in labor saving machinery as farmers have. Much of their labor is such that the hands can be kept busy at physical toil, while the head not in the least hindered by the hand may be planning and maturing some important discovery. Heretofore most of the improvements in agricultural implements have been made by practical mechanics. I ask you, farmers, if this is not permitting the mechanic to get a little the start of you? If you cannot build, you can at least invent. To be sure your interests are joined with those of the mechanic; he builds your implements of husbandry and prides himself in excelling the rest of his craft, in the beauty of finish and strength of structure he gives to his work. These he exchanges for your products and thus keeps up the activity of trade. The display of mechanical art exhibited here to-day, fully demonstrates that we need be no longer dependant upon the East for any kind of mechanical work, though the exhibition in this respect is by no means what it should be, or might be, if our mechanics had brought in their handiwork.

The many improvements in farming tools, the introduction of the best breeds of stock, and scientific discoveries in regard to the nature of soils have combined to render the pursuits of agriculture profitable, beyond any other kind of business, taken in the aggregate.

Farmers have made themselves well off, rich even, and remained so till the laurels of a green old age have strewed their pathway to the tomb, in more instances than any other class of men. Cases are rare to be sure where they have become suddenly rich, and from the nature of their business, this must be so; but let them use the same amount of head-work that the merchant or mechanic is obliged to, or fail in business, and then see in whose favor the scale turns in the long run. Is it not true that a majority of farmers act as if they thought that all that was necessary to raise a crop was to put the seed in some way into, or partly into, the ground, and then wait for Providence to furnish the harvest? Allow me here to put another question. Why is it that a few among you thrive so abundantly and get rich so fast, without seeming to make any great effort, while the greater portion remain about so so, raising enough to live upon, and not much, if any more? Is it all luck and Providence? Does not the same beneficent Being "send rain upon the just and upon the unjust?" In seeking for the solution of these queries you will be likely to find that the man who makes farming his study—who reads agricultural papers and strives to profit thereby, who investigates the nature of soils and endeavors to adapt his crops to those best suited to them respectively, who cultivates a variety of products, that he may secure at least some good ones, and last but not least who bears in mind the old almanac saying—

> "He who by the plough would thrive,
> Himself must either hold or drive,"

is the man who always has a little change in his pocket and every now and then adds a forty or eighty to his already capacious farm.

Travellers passing through the western country make the remark that we cultivate no fruit; and there is truth in the remark, for compared with what we should, we indeed cultivate no fruit. No more profitable crop can be raised, and yet because it takes a few years to perfect an orchard, or a vineyard, few undertake it. Living as the farmers of Racine county do, where fruit of all kinds may be taken to market, ripe, fresh, and as fine as when hanging on its native branches, and with the near prospect of access by railroads to several good fruit markets, the culture of fruit demands their great attention. The present season has done much to demonstrate that this is truly a fruit climate, and that ours is a fruit soil. More beautiful peaches, apples, pears, plums, grapes, cherries and other fruits cannot be found than have been grown this season in this county :—And in one of these varieties, the plum, we may safely challenge the Union to the production of finer specimens. Affording, as our State does, a native plum of excellent qualities for preserving and cooking purposes, and even for eating fresh from the tree, it is but natural to conclude that our cultivated varieties would be superior. Ours, too, is a natural grape soil. A few acres of this delicious fruit, cultivated with reference to the market for table use, might be raised upon almost every farm in the county, and at an annual nett profit of hundreds of dollars per acre. And the same may be said of fruits in general. Add to the idea of making money by fruit culture, another far more important one, viz: that ripe fruit is a panacea for diseases, and especially for those common to this climate, instead of being, as some have thought, the cause of the disease; and who that cares for the greatest and best of temporal blessings, HEALTH, will longer be without it, if it be in his power to raise or procure it. Can there be any other reason why fruit has been so little cultivated here than the obvious one, that men make haste to be rich, and are not willing to wait a few short years till trees can grow to make them so. Living for the present only, they forget that those are to come after them who may enjoy the fruits of their labor, if they do not; as they now enjoy the benefits of the toil of their predecessors. Is it not beneath the dignity and nature of man to live for himself and the present alone? The beast of the field do as much.

Three-fourths of the population of the United States is made up of families engaged in agriculture, while the other fourth is scarcely less interested in it than if actually following it as an occupation. Not a man, woman or child who lives in a civilized state, eating, drinking and dressing according to the habits of civilized life, who is not dependent upon the farmer. Little as those who fill up our large towns think of this and care about the seasons or crops, let but a year of famine come, or even a cold season like that of 1816, and the tongue of hunger would speak in trumpet tones of the interest of all classes, high and low, rich and poor, in the science of agriculture. The story which you have all heard of the woman who said that "she did not care how short the crops were for she *bought* her bread," has its parallel in no small number of cases, among those who seem to think, that, as a matter of course, they shall have the early and the latter rain, and that crops will continue to grow and flocks to increase.

Agricultural education, a most powerful aid to the farmer, has been much talked of in this country, but has received little, quite too little practical attention. In some parts of the old country, schools and colleges have been established and endowed with professorships in which, the principles of scientific farming are taught, and most valuable results are realized from them. (One of these schools at Cirencester in England, has six professors, 700 acres of land, and 200 students. At Grignon, near Paris, the French have a still more flourishing school. The farm contains 750 acres and the school has sent out 600 students. The system of study embraces a great variety of scientific and mathematical branches, and is equal in amount to the usual college course.) It is within the memory of many present, when no one thought of obtaining a liberal education unless he intended to enter some one of the learned professions, or at least to become a teacher and educator of young men for college. Now numbers and graduated annually at our colleges whose highest aim is to become successful farmers. These young men carry with them to the pursuit of agriculture, a vast amount of scientific information which they make at once practically useful. There is no good reason why farmers should not be thoroughly educated before entering upon the active duties of their calling. A great share of our legislators, our law makers, are farmers, and they are liable at any time to be called upon to perform the most responsible duties for their country and their fellow men. This fact should stimulate the sons of farmers to obtain the best education the country affords as far as their means permit; and it should also encourage their parents to give them the best chance they can at school. It ought to be a matter of mutual congratulation to the citizens of this county, that in the college located at their county seat, provision has been made by the forethought of Dr. Park, its able President, for young men to take a scientific course of two years' study—one, peculiarly adapted to aid them in the pursuits of agriculture.

If we look for the great men of this land—men whose statesmanship has influenced, almost controlled a nation, yes, whose power has been felt beyond the seas, carrying with it the glorious principles of freedom and free governments, we shall find that they, in many instances, are the sons of farmers. And why should not the farmer be the most learned of men? Who like him has the opportunity of studying all that is great and glorious in nature? Everything about him conspires to elevate, ennoble and refine: the tiny violets that look timidly up from his garden walks, the old oak that spreads its branches fearlessly aloft to catch the swift lightning or the dread tempests of heaven, the gurgling spring, the winding rivulet, the silver lake, and the glossy pebbles that lie along its shore; and the finny tribes that gambol in its waters—the rock that some mysterious power has rent in twain—these vast prairies that tell of lakes, perchance of seas, that rolled their crested waves far above where now lie cultivated fields—these artificial mounds grouped here and there like the tents of wandering tribes, covering themselves with the soil of ages, upon the summits of which stand majestic trees, whose circles number centuries, and beneath the roots of which lie buried the bones of mighty warriors—the sun that shines by day—the moon and stars that illume the night—the deep blue sky, and fleecy clouds above him—each blade of grass that springs unnoticed by his silent paths; these, all these teach him a lesson: any one of them contains a mystery that the mightiest intellect in the land might well be proud to solve. Can man be constantly surrounded by things like these and not grow wiser and better?

A false impression in regard to the dignity of labor has obtained to no small extent in this country, and it has worked its own peculiar evils. Of the two, these evils have been the most serious among that sex, which is naturally the most modest, retiring and anxious to please. Though less in the West than in any other part of our country, they are not entirely wanting here. They are seen in that unwillingness to be found attending to the duties of the household, that hurry-scurry that follows the sudden advent of a visitor—every thing that would betoken labor being quickly put aside, even to the hiding of one's self for a season in order to appear in a dress and style better suited to the ball room than the kitchen. It is not with pale faces, delicate hands, curls, silks, satins and ribbons that men of sense are pleased. Fops, who twirl bronze headed canes and sport gilded chains are the creatures that these, the offspring of a sickly sentimentality attract. Nature's noblemen, one good opinion from whom is worth ten thousand half-starved compliments from a dandy, care not for the exterior if they but find real worth within.

Nature has so fashioned us, that physical labor is congenial with our health and happiness. No one can fully enjoy the functions of life, without bodily exercise—not only exercise, but labor, such as strengthens and perfects. Where do we find that blooming cheek, that smiling face, that agility of limb, that tell of health, happiness and native beauty, if not among those who labor in the open fields and fresh air of the country?

"In ancient times, I've heard my grandam tell;
Young maids were taught to read, and write and spell,
(Neglected arts! once learned by rigid rules
As prime essentials in the 'common schools.')
Well taught besides in many a useful art,
To mend the manners and improve the heart,
Nor yet unskilled to turn the busy wheel,
To ply the shuttle or to twirl the reel,
Could thrifty tasks with cheerful grace pursue
Themselves 'accomplished,' and their duties too."

The numerous presence of the ladies here to-day, attests their interest in the occasion and is much to the encouragement of their husbands, fathers, sons and brothers, in the calling which they have chosen.—Whatever cause the ladies espouse is sure to possess zealous and devoted patrons.—The influence of woman, is everywhere potent for good or for evil. It is her lot and sphere, to act the part of the good Samaritan; and human nature is such, that kindness will influence it when nothing else can. It is her nature, and consequently her pleasure, to attend to the wants and necessities of suffering humanity.—Where care and sorrow is, there she is found a ministering angel, forgetting her toil till she has rendered relief to the distressed. This character gives her an influence far greater than that wielded by man. She is, in fact, the "power behind the throne." In whatever sphere, then, the duties of life call her to act, let her fearlessly fill it with all that independence and dignity which is the glory of TRUE WOMAN.

There is an undeveloped power in the American agricultural mind that should not longer lie buried deep in the dark recess of devotion to mere physical labor.—Great as have been the improvements of the last few years in farming, they are by no means commensurate with the progress that has attended the other branches of the arts and sciences. The ice is broken to be sure—farmers no longer laugh at a man because he takes an agricultural paper and talks now and then about "book farming." To understand the best methods of renewing soil and restoring it to its pristine vigor when once it has been impoverished, is a knowledge that should be in the possession of every cultivator of it. Western farmers, with all their boasted confidence in the never failing nature and capability of prairie soil, will yet have occasion to use all the information they can procure in order to raise from their farms the same amount of crops that they produce now. It is nonsense to talk of taking 'splendid crops' out of the soil without decreasing its productive qualities. Time will show how true this is, unless by means of manure and other appliances, the farms of this country are kept up and preserved in their present healthy condition.

To this day mere physical labor has been idolized, while study—scientific investigation—has been considered of quite too little importance by and among the masses. Farmers must encourage this spirit of investigation among themselves. If they wait for commercial cities to move in this matter, they will wait forever. Strange as it may seem, large towns do not see how closely their interests are connected with everything that has to do with raising crops and rearing flocks and herds. They never seem to consider, that when the soil is impoverished it is a direct injury to commerce, manufactures and trade; that it injures the professional occupations, and all the interests of civilized and enlightened society. But so it is.

When the American armies entered Mexico during the late war they found the Mexicans using a pointed block of wood for a plow, attached to the horns of the ox that drew it by thongs of raw hide, and guided by a handle driven into its top. This kind of plow had been in use among this people ever since, and before Cortez decoyed Montezuma from his golden halls, fought and defeated him, and thereby became the Conqueror of Mexico, more than three hundred years ago. At first thought it would seem strange that a civilized people in the nineteenth century should continue to use as one of the most important implements of agriculture this rude antedeluvian plow. But a second thought will reveal the reason. Mexico has been embroiled in wars internal and external ever since her conquest by the Spaniards. Her people have suffered from all the evils of these wars, not the least of which was an oppressive taxation. On the contrary, the inhabitants of our Republic have been almost free from war since their first great revolution, which left them in the full enjoyment of Republicanism. From the organization of government, its great men, led on by our Washington, have done much to encourage agriculture, and to make it what of right it should be, the twin sister of commerce, manufactures and trade. The government has also done much to advance this, the leading pursuit of its subjects.

Societies for the promotion and study of agriculture have sprung up in all parts of our land, and the result has been greatly beneficial to the producing classes. They have been the prime means in bringing about that advancement and progress in agricultural pursuits, which the last half century has witnessed. Other means too have done much to aid the same cause. In every direction the arts of peace are extending the strong arm of help to those who depend upon the cultivation of the soil for a livelihood. One of the most powerful of these is the railroad, with its iron horse, traversing and re-traversing the broad acres of more than five millions of farmers in the United States. It brings a market to every man, or if you choose, brings every man to market. Even here, where less than a quarter of a century ago, the white man had no fixed habitation, no fields of waving grain, or roving herds—the untiring energy and enterprise of the day has discovered important channels of trade, and is fast putting upon them those conveyances that bespeak a ready market to every producing man in the country.

What—with the agitations that are moving the old world, and are likely to continue for years—the wars and rumors of wars, like those predicted to come in the latter days, all tending to the benefit of the American farmer, so long as peace stays at home; what—with all these, over and above the natural opportunities for securing wealth, possessed by producers at all times—you may not expect of benefit, advancement, and ultimate success in your occupation, I leave you to judge. Of one thing you may rest assured, that all your labor to promote the interest of agriculturists will be a thousand times repaid, not only in your own day, but in years to come when your descendants shall fill the places you now occupy, and meet to celebrate for the hundredth time the anniversary Fair of your society.

Long ere then—bonded as she is—on the East by Lake Michigan, on the North by Lake Superior, on the West by the Mississippi River; all navigable waters, that connect, or soon will, without interruption, with the most important cities in the nation—with a soil almost inexhaustible, extending throughout her length and breadth—with her copper, lead and iron mines, that ere long will freight a fleet in a single day—with her railroads to take her products from her centre to her ships at her shores, Wisconsin will have become second to no State in the Union in her agricultural, manufacturing and commercial interests; and by the law of progress, she will stand in the centre of that grand galaxy of States which will then form a Republic—not only stretching its strong arms from the Atlantic to the Pacific, but counting its Stars from Hudson's Bay to the Gulf of Panama.

ROCK.

The operations of the Rock County Agricultural Society for the past year have been characterized by the same spirit of improvement that is so manifest in all departments of industry throughout our country.

Progress has not only been its watchword, but its history. The prediction of the result of its labors would have been pronounced visionary, but now the gratifying realizations are before us.

Our premium list for the year 1852 amounted to $300, which, together with our incidental expenses we had paid, but we were obliged to commence the present year with a treasury nearly empty, and without any fixed locality at which to hold our Annual Exhibition, or any fixtures, &c. We, however, published a premium list offering premiums to the amount of twelve hundred dollars; and notified the public that a Fair would be held at Janesville, on the twenty-sixth, twenty-seventh and twenty-eighth days of September, 1853.

A few of us then negotiated for a site for permanent Fair grounds, and purchased it, agreeing to pay $100 the first instalment, at the close of our Fair. We also incurred an additional bill of $400 for fencing and other expenses for nails, posts, labor, &c., making a clear indebtedness of more than $700, to be indemnified for which we depended entirely upon the generosity of the farmers and mechanics of Rock County. At the time appointed we opened the grounds for the exhibition of the various products of the Society, and our farmers and mechanics—and our citizens generally—were *there*. They came nobly to the rescue, and we realized from the proceeds of the Fair over $800. Our grounds—containing eight acres—were quite too limited, and many of our farmers talked strongly of moving an amendment by adding four additional acres.

Our show as a whole, considering the inauspicious circumstances under which we commenced the year; and the uncertainty as to its result which enveloped us up to the day of the Exhibition, was a magnificent one; and the display in many departments, could not be outdone west of Lake Michigan. Our friends from adjoining counties contributed not a little to heighten the interest. We had sixty-six entries of horses, over one hundred in number, and comprising some of the best blood in Wisconsin. Twenty-five entries of bulls, oxen, and cows, numbering over fifty head; and a finer collection of "blooded" animals in proportion to the number exhibited, is seldom seen. There were also entered some fine sheep, sixty in number, of the French and Spanish Merino breeds principally; and we think it highly improbable that better bucks and ewes can be found in this State than were entered at our Exhibition. The number of swine exhibited was not large, though the Suffolk and Berkshire breeds, in quality, were well represented.

The poultry department was well filled, there were about twenty-two entries; containing fifty-five 'fancy birds,' besides numerous other classes of fowls—ordinary and extraordinary, comprising all grades, from old fashioned Dominiques to the *supremest of the Celestials*; and no part of the grounds was more frequented than that occupied by the poultry. Of farm products and garden vegetables, there was a good display.

A few samples of butter and cheese were offered. This department was not as fully represented in quantity as we could have desired, but the cheese was none the less "Hamburgh," and the butter none the less "Orange" because they had the good fortune to be manufactured in Rock County, Wisconsin.

The exhibition of farming implements and mechanical productions generally, was quite good. There were some fifty entries in this department; and the quality of the articles displayed, indicated a disposition on the part of our mechanics to be ever ready with improved and perfected implements of husbandry to meet the demands of our progressive state of agriculture.

The domestic and home manufactured articles were very good. The ladies evinced by their skill and industry in supplying this portion of the representation of universal labor with splendid carpets, coverlets, bed spreads, blankets, flannel and the indispensable fabrics of the knitting-needle, a spirit of laudable improvement that is 'faster' than the age.

Flora was not forgotten at our Fair. Flowers, the 'softer sex' of nature's garden, were there in all their variegated beauty, and fanciful hues brilliant and subdued, blended together they made a scene that angels might behold and smile to see, fragrant alike they shed rich perfume around the wreath-encircled shrine, and greeted the votaries of the floral goddess with a delicious odor.

Ornamental painting and needle work formed a marked feature of our show. Also millinery, dress-making, and plain sewing, added no inconsiderable amount to the general interest; and here, let it be recorded, that the ladies performed their part in the collection and arrangement of the articles for this most successful exhibition, admirably and worthily, and are entitled to many thanks for the interest they added by their contributions and presence.

The specimens of fruit on exhibition were highly creditable to the incipient orchards of our thriving State. The different kinds and varieties of each were in just the right proportion to make up a collection which an amateur would be delighted to study, and perhaps long to taste; nothing could be more encouraging or gratifying to the farmer of Wisconsin who has long been deprived of the delicious products of the orchard, than to be assured by the handsome display at our Fair, that a very few years would suffice to place Wisconsin as a fruit-growing State in a position to defy competition. There were about twenty entries of apples and other fruit, comprising a large range of varieties and divisions of each.

The plowing match came off with spirit and energy, and gave general satisfaction. The President's address was pronounced on Tuesday afternoon of the second day of the Fair. There was a large attendance of people, and every one seemed animated and pleased with themselves and 'all the world besides.' Buoyant confidence and brilliant hope were the marked features which characterized the twin face of agriculture and mechanism.

The expenditures of the Society for the fiscal year ending December 1853, are as follows:

Purchase of lands for show grounds . . .	$101 87	
Fencing and permanent fixtures	559 31	
Printing, clerk hire, and stationery . . .	115 44	
Premium list	400 00	
		$1,176 62
The net income of the Society for the fiscal year ending December 1853, is		842 54
Amount of Society's indebtedness . . .		$334 08

Yours truly,
JOSIAH F. WILLARD, President.

To ALBERT C. INGHAM, Esq.,
Sec. of the Wis. State Agr. Society.

ADDRESS BY HON. JOSIAH F. WILLARD,

PRESIDENT OF THE ROCK COUNTY AGRICULTURAL SOCIETY.

Gentlemen of the Rock County Agricultural Society, and Mechanics' Institute, and Fellow Citizens:

Again the Anniversary of our Society is here. Again we are met to exhihit the products of our industry and skill, and, for a brief hour, to relax from our cares and labors, and indulge our *social* natures in making the acquaintance of our fellow laborers—comparing notes of experience and joyfully anticipating the future. And though not honored with the presence of a Seward, or a Greeley, to add the enchantment of their eloquence to the scene; yet we, as farmers and mechanics, can, I have no doubt, contrive to interest ourselves on such an occasion as the present, and derive both pleasure and profit from the interview.

We would not, however, depreciate or disparage the influences produced by the eloquent addresses of such men as we have mentioned. But in our particular case we conceive our very pursuits and profession have sufficient in them to inspire us with all that is necessary to enable us to appreciate and enjoy most fully our annual festival. Farmers and mechanics have, within themselves, resources for enjoyment which other classes of community do not so eminently possess. The few remarks we shall offer at this time will be confined principally, to our prospects, present and future, as farmers and mechanics of the West.

Probably the farmers of Central and Southern Wisconsin have endured more hardships, combated with more difficulties, and surmounted more obstacles, in establishing themselves in their present circumstances, than those of almost any other portion of the State. With a soil and climate unsurpassed in richness and fertility—our prairies needing but to be plowed and sowed to yield up their abundant treasures—with our broad meadows affording the finest grazing for cattle and sheep; all the favors which nature could lavishly bestow upon any country, in her kindest mood, we have enjoyed—with our granaries full and running over; with all the appliances necessary to feed and clothe a nation; in the midst of an abundance we were poor—dwelling in the very sunshine of nature's richest smiles, darkness brooded over our future. "One thing was needed." We needed connections with the world outside. We needed a market. Yet, amid the days of discouragements and hardships, our people clung to their Wisconsin homes, with a tenacity equalled only by that of the natives, our predecessors, who could only be expelled from these beautiful groves and plains by force of the white man's arms. We spoke of dark days—we mean, of course, commercially. They are of but too recent occurrence to be forgotten; we all recollect them well. Waiving further reflection on them, we turn to contemplate the *present* and *future.*

It is only by comparison and contrast that we know one set of circumstances to be better than another. It is by this means only, that we arrive at a knowledge of the fact that progress is made in any department.

Now, to ascertain whether as farmers and mechanics we are advancing; whether we have reason for brighter hopes, and whether we are actually any better off, upon the whole, than we were one year ago, we have only to compare the present with our circumstances at that time. Let us see.

One year ago we had no more access to the world at large than we had ever here enjoyed. Our marketing was done in the old style, of drawing away our farm products over rough roads to some lake port, or selling them at home for such prices as buyers were pleased to give; the proceeds of sale to the farmer, after deducting expenses, being in either ease, scarcely enough to keep body and soul together. Our supplies were obtained through the same tedious process, and cost us too much to be used with profusion. Trade, in all departments, was languid; mechanics were out of employment, and our towns exhibited an apathy and dulness in perfect keeping with the rest.

What have we now? The iron horse has made his way hither, and as he snuffs our prairie breeze, his exhilarating neighings have awakened the slumbering echoes of our beautiful valley, and hope and courage seem to have taken possession of every heart. We have the sea-board at our doors; our surplus products are now transported to market with the speed of the wind, and the returning train comes to us loaded with the necessaries and luxuries of life. Our grains which were a drug in the market, a year ago, at much less than a remunerating price, have advanced from 50 to 100 per cent. Trade flourishes; mechanics are fully employed; and our towns exhibit a vigor and activity unparalleled since the settlement of the country. Life and health, determination, confidence and joyousness brighten every countenance. I rejoice to see the contrast, visible even in the very faces of the people, as exhibited to-day, and one year ago to-day. We seem indeed a new people; and let me say a youthful people. The present state of things is not, however, altogether attributable to the cause before alluded to. Other circumstances in addition have largely contributed to our present prosperous condition. For instance, the present year is one in which Providence has richly rewarded the labors of the husbandman, in giving bountifully of the "kindly fruits of the earth." Farmers have turned their attention to raising a greater variety of products; the good results of which have in turn given them confidence, and inspired them with hope, so indispensable to the attainment of prosperity.

If a partial market for a few months, and a few favoring collateral circumstances, so change our prospects, what are to be the glorious results of Wisconsin's future? What will a connection with Chicago, and thus with the whole East and South, do for us? What the completion of our Southern Wisconsin railroad to Dubuque, and our Valley railroad to Fond du Lac? A brilliant career is before us, and we seem already to have caught its inspirations, as the improvement in our animals, manufactures, and farm products, compared with those of last year, unmistakeably indicate. All evince advancement, improvement, progress. That our soil and climate are admirably adapted to the raising of the finest horses, cattle and sheep in the world, is demonstrated beyond a doubt, and that we can compete successfully with any country in producing pork, butter and cheese, is no longer a problem. And should the farmers of Southern Wisconsin and Northern Illinois, turn their attention mainly to the rearing of cattle, sheep and hogs, they would, from their geographical location, and other advantages, be able now to compete with any portion of the United States, in supplying the markets with beef, pork, wool, butter and cheese, and eventually to monopolize the business in all Eastern markets. When our projected railroads are completed, which I may say will probably be sooner than most of us expect, we shall have the choice of an eastern, western, northern and southern market, direct. Our beef, pork, butter and cheese we can send to New York or Boston, to San Francisco or Puget's Sound; our wool where we please, or keep it at home to supply our own manufactories; our flour and grain either east or south, as the market promises best: if to the south, to exchange for cotton, sugar, and coffee, all from first hands. The former we will manufacture here into its various fabrics, and the manufactured article again exchange for more of the raw material; and thus on, until our commerce with the south will rival New England, and draw largely from her overgrown incomes obtained from southern trade. Our own Wisconsin will be sought as the summer home of the Southerner in pursuit of health, relaxation and enjoyment. Our sunnier sky, and more healthful climate, will be more grateful to him than all the East affords. And in this connection may I not be permitted to suggest the thought that perhaps an intercourse, and acquaintance between Mississippi, Alabama, and Georgia, and other Southern States and our own section of the Union, would be promotive of the best results. Might it not tend to do away with those prejudices and asperities which have, for so long a time, been cherished between the North and South. Is it too much to hope that the North-west will yet be the great pacificator between the two, and by its kindness, forbearance, and practical example, win the South to adopt to some extent our usages and customs? And thus the iron bonds which shall unite us physically and commercially, serve the double purpose of making our interests, feelings, habits, identical.

Were we to attempt to describe the probable results and improvements which will occur to Wisconsin, or even to Rock county, during the next five years, from causes now being put in operation, we might be ridiculed as an enthusiast, a visionary, or one insane—we shall attempt no such thing. Yet, although we may not set ourself up as a prophet, or the son of one, we may judge of the future somewhat by the past and present, and our opinion, based upon those data, is, that we are destined to have some few years, at least, of prosperity and success. I know that some, and persons too, whose opinions are entitled to consideration, think that we may be, even now, on the eve of a revulsion like that of 1836, and give, as reasons, our great indebtedness abroad and enormous extravagance at home; that soon we shall be pressed to pay our foreign debts, and then the crash will come, for, say they, 'it was just so in 1836 and 1837.'

It is doubtless true that our foreign indebtedness is large, and doubtless quite too true, that our people are growing extravagant. I think though, our Wisconsin farmers have not justly exposed themselves to such a charge. But all that does not make out a similar and analagous case to the times of 1836. Then speculation was the order of the day. Then it was no uncommon occurrence for a man to become a millionaire before breakfast, in buying and selling corner and water lots in some city in the moon, or other out of the way place. Banks were as plenty as grasshoppers, and issuing their rags by the million, without a dollar in their vaults to redeem them. Farmers and mechanics left their business and turned speculators; labor ceased; every body was about as a gentleman, expecting to stumble upon a sudden fortune. Labor, in fact, by all classes was esteemed to be disreputable, and a man was considered below par who could not get rich by his wits. Such a course could but bring ruin and bankruptcy in its train, and the sequel showed that not only individuals, but entire States, were engulphed in the general overthrow and destruction.

Now the times have taken an entirely different phase. If we have a large foreign debt, it is not mainly for gew-gaws, but for real substance—for railroad iron and the like, every pound of which enriches the country, and renders it better able to pay the debt, than to do without the article. All the foreign debt incurred in this way, will eventually be an income.

Our other indebtedness, we may say, will cause us no inconvenience, as we have the money to pay it. Our capital now is *bona fide* money. Our legitimate bank paper is founded upon facts, and our bankers would almost as soon issue gold dollars, as paper ones of their own.

One great cause of the present safe state of things is, that the golden streams of California, Australia, and other places, are pouring their swollen torrents into the *world's treasury*, and thereby adding untold amounts of real capital to the already ponderous mass of wealth; and the rapid expansion of business, and the great railroad impulse, are but natural effects growing out of the circumstance that capital is accumulating and must be USED, to render it of any value.

Another, and perhaps *more important* cause upon which we rely for the safety and perpetuity of our present and future prosperity is, that the present is an industrious, toiling, working age. Men have thrown sloth and idleness to the winds and adopted the adage that "God helps those who help themselves." They have gone to work with a will. We are just beginning to realize some of the good results, but a tithe of them is not yet developed. Labor creates capital, and capital in turn demands more labor. Thus labor and capital go hand in hand, each aiding the other, and together working for the common weal.

Without labor nothing can be accomplished. It is a pre-requisite of well-being—the *sine qua non* of health, wealth and happiness. True progress does not consist in obviating the necessity of labor, but in changing, by means of improvement in the arts, its character, and rendering it more conducive to the supply of the wants and comforts of man, and to the development of his mental and moral nature.

So long as the present causes continue their operation, we need not apprehend danger of any considerable change. Our prosperity is not fictitious. The age has received its momentum and will not be liable to stop at once. The question for us, farmers of Wisconsin—farmers of Rock county in particular—to settle is, what course shall we pursue to avail ourselves of the largest advantages to be derived from the anticipated "good time coming," when our railroads and other improvements are completed? We answer get *ready* for *good times*. Have plenty to *sell*—again we say, get ready for *good times*; for times have been so *bad* heretofore, that we are altogether unprepared for *good* ones.

The *more* we had to sell, the *worse* we were off, as every bushel of grain raised and sold by the farmers of Rock, till within a few months, has made them poorer. The same may be said of beef and pork. Now we ought to raise all the cattle, horses, sheep, and hogs we possibly can, and, at the same time, improve the blood of all as much and as fast as circumstances will permit. At all events, do something in that department, for it is easier to raise good animals than poor ones, and certainly they are more marketable. In order to carry on the wool, pork, and stock business profitably, we must have more fencing—I mean *inside* fences. The farmers of Rock Prairie, and even of Rock county, have, comparatively, but little inside fencing; for the want of which we lose nearly one half of the real income of our farms, every year. And, in addition to this, our farms are deteriorating and running down in their fertility, by not pasturing sheep, cattle, &c., to enrich and keep the land in tilth. Farmers will find it much more profitable to raise more corn, oats, barley and rye, and feed it to their farm stock, thus retaining at home the means of perpetuating the fertility of their soil, than so much wheat raising; though wheat raising must receive its legitimate attention.

Another important item in a preparation for good times, is a much more improved system of farming generally. Our grounds must be more carefully prepared—more pains taken to procure good seed—and a frequent exchange of seed, especially of wheat, will be necessary. Again, we need better fixtures and conveniences for feeding our hogs, sheep and cattle; we suffer a very great loss annually by feeding upon the ground, as a majority of farmers have been obliged to do. The fattening of hogs, especially, without good pens and floors, subjects the farmer to 100 per cent. loss in the food, besides he can never make as good pork. And, finally, we need good teams, good tools, good men, and a reasonable amount of resolution, and then go ahead.

One thing more, farmers should keep well posted up in respect to the markets. They, of all others, should not be caught napping over this subject. Our produce dealers are, many of them, we are happy to know, honorable men. Others, we are sorry to say, are sharpers, and farmers must look out for themselves. In order to do this every farmer should take at least one good agricultural paper, in addition to his other newspapers, and study it well. It will pay for the trifling investment better than almost any thing else.

There is one subject, without alluding to which, an agricultural address would be out of fashion—I mean the subject of government aid, in establishing agricultural colleges, schools, &c. Agricultural addresses abound usually in arguments in favor of the measure. Governor's and President's messages are considered quite incomplete without recommending something of the sort. Our State Legislatures and Congress go to work and introduce bills, and have long discussions upon the subject, but, in the end, nothing is done. The buncombe capital is manufactured—members have exhibited their *extreme regard* and *affection* for the farmer, and the thing is put over to furnish a theme for the speech makers of the next session. Such being the fact we shall pass it over without remark. * * * *

Mechanics have something to do to get ready and be prepared for the times we are anticipating. They must tax their skill and ingenuity in producing better implements for the farmer, and should immediately augment their facilities for manufacturing *five* times the amount they have usually furnished. The farmer will need them. The *inventive* capabilities of our enterprising mechanics should be laid under tribute to develope new improvements in labor-saving machinery—to form new combinations of the mechanical powers, and apply them for their own and the farmers' benefit—thus co-operating with him in bringing to light the hidden resources of our luxuriant soil.

We are gratified to know that the mechanics, especially of Janesville and Beloit, are moving in the matter. At the former place, the mechanics feeling the importance of greater manufacturing capabilities to meet the increased demand, are about oiganizing a joint stock manufacturing company, particularly for agricultural implements, on a large scale. And we have no doubt but the patronage of the farmer will be commensurate with the enterprize. The efforts of the mechanics of Rock county, heretofore, to supply tools, &c., have been highly commendable, and should not be forgotten. But a golden harvest lies before them if they keep pace with the wants and necessities of community.

The merchant need not be idle, as his business operations can be somewhat improved, and must be, to meet the large demands of the times.

Large sales and small profits must be his motto, especially if he would make it an object for farmers and others to do their trading at home. Merchants understand this, and we have no doubt they will be on hand with full supplies, and cheaper than the cheapest.

The learned professions, too, will find it necessary to brush up a little—to make some additions to their capital stock. The lawyer will have to apply himself to his authors to ascertain what kind of advice to give his clients when times are prosperous, and everybody too good-natured to quarrel.

The physician will be compelled to invent a new sort of remedies, as the ailments and diseases of community will be quite changed, and a new regimen and treatment will be necessary, instead of prescribing to men in the lowest stages of hypochondria, induced by *hard times*, his patients will be full of hope—full of money-making projects—and anticipating a long life of prosperity. We expect our physicians will adjust themselves to the circumstances, and have the *panacea* ready.

And the clergy, too, must prepare themselves with new motives and arguments to keep the people from wordly-mindedness, and teach them how to enjoy the good things of this life, and to use them in a proper manner; as they hitherto have taught them how to bear the misfortunes and hardships of former times, and it is hoped that they themselves, in turn, may participate and share largely in our temporal prosperity.

And to the ladies we hardly know what to say. They are always so near right, it is hard to find an opportunity to make even a suggestion for improvement. We expect them to be first and foremost in every good enterprise—thank them for the interest they have manifested in our Society from its commencement—crave their continued co-operation, and hope the good we anticipate to ourselves may not be without its particular benefit to them.

Ane now, in conclusion, permit me to say, it is the high privilege as well as the sacred duty of every one of us, to labor for the improvement of ourselves and each other, and endeavor, to the utmost of our ability, to leave the world at least a *little* better than we found it. But, in order to succeed in this effort, we must cultivate other provinces of thought than merely those which belong exclusively to the development of our knowledge of the external world. There are other regions of a higher and holier nature, without the cultivation of which no *true* progress can be made.

I thank you for your attention and patience, and wish you for the coming year, and for all years, abundant store of life's best blessings, and every success in the pursuits of honorable industry.

SHEBOYGAN.

No report has been received of the operations of this Society for the year 1853.

WALWORTH.

The Society in this County having failed to make any report, we are without information as to its prospects or success.

WASHINGTON.

I have but little to say in answer to your favor of the 15th December, 1853, asking a report from the Agricultural Society of Washington County. Our Society was organized one year ago, and I regret to say that its progress has not been commensurate with my expectations.

The farmers of this County do not pay proper attention to, nor take sufficient interest in, the welfare of the Society to insure its immediate success. Their neglect is excusable inasmuch as it is attributable to the nature of the country, which is heavy timbered, requiring great labor to clear it, and prepare it for yielding crops; in so much that a great many of our farmers cannot actually spare time to devote themselves to the acquisition of agricultural knowledge. The want of the requisite agricultural information is seen in the course of our farmers in planting their soil with the same seed year after year—not allowing the land to be strengthened and rejuvenated by that judicious rotation which is indispensable to the preservation of the soil in its native vigor and richness; and although our land, in consequence of its extreme fertility, continues to yield rich harvests of the same grain for a series of years, still the time will come, when by this course the soil will become exhausted, as it inevitably must be, and our farmers will feel seriously the want of that information which it is the object of the Agricultural Society to impart.

No premiums were awarded at the Fair, in consequence of the insufficiency of the funds.

It is an astonishing fact, that in our Society there are only two American born members, the remainder are all Germans, and on that account the address of the President at the annual meeting was delivered in the German language.

The officers of the present year are:—President, Jared W. Natting, Young Hickory P. O.—Secretary, Charles Walfrum, West Bend P. O.

WILLIAM ROHN, *President.*

To ALBERT C. INGHAM, Esq.
Sec. of the Wis. State Agr. Society.

WAUKESHA.

The Waukesha County Agricultural Society held its Annual Fair at Waukesha, in the month of September, 1853. No report of its operations has been received, though it is believed to be in a prosperous condition.

COMMUNICATIONS.

WISCONSIN FARMING—ITS CHARACTER AND ECONOMY.

BY D. J. POWERS, MADISON.

About twenty years have elapsed since settlements were first begun in Wisconsin, by the pioneer agricultural immigrants. From year to year this agricultural immigration has gone on, opening new farms and subduing new fields, until now almost the whole of the southern and eastern portion of the State are checkered by the fields, and dotted with the cabins and cottages of the farmer.

In numbers, we have probably increased more rapidly than any other agricultural people, that ever spread over a new country, even from the days of the patriarchs down to the present time.

Whether we have made corresponding progression in substantial agricultural improvements, rural economy, and good taste, will be the subject of our enquiry. Favored as we have been almost uniformly, with smooth inviting prairies, or with thinly timbered openings, presenting comparatively no obstacles to rapid, as well as productive and profitable improvement, it is but reasonable after an occupation of ten, fifteen, and twenty years, by an industrious enterprising people, even though poor in worldly goods at the outset, to expect that they will have accomplished much in the line of substantial improvements, both useful and ornamental; that farms on every side, and especially in the older settlements, would wear the appearance of an early ripening maturity; presenting well cultivated and well arranged fields, evincing good tillage, and a systematic and proper rotation of crops; well planted and thrifty bearing orchards, neat and well arranged buildings surrounded by shade trees, and above all, good barns and graneries, completed even to the doors. Such is true, of now and then a farm, but alas what distances intervene between them! It is a lamentable fact, but not the less true, that there is not, on an average, one real and true farmer, and one really well tilled farm to a township, taking the settled portions of the State throughout.

If this assertion be true, and I think no well informed and observant person will doubt it, it becomes important to know from what cause or causes this condition of things has arisen. (Just the opposite condition of things might have been expected, from a population as justly renowned for energy and enterprise as is ours; and doubtless this opposite condition of things would have occurred had farming, in its legitimate and true sense, been made the real and sole business of the immigrant to the exclusion of other and foreign speculations; unfortunately, however,) the immigrant no sooner arrives in the country, than the low price of the land, the great beauty of the landscape, and the fertility of the soil, combined with the natural spirit of acquisition in man, prompts him to buy all, and often much more lands than he can pay for, thus depriving himself of all means of improvement, and practically reducing himself to poverty, at least for the time being. (This, then, is too apt to be followed by a poverty of spirit, and an indolence and negligence of habit. But this inordinate desire for large landed possessions, often leads to other and kindred follies; prominent among which is, a disposition to improve

over

and till large farms, with scanty means. Instances of the kind can be found on all sides, presenting large fields half fenced and half tilled, overgrown with weeds and bushes, with the scanty crop when harvested, poorly stacked out of doors, liable to be damaged by the storms, and assailed by every unruly animal about the farm, until such times as the vagrant threshers can be obtained to thresh it. These are often a greater evil, although perhaps a necessary one, than a tribe of wandering Arabs; the amount that they scatter, waste and feed to their broken-down teams, leaving out of the account the uproar and confusion they cause about the premises, often of itself amounts to more than it would cost to thresh the grain, with a good machine and convenient barn.

The Stock department of the farm is no better managed, and perhaps even worse. The barn conveniences consist of one or more low, mean hovels, shingled with straw, with a few straggling rails, indicating the outline of a barn yard; the whole situated, perhaps, upon a bleak prairie or hill top, without even a tree to break the terrible force of a western wintry blast; and the whole, perhaps, surrounded and imbedded in all the manure that has ever fallen upon the premises, it being thought easier in the end to move the barn than the manure. Stock thus reared amid the bleak winds of winter, eating their food, which is probably miserable marsh hay, out of the manure, mud, and snow, without rack or manger, ought at least to possess the quality of hardiness, and can hardly be expected to possess any other. The difference between cattle bred in this way, or on the well adapted premises of a thorough Eastern farmer, is as great as the difference between a wild savage and a high-bred civilian. This style of farming may be in some degree excusable with beginners, who perchance may be too poor, or too ignorant, to know better. But it is hard to divine what good excuse can be found for those who have been on good farms for years, have possessed sufficient means to make ample and productive improvements, and yet continue in such courses. One reason often assigned is, that they intend to sell, and improvement will not pay cost. Another is, that times have been hard, crops poor, and prices low. No wonder that poor shallow unseasonable plowing and sowing with inferior dirty seed, is very apt, even on the best lands, to produce a scanty crop of poor grain; and even this it may be, is allowed to get wet, and grow, before it gets to market. No wonder, it brings a low price; a greater wonder that it sells at all. No wonder, that such management, or rather mismanagement, leads to hard times, especially when pursued from year to year without variation. The difference between such negligent, careless, want-to-sell-out, sort of farming, and that which is done as it should be, is as great as is the difference between folly and poverty, and prosperity and wealth.]

But as it is not pleasant, nor perhaps profitable, to dwell too long upon the dark side of things, let us turn for a moment and look at the bright side. Wisconsin can show a few good farms, and a few good farmers who do every thing as it should be done, and whose farming yields a pleasure and a profit.

I have such a picture in my mind at the present moment—let us look at it, and if perchance it proves the picture of the farm of any member of this Society he may of right feel a pride in it; but if on the other hand, he is one of 'the farmers' whom I have described, let him be ashamed, and mend his course at once. The farm in question, is in no respect better situated naturally than thousands of others scattered all over the State; nor is its owner a stronger or a more intellectual man than many of his neighbors, but fortunately what talent he has is enough, and of the right kind, to adapt him to his situation. His farm is his home to all intents, and he does not propose to sell it the very first time he is offered a few dollars more than it is worth. Fortunately for him, he is not cursed with the wandering Tartar spirit of most western Yankees, who at every prospect of making a sixpence, will sell their homestead and their all; bid good-bye forever to proven and cherished friends, to established comforts and blessings; taking their wives and their children, and starting again, like the savage, to bury themselves anew amid the deeper shades of the wilderness. Content with his own good homestead, though it does not contain quite all the good land in the neighborhood, yet he covets no adjoining 'eighty,' nor feels, as many are wont, that it is his duty to provide farms for all his children and grand children. Instead of buying more land, which he does not need, or putting his surplus money out at high, and perhaps illegal rates of interest, he uses it in improving, adorning, and beautifying the homestead.

A new house is erected, upon a pleasanter site than was occupied by the log cabin; a shady lawn comes gracefully down to the street, to which it opens through a gate, instead of a rail fence or pair of bars, which gate has a latch instead of a wooden pin. By the sunny side of the house, beneath the shade of a venerable tree, hangs a safe and commodious children's swing, which has cost him only a little labor on a rainy day, and which time is thus employed in preference to spending rainy days and hard earned money in country taverns and groceries, as is too often the case. Costing so little, who can tell the value of that swing to the young and so easily made happy rising generation? Just in the rear of the house is a well arranged, well stocked kitchen garden; in which the good lady of the house, who, let me remark, is not so good as to be good for nothing, like many of the fine rag-baby ladies of the present day, often spends an hour to the benefit of her own health as well as to the benefit of the garden. Just adjoining stands the orchard, a neat inclosure appropriated expressly to that purpose. The trees are fine, erect, and thrifty, some would have leaned, but they were carefully staked and tied upright in season; they are just beginning to bear profusely, and the quality of the fruit shows that the owner did not buy his trees of some miserable vendor travelling through the country, but went to a good nursery, and intelligently selected them—selecting those not only of good varieties, but of good quality and size; albeit they cost a little more. After being selected they were equally carefully transplanted and subsequently good care taken of them. No worms nest has found a resting place upon their branches from year to year, nor have they lacked for washing, scrubbing, hoeing and pruning—although this has all been the work of leisure moments. Now he is reaping a rich reward, and is almost envied by his neighbors, who consider him a wonderfully *lucky* man. They have always intended to plant orchards, and thought of doing it even before he set his, but never could quite get the time, although they have spent weeks and months of that time doing nothing, or that which was worse than nothing. One or two of them did set a few inferior trees, which they had a chance to buy cheap, and on credit, from a pedlar; but being set in the grass, strange to say, they did not grow, and after being run over for a couple of years by divers animals, and used as stakes to which to tie the clothes-line, they died—much to the disappointment of the owners, who, on the whole, conclude that their land was not well adapted to fruit growing.

On the right hand and left, out stretched, lie the well arranged fields, divided into convenient sizes with a main alley between them, leading to the pastures and wood lot. Each enclosure has a well hung gate, so knowingly adapted as to be sure to shut itself every time—saving all necessity of savage dogs, to worry and rend mischief-loving animals who walk in when they find the gate open. His neighbors still use bars, and some of them even continue to open the rail fence each time they pass, for the same old reason, that they never have found time to get up anything better—although some of them are carpenters and joiners—still they have spent perhaps a week each in the year taking down bars and fences.

Next let us examine the arrangement of the out buildings. First in order is the granary with its convenient bins and appointments, with hooks in the rafters, on which is hung carefully triced the well selected seed corn for the coming year. The whole superstructure is well elevated upon a good stone foundation, making it rat and mouse tight. Here the crops, well housed and secure from all harm, can safely await the proper time for market. No previously, and often needlessly contracted debt, for some idle superfluity or folly, compels their sale at a sacrifice.

Next in order is the barn, all complete even to the DOORS, not too large but well proportioned, with a good basement, giving a fine root house, and warm stables opening out into a capacious yard, inclosed with a high and tight fence, and over a portion of which temporary straw sheds are thrown, making warm shelters for the younger part of the stock, which are not fed by throwing their hay into the mud and filth of the yard, but into good, though cheap, feeding racks, so constructed that they can be easily removed from place to place; and thus admitting of being placed under shelter in stormy weather, or removed to drier locations, or arranged across the yard to subdivide it into smaller inclosures; his racks save fodder every year, enough to twice or thrice pay their cost; and yet his neighbors have never really felt that they could afford to get them up.

Everything about the establishment is carefully arranged with reference to saving all the manure. The cattle, instead of having to wander in inclement weather half a mile for water, or what is still more common, going without it, have a trough of easy access in the yard, kept constantly filled from a well, with a good chain pump, close by, and from which at any time their wants can soon be supplied. The straw instead of being left in unsightly piles, about the buildings and fields, too slowly moulder away, spreading the infection of decay about the premises, and encumbering an acre of land for years to no earthly use, is carefully stacked in long ricks through the centre of the yard, upon such a superstructure as will enable the cattle to eat from it for the whole winter between meals, thus saving one-half the amount of hay otherwise required, and all the waste. Then after having served as a dry and nice bed during the winter, it is well mixed with the compost heaps in the spring, and rendered a valuable manure. There is great economy in all this, as his animals, and his fields and crops will show. Still his greatly hurried neighbors never have time to properly stack their straw, or to make their compost heaps, and hardly time enough to get out their manure, some of them having wisely discovered that their land is rich enough without it, and that on the whole the manure is hurtful. Sage conclusion! time will teach them that manure is as valuable to Wisconsin lands as to any other, and that many crops can easily be doubled by its judicious application.

The corn crib, hog pen, and clover lot, are all so combined and arranged as to be well calculated to improve the breed of pigs.

In spring time, notice the way in which his work is done: the furrow rolls from his plow as if it were working in an ash heap, and the soil comes from the very bottom too, instead of skimming the surface. His seed, when brought upon the ground to be sown, is clean and pure, and of the right kind, having been selected and preserved in season, and from the very best. Thus, everything goes on harmoniously in season, and according to the most approved method; and the *lucky* man almost always gets a good crop, while his unlucky neighbors often fail; their wheat often turns to chess and oats, and their cattle often die of black leg.

What makes so much difference between these two kinds of farmers, beginning as they did under similar circumstances; is it all luck? to be sure it is; the good farmer had the luck to be born with a large share of natural industry, perseverance and prudence, whilst his slovenly neighbors were born with, or have acquired, habits of carelessness, probably of idleness, may be of laziness, although not conscious of it, by which they are prompted to try a great many other ways to make a living, except by hard work. Perhaps they have turned politicians, and hope to gain wealth and honor at the same time by fishing for paltry offices, amid the turbid waters, or rather whiskey of the grog shops and flunkey cross-road taverns ; idling away the long yellow days of harvest, amid the fumes of stale tobacco smoke, and *spirited* loafers, attending caucuses, and afterwards digging their potatoes with a crow bar, and husking their corn in the snow to pay for it.

Or, if not quite so aspiring, perhaps they have fixed up a horse team, or perchance a threshing machine, and are doing their neighbors' work instead of their own. Their own farm being of course neglected, and probably under a mortgage, at an exorbitant rate of interest for the horse team and the thresher, begins at once to assume all the signs and symptoms of premature old age—the work that is done on it being so poorly done, and done out of season, does not pay its cost ; and the improvements made are of such a shabby character, and so rapidly going to decay at that, as to cause the farm to decrease, rather than increase in value. Thus the mistaken man, though ranging over the country suffering hardship and exposure, under the impression that he is doing better than he could by attending to his own business, is actually, in nine cases out of ten, doing a great deal worse, and more likely than not, is paving the way to ruin, and a trip to California, which will be likely enough to prove a second death.

The time has already arrived, when every able-bodied man who has a taste and disposition to embark in that best of all business, farming, should, if he has not already done it, secure to himself a tract of land commensurate with his means and taste, being careful not to buy too much, especially on credit; and when the land is secured, and the beginning is to be made, let him go about it with industry, and a determination to do all that is done, as well as is possible under the circumstances. Let him see that his orchard is set early, and is composed of good trees if the number is not so great. Let him enclose the orchard and garden with a safe, if not a handsome, fence ; and let him make it holy ground into which no unclean beast can enter, except for plowing, and then only in careful hands. Let him lay off the ground, as fast as practicable, into proper sized fields ; and when they are sown or planted, let him be sure that it is done with good clean seed, and well done, even if the fields are smaller. Do nothing in the way of tilling the soil, by halves. Remember that ten acres well tilled will yield as much, and often more than twenty shabbily done, and at a double profit. Save all manure from the first, and distribute it carefully on those portions of the farm that will be most benefitted by it. Whatever is done in the way of procuring stock and animals, should be done as well as possible; if you cannot get the best breeds, get the best you can, and then improve them by good attention and good keeping. Keep no animal about your premises, even a pig or a chicken, that has not enough to eat, and comfortable quarters. No man is so poor, but what he can make some kind of shelter for his stock; but many are so lazy and shiftless that they do not. What kind of a christian can that man be who leaves any animal, dependent upon upon him for food or shelter, to suffer, when by proper care it could be avoided? I envy not such a man his humanity, his christian spirit, or his hope of happiness. In a word, let each farmer stick to his farm with a perseverance and determination of purpose, devoid of all idle dreams of selling, shifting or speculating. Let him take at least one good agricultural paper, and read it, and profit by its suggestions. One who does not do this, has no connecting link between himself and the more intelligent portion of his class, and 'is not posted up.' The farmer of the present day who does not read the papers, agricultural as well as political, and attend the county and state fairs, as well as the caucuses and elections, is an old fogy indeed, and a long ways behind the times.

One of the most gratifying signs of the times is, that not only the man of slender means, but those of wealth and affluent circumstances are turning their attention by thousands to the improvement of farms and to the various pursuits of agriculture—what more fitting or profitable employment for capital, or for gentlemen of taste and leisure? Is it not a perversion of correct taste that prompts so many hale, hearty and vigorous men, in the prime and manhood of life, to shut themselves up in the crowded cities, in dusty dirty offices and shops, to pursue uncertain vexatious professions and callings, to the exclusion of the more safe, noble and healthful employments of agriculture? That the employment of Father Adam and many of his noble descendants, is rapidly rising in importance and character, is a fact beyond question; and let us hope that the next few years will show abundant evidence of it even in Wisconsin, where the millions of acres of lands unsurpassed for beauty and goodness, under proper cultivation, will yield an amount of products as yet undreamed of.

As a wool growing State it hardly has an equal; its more elevated and variable surface especially adapts it to that purpose. How long can lands worth ten times the value of ours per acre, and inferior in quality at that, with longer and more rigorous winters, compete with us in growing wool? No longer of course than until our citizens can get fairly embarked in the business. Wool can be grown in Wisconsin for one-half the cost of growing it in the State of New York, and one-third of its cost in Vermont. What greater protection than this do the farmers of Wisconsin need; what better encouragement for killing off their worthless dogs and stocking their farms with sheep? The labor of wool growing is comparatively light and easy, the profits certain and large, the demand for wool unlimited, and the transportation easy and cheap.

Raising horses, mules and cattle must pay largely to all who embark properly, and who persevere in the business. Situated as we are, midway between the great eastern and rapidly growing western markets, it cannot be otherwise. Hitherto, Wisconsin has bought everything, even to its soap, candles and whiskey; its fruit, and this no small item either, and its manufactures of every kind. Millions of dollars have been paid out of the State annually for the lsst seven years for articles that might have been produced at home. This heavy and continual drain upon the scanty productive income of the State, has kept the masses of the people down to the very verge of poverty.

A new order of things is now dawning upon us; railroads are reaching their leviathan arms in all directions, doubling production and value whereever they go; and diminishing expense and inconvenience, in the same proportion.

Let us hope while all these favorable causes are awakening the whole population to double exertions, that an equal progress, in good taste and economy, will manifest itself on all hands and in all shapes, until our young but promising State attains to a fair youthful maturity.

Let our motto be "ONWARD," and our aim be to do what we do well; that our works may praise us, and "posteriy be constrained to rise up and call us blessed."

OPENING A NEW FARM.

BY BENJ. F. ADAMS, FITCHBURG.

Every wild and unsettled country has its peculiarities both of soil and climate, and these cannot be fully ascertained until tested by the experience of at least several years of permanent residence; when these are satisfactorily understood, its settlement takes place in proportion generally to its agricultural resources. The rapidity with which Wisconsin has been peopled, for the last ten years, by citizens from almost every State in the Union, and multitudes from the old world, furnishes abundant evidence that a high estimate is set upon its agricultural advantages. It is not boasting to say, that this State is deserving of an excellent reputation for farming purposes—the vast amount of produce that is even now yearly shipped from her Lake ports to the Eastern markets is the best evidence of her fertile soil and extensive resources which as yet are almost undeveloped beyond the mere commencement. The vast tracts of wild land yet remaining here contain millions of acres, and the greater part of these are susceptible of being converted into most productive farms. Why should those seeking a home in the West go beyond the limits of Wisconsin? I do not deny that a soil, equally fertile, may be found elsewhere, and wild lands at a less price, but these are more remote from good markets, and some years must elapse ere public improvements can be successfully pushed forward. In this State public works are progressing rapidly—a market is already at hand for all that can be produced—wild lands, though held above the original government price, are yet to be had at low prices—and the country has been settled long enough for farmers to have adopted a system of farming by which new-comers can profit. The importance of a knowledge of practical farming, in a newly settled country, is as essential as a knowledge of the best methods of renewing lands that have been long tilled. Those who have taken the prairie and oak-opening lands of Wisconsin in their native state, and gone through the process of making a farm, have some means of judging the best means of making, as well as managing, a new farm. Say what we may of the facility with which wild lands in this region can be cultivated, it is no easy task to change a wilderness into fruitful fields, whether that wilderness be composed of dense forests, like those which once covered all the hills and valleys of New England and New York, or exists in the solitude of a wide-spreading prairie—there are toils to be undergone and privations to be endured which pioneers well know, and which must be experienced to be fully estimated. The rough and hardy adventurer who prefers a home in some vast realm of solitude, is generally the first to penetrate an unsettled region and break the soil; going thither with limited means his operations are confined to his present necessities rather than extended to systematic farming, but his knowledge of pioneer life is well worthy of regard; his fruitful inventions to protect himself against the inclemencies of the seasons, and to provide the ways and means of living cheaply, would astonish those inexperienced. Place an Eastern man in a frontier settlement, one who knows only how to provide for his wants in accordance with established usage in the society in which he lives, and at first he would hardly know how to shelter himself from the elements—the necessity of a saw mill at hand to obtain lumber—of a shop and store to procure other necessaries for building, would so burden his mind that in the absence of all these he would feel unable to accomplish any thing. Not so with the knight of the frontier; with characteristic adaptation to circumstances his practised eye would soon select the most suitable spot to erect a cabin—his strength would quickly be applied to fell the ancient oaks. Nor would he, unaided by others, be wanted in contrivance to roll them into position for a rude house; without shingles, boards, or sawed rafters, his inventive genius would not hesitate to use poles for rafters, and the wild grass of the country for roofing, even if under the necessity of cutting it with his jack-knife. Wooden door trimmings, with deer-skin latch string, subserve the place of more costly ones. Thus would he soon find for himself and family a shelter from storms, rude enough, but still better than to be exposed in the open air to the rays of a summer's sun, or the rough blasts of an icy winter. Neither would he be unmindful of his cows and cattle—log stables would be made for them, and all the means in his power used for their comfort.

The first temporary structure erected for occupation, his next business would be to use that huge implement for stirring the unbroken soil, the breaking-plow; his oxen, few or many, are generally all used in this service. It requires considerable power to draw a plow, cutting a furrow 22 inches wide, with a beam sixteen or twenty feet in length; such were the kinds mostly used in the early settlement of Wisconsin, and they are very common at the present time. They turn a wide furrow, from two to three and a half inches deep, which will be quite thoroughly rotted in the course of twelve months, while the land will be in readiness for a wheat crop at the end of four months from the breaking. The pioneer, desirious of raising something as early as practicable for subsistence, often planted corn and potatoes as soon as the turf was turned over; with an axe or hatchet the seed can be placed in the soil, a stroke into it makes a place to receive the seed, which can be conveniently covered with the foot. He plants potatoes by dropping them and turning a furrow on them. Expecting a few bushels of corn to the acre he is not disappointed in harvest, but comforted with the reflection that it will materially aid him in beginning a farm. The corn will fatten some hogs, and the stalks will make excellent fodder for his cattle. The expense of growing such crops is trifling, since the planting and harvesting are all the labor demanded. The tough nature of the turf precludes the idea of pulverizing it till several months after plowing.

The first settlers in Central and Southern Wisconsin universally tried winter wheat for their first crop, and to a certain extent they succeeded in their efforts; for several years wheat was grown of an excellent quality, and a large yield obtained. In the month of September it was usually sown, and harrowed with such means as could be readily procured at that time—these often consisted of only a wooden toothed drag, a very inefficient farming implement. It required several trips across a field over the same ground, ere its marks were discernable, but it did its work in time. There were then less obstacles in the way than at the present time; the country, even in the oak openings, was free from oak bushes and underbrush of every description, so that in case of necessity a poor farming tool could be used.

The early settler having established himself in his cabin, broken the soil and put in his crop next turns his attention to fencing it, and providing for approaching winter. The first fences of a country are generally made without regard to the future, less attention being paid to economy in using timber; in fact, present necessities were the considerations that governed nearly all operations in farming, and the pioneers are well excused for so doing. Rails were the cheapest fencing materials in the early settlement of Wisconsin and I think are still in all those portions of the State where the expense does not exceed $4, or $4,50 per hundred, split and laid into fence; oak rails well laid into fence and kept in good repair will last many years. The reason that such fences often last for a short time only, is that weeds and bushes are suffered to grow alongside of them, and in addition they are often laid on small blocks of wood which, being in contact with the earth, soon decay, this has a tendency to rot the lower rails. True economy would require that all such contingencies be guarded against, and that rail fences be taken down once in five or six years and laid up again. Early settlers universally used burr oak rails, in consequence of the facility with which they could be converted into fencing material. Having taken one rail cut, the most that a single tree afforded, the remainder was piled in the field and burned, in accordance with the Eastern custom of clearing land. Better economy would have dictated to cut the tops into wood, and if not wanted for immediate use it might have served a useful purpose as a temporary fence, being laid into line in some convenient manner.

The clearing of land in the oak opening country has been a matter of so little consequence, that it has usually been done after the ground was broken up, and sometimes even after it was fenced. Many practised girdling the trees, and then allowing them to stand instead of cutting them down, where grain was to be sown—a practice that is not very commendable, to say the least. After girdled trees have stood one year, the timber becomes so very dry and hard that it requires double the labor to cut it that it did when green; besides such trees, standing in a grain field, are always a rendezvous for such birds as feed on grain. They look badly, and convey the idea of desolation. As much land as is designed for crops had better be cleared entirely of timber. The settlers on the prairie lands contiguous to timber used it in beginning farms for fencing, preferring it to any substitute. Some more remote from the openings threw up what is termed "sod fence," being made of earth piled up like a wall. This is now regarded as the poorest fence that can be built, for it is a well established fact that it will not stand any great length of time. The action of frost soon causes it to cave off and fill up the ditches on either side, and in a short time instead of a substantial fence, an irregular bank of earth is all that restrains flocks and herds from entering the field it incloses—a miserable impediment it forms for unruly animals.

The month of October, in the year of their arrival in the country, often found the early settlers of Wisconsin possessed of from forty to one hundred and sixty acres of land, a log cabin, a field from ten to fifty acres in extent, cropped with wheat. Think of this ye men who have toiled year after year to clear the heavy timbered lands of the Eastern States. First settlers even here had few idle hours, as may well be imagined, and it will not excite wonder that they did not find time to do their haying till October, a practice which many farmers still persist in following.

The wild grass that grows upon the marshes and prairies of Wisconsin has subserved an excellent purpose in the settlement of the country; a farmer could and can now drive here one hundred as well as five head of cattle, and have but little difficulty in obtaining hay to keep them; it should be cut, however, much earlier in the season than it is by many; July is the best time to make hay of wild grass as well as of timothy and clover. No one that is thoroughly acquainted with its nature pretends that it is equal to the cultivated grasses for fattening purposes, or to make cows give milk in large and rich quantities, but it answers a good purpose for grazing and fodder till other feed can be obtained by seeding. We cannot estimate the value to a new country of having natural meadows where large quantities of hay can be obtained for the mere labor of cutting, and which will afford sustenance for as much stock as a farmer may choose to bring with him to the country. What could a farmer, emigrating from New England to Central New York fifty years ago, have done with thirty or fifty head of cattle, driven into the wilderness? It would have been impossible to winter them. The quality of the wild grass is much superior on the dry prairie to that which grows on the marshes, but the quantity is considerably less to the acre, the soil being so much drier on the prairies the turf becomes tougher and yields only a thin growth of grass. Many who who have never seen a prairie entertain the idea that it is covered with a very luxuriant growth, and are surprised to ascertain that this is not generally the case; the roots of the native grass are so interwoven and bound together by the growth of ages, extending into the earth often to the depth of three feet, that it will not grow up thickly. The earth is, in fact, hide-bound. The quantity and quality of the wild grass is much increased by burning the land over in the fall or spring. The first frosts of autumn kill the native grass, and it then soon withers and becomes dry. Old settlers well know what trouble and losses they were liable to suffer at certain seasons of the year when the fires were burning over the country. At an early day in the settlement of Wisconsin, there were few impediments to its progress, and woe to the pioneer's stacks and fences, even his cabin was sometimes endangered, if not consumed, when the raging element, driven by a fierce wind, swept over the country. The fruit of a summer's toil has at such times often been consumed in a short time. But now, cultivated fields are so numerous, and roads running in every direction, that there is far less range for the fires, and they can be controlled if set at a favorable time.

There is one fruitful source of annoyance and vexation in commencing a farm in a newly settled country; it is difficult to provide enclosed fields at first for cattle to live in, and the consequence is, that they are suffered to roam at large, and it requires a great deal of time to look after them, especially in autumn after the frosts have killed vegetation; then they are wont to ramble off, frequently occasioning a search of several days to find them. The injury to cows that thus go for several days in succession without milking is very great; still the various urgent wants that claim attention in beginning a farm, induce many to turn their stock loose, and give them the benefit of pasturage at large; it is thought sufficient for present purposes if the settler can get his wheat crop fenced. Another inconvenience which often cannot well be removed immediately is, the want of a good supply of water at hand. It is generally known that Wisconsin is not as well watered as many of the Eastern States, and in most parts of the country the depth at which water is found below the surface is much greater than in these countries; this is especially true of the prairie country, where it is seldom found at a less depth than thirty feet, and from that to one hundred, a depth which occasions quite an expense to sink a well. The task of transporting all the water required for family use any great distance can be estimated only by those who have assumed the task for a time, and the sooner a farmer can go to work to sink a well the better for him. Let him do it if many other things are thereby neglected for awhile. The winter season is usually chosen for this business, and it is a favorable time for the purpose. The considerations that direct many in selecting a place where to settle, are water facilities—these are indeed well worthy of regard; but it often occurs in Wisconsin that some of its finest portions are, comparatively speaking, destitute of springs and running streams. The prairies especially adapted to grain growing, and possessing the richest soil in the West, are often settled upon without hesitation, and the task of obtaining water by digging is cheerfully undertaken. The uncertainty in regard to the depth required to obtain water, and the sand beds under-lying the soil generally require the precaution of curbing as the digging progresses—this is now done with sawed oak stuff one and a half inches thick, and varying in width from four to eight inches. In the early settlement of the country oak stuff split and cut into pieces of suitable length, which is four or five feet, were used. A practice has also prevailed of stoning the well inside of the curbing, allowing it to remain; but there is a serious objection to this practice, the water will taste unpleasant in contact with the wood, and sooner or later the curbing will decay. There is no way to remedy the matter but to take out the curbing as the well is stoned up. It requires more labor to be sure, but it will be enough better to pay all the extra cost. It is contended by some that water can be found near the surface in most places, by means of the divining rod, and it is useless labor to sink such deep wells as are to be found in many parts of the country. This may be true, but I have never seen a sufficient number of successful experiments made by water philosophers to establish me in this belief. Where rock is encountered in sinking a well, which often happens, it will be found most expeditious and least expensive, in my opinion, to make an artesian well. Notwithstanding many object to these wells they answer an excellent purpose. Such wells are made larger in diameter at the present time than they were a few years since, and are far less liable to objections on that account. They are very numerous in some parts of Wisconsin: Koshkonong prairie abounds with them, and many parts of Dane County, some of which penetrate to the depth of one hundred feet. I have often conversed with those who are well acquainted with them, having used them for many years, and they universally say that they have little trouble or inconvenience with them; occasionally a bucket breaks loose, but it can be easily fished up again with a small line and a good sized fish hook. The cost of such wells is from $1 to $1,75 per foot.

A few acres broken up, fenced, and cropped with wheat, a house equal to the means at hand for building, and perchance a well, were the full extent of the first year's improvements made by early settlers in this country. They did well to accomplish so much in so brief a time. The most that they could hope to realize from their first year's toil was the means of subsistence for the following year, seed-grain, and a few other necessaries; those more thoughtful of the future, did not fail to sow the seed for fruit trees, if unable to procure the trees themselves from nurseries.

There is nothing that becomes a new farm more than a flourishing young orchard; too many are negligent in setting out trees from year to year, always intending to do it at some future time. It should be borne in mind that an orchard of fruit is the work of long time. Ten years in the prime of a man's life passed in anticipation of setting out an orchard leaves him but few years in which to plant and cultivate the trees that are to yield him fruit in his declining years, and furnish a larger prospect for coming generations. This may be a source of some consolation and enjoyment, but, as a wise legislator once gravely remarked in debate, "what has posterity ever done for us in the name of common sense, that such a claim be made on our generosity?" Every new farm should at the earliest possible time be supplied with young fruit trees. All readily admit it, but do not half realize the importance of it; if they did, they never would allow year after year to pass and not a fruit tree to grace their premises. They are ever ready to answer the question "*Why* don't you plant an orchard?"—"I must wait till I get able to set out the trees." There is no excuse at the present time for not setting out orchards, nurseries are convenient and trees are sold at reasonable rates, and on easy terms. Fruit trees enhance the value of a farm at a comparatively trifling expense. No one observant of matters and things here during the present season, can have failed to note how soon the inquiry has been made by Eastern farmers, looking for farms in Wisconsin, "Have you an orchard growing on your farm?" It is needless to talk about the expense of growing fruit on a farm. I have seen, and many others have seen, the same farms that were commenced eight and ten years since, and have not now even a currant bush growing thereon. How wide the contrast with a farm that has been stocked with fruit trees, according to the best ability of the owner—apple trees, cherry trees, pear trees and peach; current bushes, raspberries, strawberries, of the choicest variety; and even the wild plum tree and crab apple, the fruit of which is by no means to be despised. Yet the real expense of all these is so little that the owner of the property never felt the burden, probably. Where is a purchaser of good judgment, to say nothing of good taste, that would not willingly pay more for a farm thus stocked than for one destitute of fruit trees, like that first mentioned. Gardening in a newly settled country of course will not claim great attention, but there is nothing lost and ultimately considerable gain by not neglecting it entirely. By setting out strawberry vines, the pie plant, asparagus, cultivating currant bushes and raspberries, a farmer's table may, after three or four years, be well supplied with luxuries. With judicious management in a very short time the place of fruit that requires longer time to be produced may, to a great extent, be supplied. I have seen wild plum trees set out, and cared for with as much attention as the best fruit trees. The early settlers found plenty of them scattered over the country, and in the absence of other fruit valued the wild plum highly; it is said to furnish excellent stock for grafting plums of the cultivated kinds—scions, and especially cherry scions, set in them, grow very rapidly. The second spring after commencing a farm is the most suitable time for setting out fruit trees; but in the hurry and anxiety to get more land broken up many a farmer forgets this fact, or delays to do the work. He experiences numerous wants, and all are pressing; he is without barns and sheds of a substantial nature, and when the time of harvesting arrives he is under the necessity of stacking his grain in the field, if he is successful in raising a crop. This practice is still followed extensively; indeed, the immense quantities of grain now grown in Wisconsin almost precludes the idea of stowing it unthrashed in barns. I know that Eastern farmers at first exclaim against this practice, but it can be done with little waste, and in a manner that will protect it against the elements. It requires the greatest care in stacking grain to secure it from damage by storms; a very little carelessness on the part of those engaged in stacking may be the means of a heavy loss to the owner. Every farmer will do well to superintend this work himself, and be certain that it is done as it should be. I have often heard the complaint made by Eastern wheat buyers that there is in Wisconsin much damaged wheat in the market. It is a fact that cannot be denied, and very much of it is injured in the stack. We seldom have unfavorable weather in harvest—the crop is generally well cured, and if it is snugly stacked it will be proof against storms. We are not arguing that barns are useless to farmers in Wisconsin by any means, but we believe that it is still expedient to stack grain in the field. The grain grown upon thirty or perhaps one hundred acres of land would be of too great bulk to put into a barn. The first settlers were obliged, from necessity, to exercise their ingenuity in many ways to provide the means of saving what they raised; after they had threshed their wheat, many of them had no other way to store it than to put it in rail pens, lined with straw, and then covered it over stack-fashion with the same material. Such a concern often constitutes a granary in this Western country. With sufficient care the grain can be sheltered from the weather in such a place, but quite an amount is wasted one way and another—wherever such a granary can be found, you may be sure of a good spot to trap quails and prairie chickens. The straw after threshing the first crop was generally all used either in covering log stables, sheds, and making various outbuildings; but often after that was done, it became an encumbrance and has frequently been burned, as well as the stubble of wheat fields—practises which multitudes still persist in adopting. In other words, they are still using all the means in their power to exhaust the soil as much as possible.

The second crop put upon new land is generally wheat; the soil is prepared, not by cross plowing, but by plowing in the direction in which it was originally broken; this appears to be necessary in consequence of the toughness of the sod. Any one not acquainted with it would naturally suppose that twelve months' time would be sufficient to decompose the sod so much that it could be cross plowed without any difficulty—such is not the case; although, after it becomes quite thoroughly rotted, the ground can be plowed with much greater ease, and in a better manner, by plowing in the same direction in which it was broken, turning the furrows back. It is not essential that the ground should be plowed deep for the second crop; if the plow run a little below the depth of the first plowing it is sufficient. The rich vegetable mould of the soil will produce bountifully several crops in succession, with very shallow plowing. If spring wheat is to be sown it will be found advantageous to plow the ground in the fall, since by so doing the crop can be put in as early as is desirable in the spring; furthermore, I believe that the soil, by the action of the atmosphere upon it during the winter, is better prepared to receive the seed. Some affirm that it matters little how early spring wheat is sown; a writer in the New York Tribune states, that it should be sown in the month of March, even if it becomes necessary to wade over shoes in mud to do the work. I am of the opinion that this is extravagant talk, and do not think the writer manifested very extensive knowledge of practical farming. The idea of wading 'over shoes in mud' for the sake of having wheat sown in March, is a rule that will not work well with us in Wisconsin. But just as soon as the ground is fit for stirring, which is generally in this country about the first of April, the seed should be put in and covered, first with a cultivator, then follow with a harrow, which will leave the ground in excellent order. Many farmers practice rolling wheat ground after the crop is put in; the advantage of this is said to be this—it presses down the soil and enables it to retain the moisture, if the season happens to be dry. On the contrary, I think it may be said that if the season happens to be wet the rolling will render the ground harder and cause it to bake. The quantity of seed that is generally sown to an acre in this country is not far from one and one half bushels on new ground, and from one bushel and three pecks to two bushels on old ground. I am in favor of sowing wheat rather thick. The reason why a less quantity is required on the sod is, that the crop having the full strength of the soil the grain spreads and makes as much straw, or more, as two bushels of seed on old ground. The danger of too great a growth of straw with heavy seeding, is feared too much in Wisconsin; as also the idea that it will be liable to lodge and to be struck with rust if it is sown thick; the fact is, the crop is greater if the ground is well seeded. The land is evidently strong enough to sustain heavy seeding, and with it, in favorable seasons for wheat, I have no doubt but that the yield will be from three to six bushels per acre more, and, as I believe, with no more liability to rust or become injured than that which is thinly sown. It matures and ripens just as fast, or faster, than half or two-thirds of a crop. The best course then that I can advise farmers to pursue, if they desire to raise wheat, is to endeavor to grow a full crop by putting in plenty of seed. Crops are liable to fail, but be not afraid of rust or blight, nor be alarmed if now and then a spot in a field lodge down, it only indicates a heavy crop; the chances are, that but little injury thereby will happen to it in the aggregate. The injuries that have befallen the wheat crop, since the settlement of the country, have principally been occasioned by winter killing, which has successively happened to winter wheat, and the blight or rot as some term it, to spring wheat.

In my opinion, this climate is not well adapted to the growth of winter wheat—the atmosphere is too cold and dry during the winter season—north and north-west winds prevail, and as a consequence we have freezing weather with little snow, generally. But quite an amount of winter wheat is raised, nevertheless, in the more northern portions of the State, where the climate differs somewhat from that in the southern. The blight first made its appearance in the year 1849, and increased till 1851, during which year the crop of spring wheat was a total failure as a consequence, except in a single variety—the Canada Club—which was not affected by it. However, at that time, there was not much of this grown. It is now almost the only variety of spring wheat sown, and has succeeded admirably for two years past, yielding from 20 to 40 bushels per acre. Some appearances of the blight are indicated the present season, but nothing extensive. I have no doubt but that, like other varieties sown for several years in succession, it will in time degenerate, and become as liable to destruction as they are now. The present season an insect called the joint worm is doing the wheat crop some injury. From my observation, it eats off the stalk at the first joint below the head; a few blighted heads also appear in the field. Really, it is not a little surprising to hear farmers and others extol the Canada Club wheat so highly, now that it is doing well, when the time has been in which the Hedgerow and Italian did just as well, and yielded about as much to the acre. The common practice is, however, to crop successively with the same variety of wheat without even exchanging seed for that raised in a different locality, till a few failures occur, and necessity makes a different course practicable. The corn crop, after a new farm has been commenced, soon becomes one of great importance to a farmer. When his second wheat crop is taken off he has ground admirably adapted to growing it. The soil has been thoroughly stirred and pulverized—having yielded a two year's growth of wheat it is has lost some of its strength, and although manure is not yet by any means essential, still a less exhausting crop will be more profitable in the end; corn drawing less of its nourishment from the soil and more from the atmosphere, is peculiarly adapted to follow such crops as wheat. Many sow oats the third year, one of the most exhausting crops that can be produced, and the least profitable; the price having seldom exceeded 30 cents since the settlement of the country, and from that going down to 9 cents per bushel. Corn has been dull enough in the market in years past, but in importance it is now second only to wheat. Certainly, Wisconsin, especially its central and southern portions, are good corn districts, not equal, it is true, to the best found in Illinois and other more southern latitudes, but capable of producing comparatively heavy yields. The Southern Dent is the kind that is mostly raised, and is said to be the most profitable. In preparing the ground for corn, there need be no fears of stirring the soil too deeply—it is a crop that requires deep plowing—I care not how rich the soil, the crop will be none the worse for deep plowing. The time for preparing the land for the seed should be immediately previous to that of planting, which in Wisconsin may be set down at from the 15th to the 25th of May; I am aware that many plant early in May, and insist that it must be planted by the tenth of that month to insure a crop—this is a mistake. It is well known to all who have lived here ten years, and observed the seasons closely, that we are much more liable to have frosts between the 1st and the 15th of May than between the 1st and the 25th of September. Four months of warm weather will mature a corn crop. But many tell us that if corn is killed by frost early it will come up again and grow; this is true, but the crop will be none the better for the early planting. Corn is a tender plant, and requires warm weather to flourish. I have seen many fields planted after the 20th of May outstrip those that were planted as early as the tenth, and compelled to struggle through a week or fortnight of cool, chilling weather accompanied with some frosts. If the ground is prepared about the time I have specified, and planted immediately afterwards, it will require but little labor to cultivate a crop of corn; a horse with a plow or cultivator will do most of the work in freeing it from weeds if the rows are so arranged as to run at right angles. But let the ground lie two or three weeks after being plowed previous to planting and the weeds will make a great show ere the corn is scarcely out of the ground, and will grow much faster. The corn crop of Wisconsin has, until within the last two years, been mostly consumed at home, either in making pork or feeding stock during the winter season. The time has now come, however, when it is beginning to be shipped eastward in considerable quantities, which will be increased annually. The prairies are thought to be rather better for growing corn than the opening country; the soil is so rich and loose and the land so free from stone and obstructions of every kind, that a crop can be cultivated with less cost.

Rye and oats can be produced in abundance in this State. The latter often yielding as much as seventy and seventy-five bushels to an acre.

Barley is not a very productive crop, for some reason unknown to me, it does not yield as largely as the other kinds of grain, that I have mentioned.

One fact is now pretty well established, that as great a variety of grain crops, and products of the soil generally, can be grown in Wisconsin as in any other State in the Union, but many of our farmers are apparently unmindful of it, since they continue to try one crop year after year, on the same land. The consequence of this excessive cropping with wheat is, that after a few years the soil is greatly exhausted—the new farm becomes an old one in more senses than one. If buildings, fences, and cultivated fields, do improve its appearance the soil is badly worn. It is folly to say, as many do here, that our soil is inexhaustible, and may be cropped for years without making any material difference in its productiveness. Three or four years cropping will not greatly impoverish the land, but continue it for ten or twelve years and it will exhaust the strength of the best land in this or any other country, if nothing is done to replenish it from year to year. I hazard the assertion that the yield of wheat for the present season on ground which was broken up last year will exceed by ten and even fifteen bushels an acre, in many instances, that grown on land that has undergone this exhausting process for twelve years or more. This I believe to be a fact, and it is one which eastern farmers, so anxious to purchase improved farms in Wisconsin, would do well to consider, and reflect whether with the ample means which many of them possess they cannot take our wild lands and under better treatment, ere long, surround themselves with good substantial buildings, fences, &c., and also possess a farm in the full strength of its productiveness, which by judicious management may thus be preserved.

The cost of breaking up new land may now be set down at $3 per acre, on an average. The growth of wood has so increased since the settlement of the country, especially in the openings, that $1 per acre has been added to the cost of preparing the land for the first crop, and the cost will be increased rapidly for the future. The range of the autumnal fires is so restrained now, that they are not productive of much damage to the growth of young trees.

The cost of fencing at the present time with rails is about thirty or thirty-five cents per rod, but a few years longer will render it necessary to dispense with the use of these, as all the timber will be needed for other purposes. The question now arises what will people do to obtain fencing materials? Many Eastern people often ask this question, as if confident a satisfactory answer could not be rendered. We answer, the soil is very rich and will pay a return for cultivation. I know many farms on the broad prairies of Wisconsin that have furnished one crop of wheat sufficient to pay for the breaking up of the soil and fencing the same, when the materials were transported many miles. In the prairie sections posts and boards are beginning to be used extensively. The time is not distant when hedges will probably be grown and stone walls be built to to enclose fields wherever quarries are to be found, and they are numerous in the prairie country. Inventive Yankees will be sure to contrive some way to make fields upon a soil so productive; there are large tracts of wild land, well located in Wisconsin, that can be purchased at from $7 to $10 per acre—an outlay of as much more money per acre in buildings, fencing, and breaking, will put a farm in productive order. This fixes the value at $20 per acre.—I am speaking of the prairie and opening lands. It is well known that the cost of making a farm in heavy timbered land is far greater; from my limited experience in clearing such land I place the cost of clearing alone at $10 per acre.

As to the comparative merits of prairie and opening land a wide difference of opinion exists among farmers. The prairie farmer is often heard to remark, I would not take an opening farm for my own and work it; while the farmer in the openings exclaims, I would not have a prairie farm as a gift—both are certainly extravagant in their ideas, and more or less prejudiced in favor of their respective localities. One fact, I believe, is established beyond controversy, viz., the richest and strongest soil in this country is unquestionably found on the prairies, and it can be cultivated with greater facility than can the soil in the openings, it being free from stumps and stones. Reapers can also be used advantageously in harvesting grain, placing the harvest completely within the control of the farmer. These machines on the smooth prairies will cut from eight to sixteen acres per day, and do the work better than it can possibly be done with grain cradles. The saving of labor by the use of these machines cannot be too highly appreciated; all who have tried swinging a cradle in stout grain during the hot days of July, can testify to the hardness of the task as far exceeding that of following a reaper and binding the grain. It requires six men to bind and set up the grain as fast as it is cut by a reaper. The expense of harvesting is larger, the cost of a reaper being from $125 to $150; but the ease and rapidity with which it is done, and the unlimited extent that a farmer can enter into grain raising are considerations which overbalance the costs.

The prairies are better adapted to growing grain than raising stock; on the most of them there is a great lack of water, and often it is found only at a great depth below the surface. In such localities, the cheapest way that a farmer can supply his cattle with water is to construct capacious cisterns around his buildings and put in them chain pumps. The task then will be light compared with that of drawing water from deep wells; and pure rain water is just as good for stock to drink as any other. Where the situation of the land will admit, I know of no good reason why large reservoirs for the reception of water cannot be constructed in hill-side ravines. This plan has been suggested by some, but I am not aware that it has in any place been put into practice. The idea is this—select a suitable spot on a slope or hill side where the natural inclination of the ground converges towards a common point, construct a large cistern, and having covered it strongly with timbers, but not water-tight, then so cover with sand, gravel, &c., that water will filter through it into the reservoir; a conductor from the bottom of the cistern, extending to the surface of the earth horizontally, may be so graduated in the quantity it discharges as to convey a continual stream from which cattle can drink at any time.

I have said that prairie lands are not so well adapted to raising stock as grain, but simply so from the lack of water; they will produce grass bountifully when seeded with timothy grass, and sheep do well when pastured on them, even where the sheep have not access to water; these animals can be deprived of this and suffer less in consequence than other stock. It is said by some that the prairies do not produce wheat equal to that raised in the openings, either in quantity or quality. The difference which I have observed is, that the wheat raised in the openings is a little more plump generally, but the quantity of the crop on the prairie is one-fourth greater. Corn is also produced with less labor, and in larger yields on the prairie; the soil is so free from stones and stumps that there is nothing in the way to prevent the cultivation in the best manner, as the greater part of the work can be done with a horse and cultivator.

Winter wheat is a crop that does not generally flourish on the prairies; the land is too much exposed to the action of cold dry winds which commonly prevail during the winter and spring months; the ground being bare, whenever warm days occur the surface is thawed and frozen again alternately, which is quite sure to have a killing effect on wheat. In fact, the central and southern portions of Wisconsin are not well adapted to the growth of winter wheat, whether it be sown on prairies or on opening lands, for with little or no snow to protect it from the action of the elements, it often winter-kills, and sometimes if it escapes this calamity, the dry weather in April is no less fatal in its effect upon the crop. It is true enough that the prairies are cold places during the winter season; the wind has as fair a range as upon the ocean, and in piercing cold weather its effects are keenly felt, but a few years time will serve to surround a habitation with pleasant groves, if the occupant has any correct ideas of comfort and convenience. It is a great mistake to suppose that forest or fruit trees will not flourish in prairie soil. I can cite some of the finest orchards in the State, some of the most beautiful groves of locusts, of maple, and other forest trees, all growing on prairie soil. I am not supposing that many, acquainted with the nature of prairie soil, entertain any other ideas than my own in relation to this point, but who has not often heard the inquiry among Eastern people, are the prairies favorable to the growth of trees? Our country people are not generally inclined to expend much time or money in planting trees, but are all anxious to know where they will flourish. The most that the majority do in the way of growing trees is to set out about half a dozen of the size of a small whip-stalk and suffer the tops to be broken off, leaving a scratch stick with which unruly cattle can relieve their itching sensations by frequent rubbing against it. This much of ornamental work is done probably for the sake of appearances, the doers cherishing the idea that they ought to be regarded as men of taste, while they rest under the belief that ornamental farming will not pay. On the whole, then, the only advantages of any account which the opening country has over the prairie are simply—timber for first fences, and fire-wood at hand for an indefinite length of time, while the land is not quite so bleak in the winter season. I regard the soil not quite so strong and productive, but very good. With plenty of means to operate with, all who have knowledge of these matters, will admit that a prairie farm can the soonest be made most productive, a fact which those who are looking after quick returns will do well to regard. There is one consideration above all others, which those desiring farms should bear in mind, the first crops on a soil are the best and surest; I may with propriety add, in this connection, that during a residence of ten years in Wisconsin I have never known a crop of spring wheat to fail in land newly broken up. There have been some seasons when the yield was not large, but nothing like a failure has happened. The second crop is often better than the first, the ground being in a better condition to receive the seed. One reason why the crop is not sometimes greater on sod ground is, that pains are not taken to get in the seed thoroughly; the turf should be torn in pieces by a heavy cultivator in the first place, then a good harrowing afterwards will do up the work effectually.

As an instance of the productiveness of new land, I may mention a field of eighty acres within my knowledge which was sown the present season with wheat. The cost of breaking up this land was $2 20. The owner built 1½ miles of fence to inclose this field, at an expense of $120. The seed for sowing cost $120—the sowing and getting in the seed cost $50. The crop was something over two thousand bushels, but only this quantity was secured in good condition. The harvesting of this, in consequence of the high price of labor this year, was not less than $200, and the threshing $110. There was an immense waste in this field in consequence of the sudden ripening of the grain, which was variously estimated at from 200 to 400 bushels. The wheat shelled badly on the ground; and in many places in the field the grain was lodged, so that it was necessary to cut it with a scythe. The most of this field was cut with a reaper. The owner sold his crop for $1 per bushel and something over, realizing $2000 in money, after owning the land only 18 months, and expending $820 to make it productive. This, added to the cost of the land, $400, makes nearly the sum total of the investment. This is a specimen of new land farming in Wisconsin. His neighbor on the opposite side of the road did equally well with new ground. In the same neighborhood, farms that have been cropped continually for ten and twelve years, and with the buildings attached valued at from five to ten thousand dollars, yielded not more than half the quantity of grain that these new farms did. The case is far different now here, from what it was ten years ago, in making a new farm. The general poverty of the settlers—the want of a market at hand—the distance to be travelled to dispose of produce, and the low price paid for it, all combined to render it the most tedious business undertaken, and the slowest to yield a return for the means expended, and labor bestowed. Only think of the task of carting grain sixty or even one hundred miles to the lake towns; the journey perhaps to be performed by oxen over roads difficult to be travelled even without any loading. If a farmer was fortunate enough to get a few loads to the market in the course of a year without killing his team, or breaking his wagon, he might possibly have money enough left after paying some of his expenses, and getting trusted a little at taverns on the road, to pay part of his taxes; if unable to do this, money was to be had at twenty-five per cent. interest, with good security, of those whose mission it was to develope the resources of Wisconsin!

No wonder that farmers became discouraged under such a state of things; well they might look with indifference upon the nature of their improvements, with little to encourage them and much to dishearten. The dawning of a brighter and better day for farmers in Wisconsin, should now stimulate them to make improvements of a more systematic and permanent character, and to endeavor so to cultivate the soil as to retain its richness. When a few crops shall have been taken off from a new farm, let the ground be seeded down for a few years perhaps, and let other portions of the farm be broken up. It should be the aim of every farmer to get all the land on his farm plowed as soon as may be convenient, with the exception of what he may wish to reserve for timber lots. Land can be put to a more profitable use than producing wild grass; on a dry soil it grows thin, and is mixed with noxious weeds in abundance. Entirely destroyed by the first frosts of autumn, it withers and dries away; and if by accident a fire is started in it, fences, stacks, and buildings, are alike in danger of being consumed.

It appears to me that farmers might improve some upon the practice of burning all the straw and stubble in grain fields; let it be piled where cattle are yarded during the winter season, and converted into manure. The time will certainly come when the application of manure will do the land good—talk about a soil of inexhaustible fertility—it is all nonsense. As a means of replenishing the soil of land that has been cropped too much, I know not why the practice of growing clover, and plowing it under, cannot be adopted here as well as in Western New York. Perhaps some Wisconsin farmers who burn stubble, may raise the inquiry: How can a crop of clover growing rank, knee-high, be turned under with a plow—we cannot turn over stubble ground till burnt over, for the stubble clogs a plow badly and hinders us in our work? The answer to this is, that a roller passing over a clover field will press the clover down flat, and make way for the plow to turn a smooth furrow, without much interruption.

After commencing a farm, and having made considerable progress in the way of improvements, farmers can take that course in managing it which will render it productive from year to year. Whether a farmer possess a grain farm or not, it is important that some attention be given from the beginning of his operations in making a farm, to raising stock; a few good cows and a few good sheep and hogs, at least, should belong to every farmer. The expense of keeping good stock is no greater than that of keeping poor. With a good stock of cattle, sheep and hogs in his possession, the farmer has something to depend on in case of necessity, to raise means when his crops may have been nearly all cut off.

During the years 1850 and 1851 the farmers generally in Wisconsin were in a sad condition; the wheat crop failing during those years left the most of them destitute of every thing from which to raise money. Many had not as much stock on their farms as was exempted by law from execution, and the only resource left for them was to hire money at exorbitant rates and mortgage their farms, or suffer themselves to be ruined at once as to property. They turned their attention then wholly to raising wheat, because it was the only crop that would sell for money. Now the case is very different; a greater variety of crops can be grown with profit, and that farmer who acts wisely will not risk often all on the fate of a single crop. When we look at the variety of crops which this country is capable of producing, we see no necessity for hazarding much on a single crop. Wheat, corn, oats, rye, flax and broom corn, are all crops that flourish in our soil and find a ready market. The extent to which a farmer can with profit engage in farming, is a matter which he is better able to decide for himself than others, for he is supposed to know his own circumstances best.

Much is said and written at the present day about the disadvantages of owning large farms. I have often heard the remark made by those whose notions of farming were derived from reading the New York Tribune, that a few acres of land are all that any farmer ought to possess. These ideas may do for a man living in the immediate vicinity of the populous cities of the East, but may not, perhaps, for others differently situated. I know not why, if his means will admit of it, a man may not as well manage extensive farming operations as extensive operations in other business pursuits. For one, I see but a single objection of any consequence to large farms in this country, neighbors are thereby thrown too far apart and enjoy less facilities for social intercourse among their families. I have little sympathy with those who bestow unqualified censure upon our farmers, as a class, for the manner in which they manage their business. More lectures are read to them than to men in any other pursuit, and often by those whose ignorance of farming directs them to advise farmers to 'wade over shoes in mud, for the sake of sowing spring wheat in March.' It is desirable that whatever is undertaken in farming be well done, to ensure success, and I apprehend that farmers generally have knowledge of this matter, and aim to profit by all the means in their power. For this they toil—for this they read—and for this many of them experiment. We rejoice at the present signs of their success; they left the green hills of New England and New York for a wilderness, which, after years of toil, they have cleared into productive fields; and the rude structures, for habitation and shelter, erected in days of poverty and want, are now wtih each revolving year, giving place to tasteful and comfortable dwellings. Yet a few years and orchards of fruit, waving meadows, ornamental groves, and highly cultivated fields, will render it difficult for a stranger to surmise, from the appearance of the country, the date of its first settlement.

MANURES.

BY S. H. CARPENTER, MADISON.

"Productiveness of crops and destructiveness of soil, are the two most prominent features of Amercican Agriculture."

"Justice can never be done to the soil until all classes study, understand, and obey the laws of nature." [Dr. LEE, *in Patent Office Report*, 1852-53.

Theory and practice should always go hand in hand.—Theory should develop principles, and practice should test their utility. Theory without practice is useless and often absurd, because purely speculative; and many theories in themselves beautiful when reduced to practice prove wholly impracticable; but practice without theory is devoid of progression, and revolves in the same beaten track forever. Thus the two should go hand in hand.

The fact that Agriculture may derive lasting benefit from chemical investigations is too generally received to need any corroborative testimony, and the labors of the French chemists in the analysis of soils and manures, and a study of their mutual adaptation, has advanced agriculture to the rank of a science. Agriculture is indeed a science. It needs to be studied to be thoroughly understood, and I am aware of no valid reason why agriculture does not demand an education as thorough, and a mind as fully developed, as any of the so-called learned professions; but common education can never make a *good* farmer, he needs the higher education that observation and experience alone can give—he needs both and can do without neither, but he need not avoid using the experiments and deductions of others. In a neighborhood of men possessed of mutual confidence, and where there is a great similarity of soil and climate, the opinion of one intelligent observing farmer will carry more influence than all the learned recommendations of State or County Societies.

Observation, then, is the great duty of the farmer, and *adaptation* is his great study. Acute observation and patient reflection on the facts, stored up by a faithful memory, must, in a great measure, rule his action, and form his *practical* education—an education without which scientific attainment is almost useless. Nevertheless, he need not doubt the fixed principles of science, because they have never passed under his observation, nor disbelieve an agricultural fact because its birth-place was the laboratory of the chemist.

It will be my object in the following paper to discuss the subject of MANURES, and their adaptation—to show that as the chemical constituents of plants vary, there must be a corresponding variation in suitable manures. To be abstruse I shall not attempt, nor to speak in the conventional language of chemical science, but I shall endeavor to place plainly before the reader, facts which will not prove mere theories, but facts based upon the immediate laws of the material world. There are fixed and fundamental principles that lie at the basis of the adaptation of manures to soils and grains, which are universal because fundamental; and to bring out more fully these principles, and show the adaptation of the one to the other, we will first consider:

1. The Nature of Plants.
2. The Inorganic Elements of Soil.
3. Manures in general.

It will at once be seen that if we show that plants vary in their inorganic elements, and soils also vary, that manures to be perfectly adapted must also vary, and our point is gained.

On the Nature of Plants.—A plant is organized matter deriving its nourishment and support from inorganic substances. In this lies the great difference between the support of plants and animals—the latter, derive their nourishment from organic—the former, from inorganic matter.

Chemical analysis shows the basis of vegetable tissue to be Carbon, Oxygen, Hydrogen and Nitrogen.* In the seed, especially of the cereals

* Boussingault gives the following analysis of Wheat:

Carbon	46.6
Hydrogen	5.8
Nitrogen	3.45
Oxygen	44.15
	100.00

Of course this analysis does not include the phosphates, &c.

Nitrogen is chiefly found, and the ashes of the seeds give, in addition to the elements named in the analysis, phosphates, sulphates, alkaline and earthy chlorides, besides carbonates produced by the combustion.

[NOTE.—It will be seen that all the elements necessary to perfect a plant, and to develop seed—the end of its existence—may be found in air and water, so that plants may be grown that will ripen seed in a soil entirely destitute of humus, (or vegetable mould,) or still further, destitute even of all the mineral substances that usually enter into their composition. Peas may be grown in calcined brick-dust, or black sand, which will produce flowers and ripen seed which will again grow in like manner, without the least aid from vegetable or mineral stimulants. This curious phenomenon will be further commented on in treating of vegetation.]

It will be seen at a glance by this analysis, that there is a striking identity between the inorganic elements of plants and animals, thus seeming to force upon our minds the recognition of the beautiful adaptation of every part of the creation to every other part—the beautiful harmony that pervades all the works of the Great Creator. To study this harmony, and to develop this adaptedness is the duty of the agriculturist.

Vegetable Physiology, divides the plant into two great divisions, viz., the stem or ascending axis—the root or descending axis. The leaves, which are the organs of respiration and digestion, clothe the stem; while the spongioles, the hair-like extremities of the roots, perform the no less indispensible office of absorption. To the spongioles seems delegated the selection of the inorganic elements of the plant in the proper proportion; and while these are perfect they will absorb nothing from the soil or applied manure that is not congenial to the growth and development of the plant; but if the spongioles be destroyed in any manner, the power that the plant has of choice is also destroyed, and the absorption is indiscriminate.

Now it is easy to conceive of the absorption of gaseous matters by a plant through its leaves, but whence come the inorganic substances, or how are they imbibed? The residue after combustion is composed chiefly of salts, alkaline chlorides of potash and soda, phosphates, carbonate of lime and magnesia, silica, and also metalic traces.

Analysis of Alkaline Salts and Insoluble Substances in the Ashes of Wheat Straw.—By M. Berthier.

Soluble Compounds	Sulph. Acid	.020	Compounds Insoluble	Phosphoric Acid .	.012
	Hydrochl. Acid	.130		Silica	.750
	Silica	.350		Lime	.058
	Potash, Soda, Water	.500		Oxide of Iron . .	.025
				Carbon and Loss .	.155
		1,000			1.000

Magnesia and Oxide of Manganese are found in the ashes of oak bark. The following Analysis is also given of Wheat Straw by M. Berthier, as quoted by Boussingault:

Sulph. Potash	.004
Chloride Potasium . . .	.032
Silicate of Potash . . .	.130
Silica	.715
Carbonate Lime	.096
Phosphate of Lime . . .	.023
	1.000

It will be seen that Potasium enters in three forms, and Lime in two; while Silica composes nearly *three-fourths* of the whole.

These substances are not taken from the air but exist in the soil, for this must be considered as the source of the saline and earthy matter found in plants. Plants indigenous to a sandy soil are richer in silica than those found in clay soils; but opinions are divided, whether the soil or manures have the greater influence, but it is sufficient for our purpose to know that both exert a powerful influence on the development of vegetation, and the question proposed is simply this: Whether mineral or vegetable manures are most efficacious? both are necessary. Many of the substances taken up by plants are soluble in water, and thus easily enter the circulatory organs; but the mystery still remains unsolved how plants can assimilate insoluble substances—for example: silica, which is insoluble in water, forms nearly *three-fourths* of the solid matter of wheat straw, and in the common scouring rush (*Equisetum Hyemale*) the silex is perceptible to the touch. But the fact of the assimilation is known, and however curious it might be to enquire into the modus operandi, it would not affect materially the question before us. The plant does select the most congenial substances and in healthy state refuses all others.

[NOTE.—What power causes the ascent of sap, or the action of the spongiolis, has not been fully ascertained. We can easily conceive how the spongiolis might imbibe moisture, by the simple influence of capillary attraction; but neither the porosity of the roots nor the chemical modifications of the sap, which take place in the leaves, can fully account for the rapid ascent of sap, and the immense force which occasions this rise; a force which Dr. Hales found to be equal to the pressure of *nineteen* pounds to the square inch—a pressure nearly a third greater than that of the atmosphere.]

In the leaves the sap is peculiarly modified and concentrated, and the elements necessary to the growth of the plant, that exist in the gaseous state, are imbibed. Baron Liebig maintains that the atmosphere is the source of all the carbon which plants contain, and if this is true, which is considered doubtful, all the carbon or woody fibre must be imbibed through the leaves; and they certainly do take in carbonic acid from the atmosphere, retain the carbon, and return the oxygen pure.* Hence, we see that although the means of nutrition are two, viz.: by the leaves and roots, only the latter falls duly within the province of this paper.

It will be readily seen from this cursory glance at the vegetable economy, that the absorption of whatever is in the atmosphere may take place in the leaves—for example: Carbonic acid gas, oxygen, nitrogen and hydrogen, in small quantities; and also that the absorption of inorganic elements, even though insoluble, is performed by the roots. Now all the elements necessary to the growth of plants may be found in the atmosphere and water; but the plant driven to this slow and imperfect assimilation will be stinted in its growth for lack of material, because, although there may be a superabundance of all the necessary elements except one, this one exception nullifies the others, and the development will take place no farther than it can be perfect; and it is the province of manures to furnish at once, in suitable quantities, the requisite elements for the growth of plants. Here we find a strong argument for the complex nature of manures, and also for studying the mutual adaptation between them and soils.

The inorganic elements greatly differ. Marine plants contain iodine and soda. Plants from the desert, silex. Marsh plants are soft and watery—plants from dry soils are hard and dry.

Soils also differ. They are silicious, alkaline, aluminous. Manures also in like manner differ, being animal or vegetable, and mineral; some

* The exact reverse in the animal kingdom.

adapted to retain moisture, and others to repel it. Do not these facts point out an unmistakable adaptation between the manure and the crop, as plainly as was before seen between the soil and manure.

Soil is composed of disintegrated mineral substances—(mineral is here and elsewhere used in its geological significance)—and partakes of the nature of its original. If the rock was quartz, the soil will be sandy; if feldspathic or micaceous,* the soil will be clay or loam, if both are intermixed. But soil, as we now find it, rarely is thus simple in its composition, containing also *humus* or decayed vegetable matter, which is chiefly composed of carbon, (seventy-five per cent), and alkaline elements as lime (formed from the disintegration of carbonate of lime, which can easily be tested with acid) and potash, which exists in both Feldspar and Mica.

In a general analysis of soil, the first object of enquiry is, to ascertain the proportion of sandy matter, which can be done by washing the calcined soil; and secondly, to find the proportion of clay and other soluble substances, which is also found by washing the soil and filtering; and thirdly, to find the proportion of humus, which may be tested with sufficient accuracy by noticing the loss in waste by calcination.†

An examination of a more general nature may be based on the above, by considering soils with reference:

1st. To their specific gravities.
2d. Their capacity for holding water.
3d. Their aptitude to yield moisture.
4th. Their faculty for acquiring and retaining heat.

[NOTE.—By following this examination with a study of the peculiar nature of different manures, and the habits of crops, we shall be able to arrive at definite conclusions, and know as facts worthy of confidence what we would otherwise follow as conjecture; and agriculture would, even to the farmer, be reduced to a science, which would be governed by fixed and natural laws, and follow rules unalterable because fundamental, instead of being the sport of circumstances or the slave of the prejudices of ignorance. Farmers are themselves culpably negligent in the performance of their duty; they act as though they were only machines to raise produce, and exchange that produce for cash or the necessaries of life. Let them cultivate a spirit of inquiry, as well as the soil, and raise their thoughts to the consideration of the principles that govern the stupendous changes that are constantly taking place before their eyes.]

* Feldspar contains nearly twenty and Mica thirty-four per cent. of Alumina.

† The soil should be perfectly dry before it is first weighed.

The specific gravity of Soils varies in direct proportion to the amount of sand they contain, and is easily determined by the process described above. Clayey soils, although called heavy soils, are specifically lighter than sandy soils.

The power of absorbing moisture varies in direct proportion to the quantity of humus contained in the soils. Humus possesses this faculty in a remarkable degree, one hundred parts absorbing one hundred and ninety of water, while clay absorbs but fifty.

NOTE.—Here we see a powerful auxilliary to the farmer in preventing drought—Manure. Let the soil be well fed with vegetable manure, and the light rains and dews will all be hnsbanded and garnered up for future use in time of need, instead of passing at once into the subsoil.]

The faculty of yielding Moisture.—The power of retaining moisture sufficient to ensure vegetation is necessary, but not more so than is the ability to yield the excess. Soils which retain moisture too strongly are wet, late, and cold, while those which yield it too readily are apt to suffer from dry weather. Humus heads the list for its retentive properties, while silicious and calcareous sand possess the greatest evaporative power.

The faculty of acquiring and retaining Heat depends greatly on the conducting power of the soil, and therefore on its density, or specific gravity. Soils which are quick to receive warmth are called early. Sand possesses this power in the highest degree, and clay in the lowest; therefore the former are early, the latter late.

Besides these points of investigation, based on the three primitive points of analysis, there are other considerations which should not be overlooked, such, for instance, as

The Depth of Soil—Which is one of the most important considerations in husbandry, has been too much overlooked; and farmers cultivate only a very shallow layer of earth, which can easily be recognized by the intermixture of humus, and the lighter color of the subsoil. There are several reasons why soil should be worked deep. First, We derive a greater advantage from the soil, for the roots can extend themselves more widely; and secondly, The humus intermingled with the soil to a considerable depth will retain the moisture, and the soil will be enabled to withstand the drought to which, in this country, we are liable. It is also the best preventive against the flooding of heavy rains, because the water can enter the soil, and pass away by the natural channels, instead of overflowing the surface; and, again, in the subsoil are found all the elements of fertility which the soil possessed before it was weakened by repeated cropping.

The Improvement of Soils—Is a modification of their original natural qualities, to better adapt them to the climate or to the crops they are intended to produce. Observation shows, that soils with a due proportion of sand and clay are the best adapted to the general uses of agriculture, but seldom are these two ingredients found united in the proper proportion, either the one or the other predominates; and the most natural inference is, that a mechanical intermixture would be the proper method of amelioration. No doubt that a heavy clay soil would be materially benefitted by the addition of a quantity of sand, and that a loose sand would be made more productive by an intermixture with clay soil; for the cohesiveness of a clay soil (says the theorist) would be overcome in a great measure by the sand—it would dry earlier and retain the heat better; and so, on the other hand, sandy soils are too loose and possess too little cohesiveness—now, introduce clay as a cement, and your soil is perfect: neither too loose nor yet too cohesive. But this theory, which at first sight appears so natural, is obnoxious to a weighty objection, its expensiveness and the same ends can be obtained equally well, by simpler and far cheaper means.

[NOTE.—For some crops stiff soils are preferable, while others require the opposite, and we can generally decide from the roots of the plant what kind of soil is best adapted to its culture. Plants with large, or largely developed, roots, require a loose soil, well stirred—for instance, turnips, carrots, potatoes, and Indian corn; while wheat, and the grasses, flourish best in a soil of more consistency. But the skillful agriculturist will not only understand the wants of crops, and the nature of his soil, but he will also investigate the means of improving his domain—he must not rest satisfied with the good qualities of his farm, but must study its defects and how to apply the remedy, and be guided both by his own observation and experience, and that of others; always endeavoring to add to the general fund of knowledge by continued and careful experiment.]

Sandy soils, for instance, are unable to retain sufficient moisture, and we overcome this defect, not by an intermixture of clay, as theory would do, but by manures capable of retaining moisture in a high degree—for instance, humus or vegetable mould, which possesses, as we have before shown, this faculty in excess, and hence reason would select it as the most fitting manure in such cases. Again, clay will retain moisture to an extent that is deleterious, and humus is by no means the appropriate manure for such soils, except so far as humus is necessary in all soils to ensure plentiful vegetation; and reason would dictate the use of those which tend to give out their moisture, such as long manures, or *par excellence* ashes. But the farmer may not always have these means at hand, when he must be guided by his knowledge of the nature of soils, and the preference of crops, and act accordingly; but when these means are at hand, the farmers' greatest hope for lucrative crops must rest almost entirely upon a judicious system of manuring. As it has been well said by Dr. Lee, "Productivenees of crops and destructiveness of soil are the distinguishing features of American agriculture," and this must be remedied by an increase of elementary knowledge among farmers—an increase of observation—an increase of reasoning on facts stored up in the memory.

On Manures.—No soil, however rich it may be in the inorganic elements which directly enter into the composition of the living plant, can be profitably productive if it does not contain vegetable matter, either in a decomposed state or in the state of decomposition. Some soils, like our prairies, are very rich in this humus, but the majority of lands are quite deficient, and the fertilizing element must be supplied by art. The atmosphere, with the aid of light, heat and moisture, will bring a plant to maturity, but the farmer cannot afford to lose time on sterile soil; and where Nature has failed to grant him fertile lands, art must remedy the defect; and in general terms the rule may be laid down that all organic elements of plants are, or can be, derived from the atmosphere, and all inorganic from the soil, and upon this rests the science of manuring—to furnish the plant those ingredients, both organic and inorganic, which the soil or the atmosphere does not furnish in sufficient quantity.

The analogy of nature would show that the elements which enter into the composition of a plant, would be peculiarly fitted to aid in its reproduction, when the same elements would again be required in precisely the same proportion; and this is, as we have already said, the province of manures to furnish the plant for its assimilation at once those elements which otherwise it would not receive, are at best but in insufficient quantities, although Baron Liebig seems to almost ignore the benefits of any but inorganic manures.

Manures are generally divided into two classes, and whether this division has any foundation in nature or not, I shall adopt it as being an easy and simple classification :

1st. *Organic* manures, which of course must contain all the elements of the former organization.

2d. *Inorganic* manures, mineral manures, stimulants either saline or alkaline.

This division is entirely arbitrary, as is the term stimulants, as though mineral manures were any thing different in action from vegetable, or possessed a stimulating power which the latter does not equally possess. The term *stimulant* as applied to mineral fertilizers is entirely misapplied; for, as we have before defined, the action of manures is not any stimulation of the plant to greater activity in performing its natural functions, but simply giving it the means of performing them the more rapidly.

Any agent which tends to restore, when weakened by cropping—to create, when deficient by nature—or to augment the fertility of the soil, is termed a manure. Organic manures, from their complex nature, are better fitted for general and indiscriminate use than those of simpler composition, and are in consequence in more general use ; and here, as elsewhere, practice preceding theory, has declared them the most important. Any manure to be efficacious must possess this complex nature; and this principle becomes of great importance when we consider how many farmers have been misled by the notices of the astonishing effects of some mineral manure, as heralded in the Agricultural Journals, and being induced to follow their example have met with complete failure. Lime spread upon barren sand would not insure a plentiful crop of wheat; nor plaster, however plentifully sown, upon sterile soil, produce an abundant yield of grass. Other elements must pre-exist in the soil, or be furnished by the husbandman.

Therefore considering organic manures to be of greater importance, we will first consider them ; and the first question that naturally arises is—*On what does the efficacy of manures depend?* In the solution of this question we must invoke the aid of chemistry, and I might add in passing, that this is the great question in agricultural chemistry which has divided the French and German chemists—the head of the latter class being Baron Liebig, whose views were for a long time considered as infallible, but the theory of the learned German failed when it was reduced to practice. His views were successfully combated by several agricultural chemists, both French and English, and the general belief is now against him. He endeavored to include agriculture in chemistry, and settle all its disputes and regulate its actions by chemical formulæ, but Nature resisted the restriction and pursued her own way in spite of the chemical learning of the great Baron.

Agricultural chemists are of the opinion that manures are to be classed with reference to the nitrogen they contain, or are capable of fixing, and by nitrogen in the first instance I include all nitrogenized principles. This element, (nitrogen or azote as it is called by the French chemists,) is always produced by the decomposition of organic matter and may generally be detected when the decomposition is rapid by the pungent ammoniacal odor; and the richer the organic substance is in nitrogen, by so much is its decomposition more rapid; the uniformity with which it appears during the decomposition of organic matter; and the fact which observation had already deduced, that the more highly nitrogenized the substance the more valuable it was as a manure, might in itself be sufficient for our purpose, but to substantiate more fully this position we will add the views of others.

Boussingault (Rural Economy, p. 254, Appleton's Ed. 1850, p. 507, 12mo.) says, "agriculturists have in all ages admitted, that the most powerful manures are derived from animal substances, an opinion, or rather a fact which, expressed in scientific language, amounts to this—that the most active manures are precisely those which contain the largest proportion of azotized principles. It is obvious indeed from every thing which precedes, that all the substances which contribute to form farm dung, contain azote (nitrogen.) When we consider the immediate changes which all highly azotized substances undergo in the process of putrefaction, we can foresee that in their transformation into manure they must give origin to ammoniacal salts; and well established facts prove, beyond a doubt, that salts having ammonia for their base, must be ranked among the most powerful of all the agents in promoting vegetation. It is sufficient, for instance, to bear in mind that in the productive husbandry of Flanders, putrid urine is the manure that is employed with the greatest success ; but we have seen that by putrefaction the urea* of the urine is entirely changed into carbonate of ammonia. The fields of Flanders are consequently fertilized with a solution of carbonate of ammonia in water."

Baron Liebig, although almost an enthusiast in favor of the efficacy of inorganic manures, and although he maintains that plants can find an adequate supply of nitrogen in rain water and the atmosphere, nevertheless holds the following views, according to the Handbuch fur Augehense-Landwirthe, (see Patent Office Report, 1847, p. 223,) "that plants receive nitrogen from the ammonia of rain water, and this ammonia is derived not only from the putrefaction of organic bodies, but it is also in part a constituent part of the body of the globe. Animal manures operate only by the formation of ammonia." We cannot but think that the Baron in maintaining the intervention of the atmosphere in the assimilation of nitrogen, and in claiming that animal manures act only by means of the atmosphere, had in view the support of his favorite theory of inorganic manures, which is, "that the crops on a field diminish or increase in exact proportion to the diminution or increase of the mineral substances conveyed to it in the manure."

J. F. W. Johnston also, in his Agricultural Chemistry, sums up his remarks on this subject in the following words, "thus the *immediate* and *visible* effect of different vegetable substances in the same state is measured by the relative quantities of nitrogen they contain—their *permanent* effects by the relative quantities of inorganic and carbonaceous matters." This is taking the middle ground between the French and German chemists, but still he acknowledges the principle which is sufficient for our purpose.

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* Urea is composed of	Carbon.................	20.
	Hydrogen...............	6.6
	Oxygen.................	26.7
	Nitrogen...............	46.7
		100.0

Joseph Harris, in his Prize Essay in the Transactions of the New York Agricultural Society, given also in the Patent Office Report for 1852–3, gives the results of some experiments, one of which we quote:—"It is seen that in 1844 with mineral manures and no ammonia (of course by this he means no azotized manure as plants do unquestionably assimilate ammonia in a limited degree from rain water) the increase of grain over the unmanured plot is less than one bushel and no increase of straw, while for the next five consecutive years when ammonia was supplied and no minerals, there is an average increase of ten bushels per acre and about as much again straw." * * Can any one after carefully studying the above results avoid concluding that ammonia is 'the one thing needful' for the growth of wheat in agricultural quantity?"

John Bennet Lawes, in an Essay published by the Royal Agricultural Society of England, (see Patent Office Report, 1847, p. 221,) written in opposition to the well known views of Liebig, says, in regard to this question:—"It affects the whole economy of cultivation, and the final solution of it must very materially influence the action of all practical agriculturists. With regard to the most important crop (wheat) my own experiments are so decisive, and through the whole series the results are so uniform, that it is hardly possible to have two opinions on the subject, and what is still more, they are in accordance with the dictates of reason and the practical experience of agriculture. The absolute necessity of supplying nitrogen to enable the soil to produce more wheat than it could do in a natural state, is so apparent throughout this series of experiments, that it is difficult to entertain the slightest doubt upon this subject." He then adds the following paragraph, showing precisely what is the proper action of mineral manures:—"The various contradictory results obtained by the application of mineral manures to wheat are completely accounted for, when it is known that they only increase the produce in proportion to the available azotized matter existing in the soil."

Hence taking this principle for granted, which can be done quite safely we think, from the above evidence, we have an easy test of the value of manures, and a sure guide in our investigations.

[NOTE.—There is also another point which it may be well to notice in this connection—the nitrification of soils. Baron Liebig maintains that it is due to the slow combustion of ammonia by which nitric acid is formed; but this combustion takes place only at high temperatures. M. Kuhlman announced to the Academy of Sciences that he had found nitrate of ammonia among the products of the putrefaction of animal matter, and claimed it to be one of the products of the decomposition; but this is disproved by other chemists of note, and no doubt in most cases the nitrification of soils is owing either to some peculiar and permanent cause, or else rests upon a principle with which we are not fully acquainted; and although this acquaintance might be of little practical value, nevertheless as having a bearing upon the great question before us, we thought it worth while to notice it briefly here.]

The peculiar province of manures, as has already been shown, is to furnish the plant for assimilation at once, what it would otherwise obtain only by the slow process of absorption from the atmosphere in insufficient quantities, which would lessen materially the productiveness of the plant, as Nature always requires the same elements to produce the same results; for instance, if there is not sufficient phosphoric acid in an acre of ground to produce forty bushels of wheat, although every other necessary element may be even in excess, still the forty bushels will not be produced. Here we see the vast advantage that complex manures possess over those simple in their nature, and for this reason we begin with organic manures, which contain all the elements composing the organization; but before noticing the characteristics of the different organic manures, allow me to offer some suggestions of a more general nature—and first, as to the

Preservation of Manure.—In all well-regulated agricultural establishments the preservation of manure is a question of vital importance, and we can almost infallibly judge of the thrift and prudence of a farmer by his dung-heap, for a farmer of forethought will at once perceive that a slight outlay here will be amply repaid in the increased productiveness of his farm; but instead of this care in the production and preservation of manure, how often does it seem that the dung-heap is exposed as though it was a matter of the utmost consequence that it should be leached as thoroughly as possible, exposed not only to the weather, but so placed that the eaves of the barn will pour upon it, and wash away the very principle of fertility into the gutter, where its effects may be traced all summer by the increased verdure that lines its path.

The practice of heaping up the farm yard manure in large heaps, and adding to it constantly for a year, is positively injurious. Manure should be kept in the yard so as to avoid, as far as is possible, heating, and a little care in spreading fresh additions evenly will be all that is necessary; to remedy this, in a great measure, gypsum, or plaster of Paris strewn over the heap would also be advantageous, as it would change the volatile carbonate of ammonia into the fixed sulphate. The custom also of adding lime to heaps to hasten their decomposition is injurious. The reason for this view is, that by decomposition a large proportion of ammonia escapes and is consequently lost; still, for crops that are of a quick growth, short well rotted manures are preferable, inasmuch as their action is quicker. M. Picted says, that "an experience of more than seven years has convinced me that we shall be great gainers by using manure as soon as it comes from the stables," but this is plainly impracticable, and our endeavors must then be confined to the preservation of it in its natural state as nearly as possible.

To preserve the liquid manure and also the drainings of the heap, instead of reservoirs, which would be too expensive for the majority of farmers, it will answer nearly as well to spread the yard with something capable of retaining moisture, as sand or peat, or any dry porous substance. The value of this manure is vastly underrated, and little or no pains are taken for its preservation, while analysis shows it to be by far the most valuable fertilizing product of the farm yard.—(vide the preceding note on the analysis of urea.)

The relative value of long and short Manures is a subject which was formerly much agitated, but which seems now nearly at rest, but we know not which side claims the victory.

If the principle above stated be true, viz: that the value of manures is directly proportional to the azotized principles they contain or produce in the process of decomposition, it must be clear that the full effect of manure cannot be obtained except it be applied before decomposition has taken place; for since by the separation of elements—the effect of decomposition—the volatile ammonia passes into the atmosphere, and its primary effect *is wholly lost.* But, as we have said before, by the application of gypsum or plaster of Paris, or by a layer of loose earth, the carbonate of ammonia is either fixed or condensed; but even then it cannot be doubted that a great proportion of its efficacy is lost, as such substances are more easily assimilated in their nascent state than otherwise;

but, however, this may be, it does not interfere with the subject in hand—the relative value of long and short manures.

Still it is astonishing that many farmers, and good farmers too, claim that it is positively injurious for manures to ferment in the soil. Upon what principle of reason or philosophy this belief is formed it would be difficult to decide. It cannot be the result of experience, nor yet is it even tenable theory; but most probably it arose from some isolated experience, gained force from circumstance, and at last increased in authority until it became treason almost to disbelieve it. Practice does not prove it, science disproves it, and nature maintains the veracity of science.

Manure introduced fresh into the soil, undergoes there the identical changes which it does in the heap; so that the same end is at last gained, and the manure remains in the soil after its full decomposition, equally as though it was *introduced after* the decomposition had taken place in the dunghill; but the changes are slower, and we may with good reason say to much better advantage, for as the decomposition takes place slower, the elements are formed, as they can be taken up by the plant, and not given it all at once; and being mixed with a large quantity of inert matter, and in presence of the spongioles, not only the volatile but also the fixed elements will be more completely assimilated, and less manure will produce greater results when applied fresh, than large quantities of fully decomposed matter.

But leaving this dry philosophizing let us enquire of nature and experience. Pastures which receive fresh manure daily, instead of showing injurious results manifest the opposite, and an Italian chemist* has proven by repeated experiments that a soil composed of one-fourth fresh horse dung gave no indications of any deleterious effects. The same chemist has also shown, that horse dung loses in four months *one-half* of its fertilizing power, by being suffered to ferment in heaps. Sir Humphrey Davy has also proved the same fact by repeated experiment, and shown that the loss of volatile fertilizing elements is very great, far above even the usual calculation.

This experiment was, I believe, as follows: He enclosed manure in a large iron retort, with a long neck, and then introduced the neck of the retort into the earth at the roots of plants, and noted the effects on the

* M. Gazzeri.

plants singly. This of course was decisive. Other names of note might be mentioned, but every farmer had much better satisfy himself by actual experiment, if he distrusts the results of the problem as deduced by science.

There are practical disadvantages attending the immediate application of manure, for want of time will often force the farmer to leave it in heaps during the summer, and to meet this exigency we have above given means of securing the volatile products of decomposition, or of checking almost entirely the fermentation.

Care must often be used in the application of coarse manures ; as in cold soils, there might not be sufficient heat engendered or retained to ensure full decomposition, which of course is necessary, and the manure would pass into the so-called "dry rot," when it would not only be worthless, but absolutely injurious.

In warm dry soils, long manures would be especially valuable, from their disposition to imbibe and retain moisture.

Top dressings, which are growing into deserved repute, should always be of manure well rotted, but long manures should always be plowed in.

DRAINAGE.

BY JOHN BERKLEY, BURKE.

Dear Sir :—In undertaking to give you some history of the art of draining land, as it is practised in England, I feel myself thrown upon the resources of my memory for much of the practical details ; and deprived, as I am, of access to the tomes of knowledge possessed by the libraries of my native country, I must be content to give you the best report I am able of an art which has employed some of the most skillful and scientific agriculturists of this or of any other age. Long before draining was practised with the labor and cost of the last half century, and mapped out with the certainty of a mathematical problem, attempts were made in a rude style at getting waters off the land by ditching and cuttings, and open furrows, throwing the land, when cultivated for grain crops, into ridges high in the middle and descending on each side, reaching from a space of six or eight feet from the hollow or descent of one ridge to the crown and descent on the other side; and so on, over fields of fifty acres, the hollow carrying off the water as it fell on the ridge or crown, to the base or hollow and so running down the furrows of these long ridges to the bottom of the field, where the water was run into a ditch against the fence, and either left there or allowed to take its course out, which, if it had lower land it failed not to do, and so flowed on until it fell into a lower deep, which, in time, constituted a lake or morass, or swamp, or bog.

Some of the earliest successful attempts at draining and improving lands were made by the Dutch. Holland and the low countries being subjected, as they were to inundations, mud dykes and ditches of great breadth and depth were erected; by one of which they shut out the overflowings, and by the other contained the excess of water. The skill and labors of this people were potent in all Europe and America.

In England where tenant farmers are the tillers of the soil, and where the hire of land is from five to seven, and ten to twenty shillings per acre, men are compelled to produce large crops, and it is notorious what skill and energy has effected in that country. The position of an occupier from year to year is against permanent improvement, although I must admit for the honor of my country, that there are many, very many land owners, who would go with an enterprising tenant-farmer rather than against him, yet there are dishonorable exceptions, and not a few have been made to regret their spirited endeavors to improve their farms by the grasping stewards of the aristocratic owners of land. I have myself had to experience this, for after an acknowledged improvement in cultivation, I had to escape with difficulty from the penalties subject to an infringement of a prescribed mode of cultivation. I put in drains and tore up land that was going fast into a primitive state of sterility, and an ignorant steward of the estate almost compelled me to pay five thousand dollars for breaking up old grass land, that is land that has been in pasturage for cattle for a generation. I managed this land, for which I paid $8 per acre, as I did my own; that which required draining I drained, that which was returning into mountain herbs instead of producing grass I plowed up, and with such management I not only effected a change from a humid climate to a dry one, but I made two blades of grass grow where none had grown before, and yet for this I was about to be mulcted in a penalty of some thousands of dollars for the liberty I had taken to manage the land hired according to my judgment; and to this sort of policy almost all the land owners of England are committed; the life estate or income being merely theirs, improvement or ultimate increase of value is not contemplated; hence drainage, requiring present outlay, was above all other improvements neglected or objected to by them, so far at least as the expense of doing so was incumbent upon them. Tenants there were who, upon long leases, such as twenty-one years, expended large sums in draining, and there were owners too, who co-operated with their tenants in the prosecution of so valuable a project; and among many Mr. Coke, of Norfolk, (whose son is now Earl of Leicester,) is among the honorable exceptions who practised the old English jovial toast, at the dinners of agriculturists, of "Live and let live," and this gentleman by his wise liberality converted, in connection with a spirited tenant, a barren waste into a fruitful field, and by so doing increased his income twenty fold. But I should weary your readers, as well as yourself, were I to recite the instances of good and bad management of the owners of land in England, our subject is drainage, though my remarks will not be found out of place when I state to you the trouble this drainage question has caused. The mere life interest of many a pinched land owner would not allow him to exercise his judgment, the adage "'tis mine to day and may be his to-morrow" operated to such an extent that no land owner under this system of primogeniture would lay out any money for his successors; and as draining did not pay the first or second year's tenant and land owners, each felt himself insecure, and so draining was neglected altogether, although examples were abundant of its necessity as well as of its profit. The abolition of the corn laws, however, procured for the nobility of England and its land owners an act of parliament loaning money by the government of the country, at a low per centage, to land owners, for the purpose of draining their lands, and that this is and should appear and be chargeable upon the present as well as upon the future proprietors, and thus much of the land of England, hitherto lost and valueless, has been restored and made productive. The whole amount, four mills, granted by the government of the country, has been taken up and laid out in solid improvements and drainage; and now having brought myself and you to this historical recognition of the value of draining, I shall say, with as much conciseness as I am able, what I have to say of drainage.

It will not, I hope, be necessary for me to prove the injury done to agriculture by stagnant water, from whatever source the moisture arises, whether from surface water or from springs beneath the surface, the necessity still exists for its removal. I will take it for granted that all argument on this head is useless, and that all admit the value of dry land and the worthlessness of wet. No grass or grain ever grew upon a lake, submerged land will produce nothing; marshes grow grass in spite of the water dwelling upon them, by reason of their low level, and by the accumulation of animal, vegetable and mineral matter, of which they became the natural deposits. The most of the higher lands, the mouldering of stones, the debris of the hills, all find in these level plains a safe deposit—the very elements of fruition are forced into the marshes, and according to their low and level situations they are richer in all that is necessary to sustain the growth of plants than any other land. The water which also makes them an abiding place, is the only drawback; if these marshes were drained, if the water ran off them, instead of staying upon them, there would be no bounds to their luxuriance. A crop of marsh hay is poor amends for what might be produced; watery aquatic plants, which have no feeding quality, are stuffed into the stomachs of the horse and neat cattle, without accomplishing any of the purposes for which food is destined, beyond saving from starvation, Well, then, to cast this water off these rich plains and valleys is the object of draining, and if this can be effected, then will the desert blossom as the rose.

To change a marsh from its fœtid, cold, and vaporous atmosphere, into a fruitful and smiling plain; to render a bog or swamp, where no sure footing can be found, into solid and substantial earth; to make aquatic plants give place to rich and feeding herbs; to render agreeable food to the animal instead of coarse wiry unpleasant grass, is the object of draining land—to do which, each agriculturist so purposed must make not only a survey of his own but of adjacent lands. Purposing, as I presume he will, to drain his whole farm, he will make such an observation or view as will enable him to determine where to commence his work, he will open up a ground trench drain leading through his land, and he will make tributary drains in connection, and he will have an eye to the destruction of the waste or drained-off waters. A neighbor of mine in England laid out his drains on so intelligent a principle, that the drainings of his fields were all conducted to his farm yard, where he had a continual stream of water derived from the drainage of his lands—of course his farm buildings were so placed that the level ran out of them. In making drains especial care must be taken to cut them clean and to give the bottom a level and regular course, there must be no promiscuous spading—three feet deep, running in from the top three feet to a foot or more at the bottom, and that bottom level and clean; pipes made for the purpose must be placed along the line of drain. Machines are in use in this country, for the manufacture of such, and wherever they are made, the cost is so moderate as to render them the very best means of carrying off the water; failing to obtain these, a drain may be made of stones, and the limestone of this State would make excellent conduits. It is easily constructed of flat stones, and if they are all flat which are placed at the bottom and sides, supporting a roof, and giving a channel or conduit of 6 or 8 inches they will answer the purpose, and will last a long lifetime; brush and straw can be used and is used but only, I conceive, when stones cannot be had, for it is obvious that drains so made must be liable, from the rotting of the material, to choke up and render the labors of the farmer abortive; he may have many rods to take up in search of such a casualty, as the stopping up of a drain without finding out the cause. But tiles made by machines are the great desideratum, the joints allowing water to penetrate to the channels, and so affording to the land the fine percolating process of rain penetrating the whole earth, leaving in it all that is valuable, and then running off freed from these properties, as water to fulfil its next purpose of giving direct support to all animal existence. That rain refreshes and fertilizes the earth, and that in the absence of rain the natural products of the earth sicken and die are truisms almost unnecessary to be repeated. But that marshes are to be valued for their growth of watery plants, and that innutritious grass is to be supported against cultivated grasses, is an error so great as to need the strongest reprehension. In springy ground which occurs in elevated as well as low land, all that is necessary is to tap the spring, put in your drain, excavate to the depth of three or five feet, as may be required to take off the water, and take that drain in a strait line to your level; if the land is full of dry springs a parallel or curved drain will be well put in along the hill side, and brought into connection with the main drain. It is not necessary that the whole of a farm shall have the drains connected; each field may be drained upon the same principle, care being taken that you clear off the water. Never let it be forgotten that all surface water is bad where it dwells or rests. To flow over is refreshing to grass plants, washing off insects and depositing lime or ammonia, &c.

I may be allowed to state the graphic expression, which dwells in my mind to this day, given by Lewis Burkhard, a Swiss educated in England, and travelling through Nubia and Egypt, of the inhabitants of that country waiting for the rise of the river Nile; 'the banks of that river clad with expectants of its bounteous overflow.' This is the first system of irrigation we read of, and it is perfect. At a certain period of the year the inundation took place; the husbandmen then deposited the seed in the mud which it left, and their crop ensued. In our day the irrigation of land has been beneficially practised, both by turning floods of spring water over grasses, and by the sewerage of towns.

In Edinburgh, the capital city of Scotland, a portion of land is watered by the sewerage of the city, it is so low situated as to allow of this, and the grass is in cansequence so luxuriant as to admit of its being cut three or four times in the year, equal in each mowing to two tons per acre.

Another instance I gave in some remarks made on the culture of grasses by the late Duke of Portland,* converting 400 acres of barrens into fruitful soil, by turning the river Maun over the land and by draining the town of Chipstone and directing its sewerage over the lands in question. I named, too, the improvement of the large district of country between Liverpool and Manchester, by draining into open ditches the bog of Chat Moss. But why should we go to Europe or to England for successful applications of drainage. Under our own eyes we have a striking example of what energy will effect.

Part of the city of Madison is laid out on a piece of flat ground, so level as almost to preclude the possibility of draining it, and yet it is done. Two years ago it was so wet as to be impassable; previous to that

* See Vol. II. of Transactions, p. 198.

time it was a lake of water—now it is sound cultivatable ground. The spirited proprietor, L. J. Farwell, has intersected it with open ditches, into which the superfluous waters drain; and although those ditches remain filled with the water, the object of drainage is accomplished—and now by a little more expense they too can be emptied.

As a proprietor of land, and as a tenant farmer, I never hesitated to drain; and I have done so without any lease of land, although I would not recommend the practice—for ten to one, but your rent is advanced upon you for the improvement.

Draining has had for its advocates the intelligent of the present age, as well as of the last half century. I should have been glad to have given you the names of men who have done some service in their day and generation, but without my books I cannot. The late Mr. Smith, of Decatur, wrote elaborately on this subject, and of his own experience recommended deep draining; and the wisdom of his suggestions and the proof of his increased crops were so apparent as to make the practice common with all who had the means, and whose lands were unentailed; and so enthusiastic were some, that a gentleman I knew well, whose land was wet, and who was so pleased with the novelty of the thing, that doing, as he did all things to an extreme, he put in his drains so deep that the springs of water that supplied his farm houses were all drained off!

Another system of drainage has obtained some repute, called furrow draining. Many of the fields of England, as I before remarked, were cast up into ridges, which gave an uneven surface to the land, and I stated why this was done; in these furrows, or bottoms of ridges, drains have been laid to the depth of the plow-share, and from this much cheaper practice great gain has been made in the increase of crops, and no doubt it is an excellent system; but in my opinion much less effective and less permanent than deep drainage. It is true that the drains thus made, being about a foot in depth, carry off the surface water, and at such a depth the roots of grains or grasses do not penetrate; but it will be obvious that such draining will only suit lands having an easy descent, and is inapplicable to a wet and boggy country; besides being liable to be disturbed or broken in by the workings of the plow-share. Roads as well as lands should all be drained; there is no necessity for any man to get up to the neck with his team, the water can be ditched if not drained off. A good wide, or narrow ditch, as may be found requisite, will drain any adjacent road; and nothing, besides, is so great a comfort or so marks the country or its residents as good roads. To have a road about your house, or through your farm, in such a state as to compel you to seek out another in a wet season, is as slovenly as it is wasteful and expensive; when it is known that any road can be made dry and pleasant to pass along by a drain, either open or covered. It is, I think, unnecessary except when the means are ample to make your farm road by covered drains, especially when it is only in rainy weather that such are needed. A neat ditch, which can be made first by a plow and then by a spade, will answer all the purposes; it will require, of course, to be occasionally spaded, but to an orderly farmer this is no trouble, or at any rate he will make none of it; having, as it has, for its object, neatness as well as comfort for all about him.

Having indicated the evils of watery land; having rendered proofs of the improvement of such, and having, I think, shown the utility of the improvement by drainage, I shall bring my remarks to a close by adding the recorded experience of one of your own countrymen; and by further observing that the draining tiles made by machinery are made in two parts, equally constructed so as to make a complete pipe—a bottom with a half tube and flanges, and a top to match. I add a diagram of land requiring drainage, consisting of springs, high and wet low land; draining that as I have described, will give any one suggestions enough how to place his drains. For the information of your readers, I may state that a good workman will lay 500 or 600 rods per day. Before filling in, a little grass or hay may be advantageously laid over the tiles, to prevent earth from falling through the joints or crevices of the tiles; the surface earth is put in first on the tile or drain, being of more friable texture, and admitting the passage of rain or water more readily to it; and then fill in with subsoil. It is well to avoid right angles in tributary drains; running them into the main-drain less acutely, is a less check to the current than very acute intersections. A thousand tiles will lay about 75 rods; a cent a rod will be the utmost cost of laying, and digging the trench will not exceed 20 cents per rod. I am satisfied that freezing out would be prevented by draining.

Mr. John Johnston, of Seneca Lake, Geneva, N. Y,, states his opinion and experience of draining as follows:—" My farm is on the east side of the Seneca Lake, opposite to Geneva. About six years ago I began to drain a field containing twenty acres, on my boundary line; six of which were subjected at that time to drainage, the six acres had seldom given a remunerating crop even of grass. After draining the six acres, the whole field was plowed and prepared for corn, two acres being reserved for potatoes. The usual care was given to the cultivation of the whole crop, which, during its growth, showed a marked difference between the drained and undrained portions of the field. The yield of this field proved to be the largest ever raised, as I believe, in the county, the product being eighty three bushels and over per acre; when the corn was husked and housed, it was weighed and measured in the ear, and allowing seventy five pounds to the bushel, for corn and cobs, the product was as above stated. This field attracted much attention; it was examined at the time of draining and after plowing, both the first and second season, permitting the parties to walk on the drained parts, without any undue moisture, while all other undrained land in the neighbourhood was muddy, and, as before stated, the corn was found far more vigorous in the plant and abundant in the grain. In the following season, after corn I cropped it with barley, and found the drained land produced altogether the finest plant and the best yield of grain. I next prepared the field and cropped it with wheat. The difference again was so striking and distinct in favor of the drained land, that I felt the propriety of draining the whole field, which was completed without loss of time at a cost of twenty two dollars per acre. I then plowed it and sowed with barley, and seeded with clover; of the latter I cut a very large crop last summer, and not one square foot of the clover froze out, and now I can rely on a good crop of any thing I may sow or plant. I had previously drained several other fields, or at least those parts that needed it. Encouraged by a considerable increase of products derived from my former draining, I determined to extend the system as rapidly as convenience and circumstances would permit. Upon examination it appeared necessary to possess a piece of land belonging to a neighbor, that I might secure a good and sure outlet for the water from some of my upland fields that required draining. With this view, I purchased 10 60-100 acres of low land saturated with water. On a part of this land, say about four acres, from twelve to eighteen inches of the surface was a black vegetable mould, lying on a stratum of clay of the same depth, under which I found a hard bottom for my tiles, not over three feet in depth. I felt persuaded that those ten acres were wet from my own upland as well as from my neighbor's wet land adjoining. The first ditch I dug was directly on the line between the land I got of my neighbor and that he still owns; this I found cut off all the water on that side. I then commenced draining this 10 60-100 acres, also about thirty acres of upland; a large proportion of the upland did not require draining. In the two pieces which, made into one field, contained about 40 acres, I had 1072 rods of drains, which have drained the whole in a thorough manner. The first year after completing the drains in this field, the whole, or nearly the whole, upland and all, was planted with corn; the season was not favorable for that crop, yet the crop was fair, being full forty bushels of shelled corn to the acre. The low ground was excellent, where nothing but coarse grass had grown for 20 years before. This year, 1851, I harvested from this field a crop of wheat, and a heavier crop I never saw stand up. Heretofore, many acres of wheat were lost on the uplands by freezing out, and none would grow on the low-lands—now there is no loss from that cause. Only two small patches, in all less than one quarter of an acre, was lodged; in fact, the whole field was so even it was difficult to pronounce any five acres worse than the rest. The wet ground got from my neighbor was the source of much curiosity to all around, as none would believe that wheat could be ripened on land so long saturated with water. It was watched, therefore, from the time it came above ground in the fall, until the last of it was harvested. The result was a crop of wheat, abundant in quantity and excellent in quality."

Mr. Berkley accompanies the foregoing valuable paper on drainage, with some remarks upon the value of Fairs and Markets, which are inserted below.

A. C. I.

Next to the cultivation of good and nutritious grasses, and together with well drained lands, comes Fairs and Markets. To have a mart, or assemblage of the persons having to sell or buy, seems to be an instinctive principle of society; and although Fairs originated in a rude and primitive period of history, yet their continuance up to the present time has shown that they are not only required, but that experience has proved them necessary. On the Continent of Europe these periodical assemblages are common to every nation. The Fairs of Frankfort and

Leipsic, in Germany, are resorted to by merchants from all the States of Europe, and by buyers from this country also. The wools and cloths of Saxony as well as other manufactured goods, together with the raw produce of the country, form so large a collection of merchandize as to keep the fair in existence for three weeks. In England, too, Fairs are common to almost every large town or community. The Agricultural Fairs, for in England the Fairs are entirely agricultural, are numerously attended; and the amount of money exchanged for cattle, horses, sheep and swine is considerable. Such, indeed, is the necessity of the case that these fairs, from the quantities offered for sale, are, in many instances, divided into exclusively sheep fairs, and horned cattle fairs, and horse fairs. The breeding and rearing of each class of animals being pursued, especially of sheep, by the graziers of the hilly and mountainous parts of the country; the fattening for mutton, and wool growing, by others. No better way can, in my opinion, be found for general disposal and purchase than by bringing the respective parties together at a fair or market where it is an understood thing that men come to sell, and come to buy. The most needy and the least, meet here on common ground, and the market price is obtainable by one as well as another.

Fairs for the sale of cattle, horses, sheep and swine, held in the spring and autumn of each year, would be highly advantageous. An order by or with the sanction of the Governor would make it observable, consequential and legal; and to any city, in a newly settled country, the consequences would be important.

Your own and other State Fairs, is an assurance of success in that which I suggest; in them it is proven what competition and emulation has effected, and inasmuch as general fairs would be open to all without cost, the general good that would ensue cannot be doubted; and it will be worth the serious consideration of those who possess property in Madison to be in time with suchinstitutions, as it is manifest the public mind will call for.

Next to fairs, markets or market days, are indispensable, on which the produce of the farm can be brought to market. The vicinage, and more, would know that at Madison, for instance, there is a public market for the sale of grain, corn, hay, &c., on the Tuesdays and Saturdays of each week; to which he who has to sell wheat, &c., may surely go—for such days being known as market days, those whose business it is to buy will as surely resort. The advantage to all incalculable, for such days being known as market days—and they would, I think, be great days—buyers and visitors from Milwaukee, Chicago, and beyond, desiring to buy largely, would gather together to get where it is to be got, as well as would the sellers congregate where buyers come. Reciprocally they would meet, the bond being the interest of each. Nor need these markets be confined to grain, or corn, or hay—butter, eggs, poultry, might all be exhibited, each seller with his grain or corn in a two bushel bag, representing his wagon load, and in another department baskets of butter and eggs, and poultry ranged along the railing of the square of the Capitol.

No time should be lost, I think, in putting these suggestions into a rule; let it be publicly enacted by law of the Legislature, limiting the duration of such markets to two hours or three, say from 10 to 12 o'clock of the market day.

The Exchange in London, where the merchants of the world meet to transact business as important as the councils of Downing Street, or Washington, is limited to an hour, at the termination of which time the officers turn every one out, civilly of course.

Better than the open street, would be a building large enough to accommodate all; and in such case a small payment by the sellers would be willingly paid to defray the interest on the expenditure. In such an erection, stalls or benches might be constructed for the sale of agricultural and garden produce, subject to a small rent charge, and forming for the two market days of the week a horticultural bazaar. Should the government not like the responsibility of the undertaking, no better investment of money could be made, or speculation entered into, than to erect a building for a market, with inside stores which could be occupied on other days besides. No one's interest could be injured by such an institution. The only one that at all appears is that of the respectable store keeper's; but how could it injure them? they are open to perpetual competition, and this would not add to it, whereas it would most certainly increase the business of the town; and on the days in question give to each store and tavern keeper a "field day," and nothing in my opinion would so inevitably improve the value of the property of such town, as that of its instituting public markets on specific days. But I forbear to enlarge—it is apparent that an inducement for distant as well as near visitors is conducive to importance; and that the wealth of any State is in its *members*, and that its happiness, as well as its well-being, is in diffusing the greatest amount of good to the largest number of people.

Yours faithfnlly,

JOHN BERKLEY.

To ALBERT C. INGHAM, Esq.
Sec. of the Wis. State Agr. Society.

THE NATURE AND ANALYSES OF SOILS.

BY P. R. HOY, M. D., RACINE.

The prosperity of the farmer will be much assisted by a knowledge of the nature, habits and proper food for each crop he wishes to cultivate; as well as a knowledge of the composition of the soil, what crop it is best adapted to producc, and what manure it may require to render the growing of other crops profitable.

It is now a well established principle, that different vegetables require different food, as well as animals. It would be just as absurd, in view of the well established principles of agricultural chemistry, to 'plaster' land in order to insure a good crop of wheat, as it would be to expect a lion to thrive on oats; while on the other hand, turnips, clover, and some other crops, would be materially benefitted by it, (plaster,) provided their soil did not already contain enough, which is impossible to know without analysis. Nature's laws are invariable, and it is the interesting business of the scientific agriculturist to become acquainted with her laws, so far, at least, as it relates to his occupation. In this I propose to render him some assistance, and if he will not be discouraged by the bare words chemistry, analysis, &c., I will endeavor to prove that the analysis of soils, so far as to arrive at practical results, is simple and easy; requiring no array of costly apparatus or great skill, and a very limited knowledge of the mysteries of chemistry. With a little patience and industry, the hand that guides the plow may be made to analyze the soil it cultivates, and become familiar with qualities and composition—that grand key to a rational and successful system of agriculture.

First, procure the following articles, necessary—or, I might say indispensable—to analyze soils; they can be procured at any drug establishment, and will cost about twelve shillings. A pair of scales and troy weights, sufficient to weigh one quarter of a pound—you can make a few extra ten and twenty grain weights—a glass funnel, a small bottle (with a glass stopper) full of muriatic acid, a few sheets of filtering paper, (newspaper will answer,) two or three four ounce vial-bottles, a few cents worth of prussiate of potash. These, with what any farmer has about his house, will answer our purpose. There are, however, a number of other articles that would be highly convenient to have; such as a wedgewood-ware morter and pestle, and sett of Hessian crucibles, but our object is to get along with as little expense as possible, for economy must be the farmer's motto.

Taking Samples of Soils to Analyze.—If you have an old musket barrel with the breech-pin out, grind the muzzle around to an edge, this will make a good "borer" for our purpose—if you have not such an article, you can dig down with a spade—get your samples from the side of the hole, not from the pile of dirt thrown out; for the surface and subsoil will be mixed. Let us commence at home—thrust down your gun barrel about two feet here where the soil is in its primitive state; take a rod that will fill the bore, and push out the soil on a board—there it is, a long column—and on inspection its appearance is of a light, reddish color, and feels sharp and gritty, with but little adhesive properties; near the surface it is a little darker, containing a small quantity of vegetable mould, which diminishes as you descend; under, and at the bottom of the bore it appears to be little else than sand. Take a small parcel from near the surface, lay it on a plate, or bit of glass, and pour on a few drops of muriatic acid, if it effervesces or bubbles up it is a proof of its containing lime; should the effervescence be slight, the soil contains a small quantity of lime—how much we shall know when analyzed. This is what is called a "silicious soil," (i. e., sandy.) Take about a quarter or half a pound from the top; if you dig with a spade, take your sample from about two inches of the surface—carefully wrap it up in paper, or what is better, put it in a clean bottle and cork tight; label it, "No. 1, surface soil from school section, Racine—character, sandy.

We will bore down for our next samples, in your low flat and rather moist piece of land, as yet uncultivated—at the depth of two and a half feet is a stratum bed or layer of clay; the soil is black, has a soft spongy feel, and when pressed between the thumb and finger, a reddish colored liquid is forced out; this contains an abundance of undecomposed vegetable fibre, test need not be applied (muriatic acid) as it will be seen at a glance, by the undecomposed state of the vegetable matter, that there is no lime present. This is evidently a "peaty soil." Save a specimen as above; label it, "No. 2, &c.—quality, peaty."

The next specimen we will take from the cold, clayey field, so liable to "bake" and crack when it is worked in hot weather—the soil is of a yellowish color, owing no doubt to the presence of a little oxide of iron; as we descend, it becomes lighter colored, and has a clammy, adhesive feel. This, we readily perceive, is a stiff, argillaceous or clayey soil, partaking a little of the ferruginous or irony character. Put up your sample, as usual, and label it, "No. 3—clayey."

Next, and last, we will take a sample from the field which produces about forty bushels of wheat to the acre, without any manuring. Extending a foot below the surface, we find a dark friable loam, it crumbles freely when handled, and upon pressing it between the fingers it feels "fatty," and sticks together, and smells like mouldering wood, or decomposed bark. Near fourteen inches below the surface, the soil becomes lighter, and contains less humus, or decayed vegetable mould; it is soft to the touch, though not stiff and clammy, like the clayey specimen. Here must be lime, but let us be sure. This is readily ascertained by applying the test, which will cause it to smoke and foam. This is a fine calcareous soil, or loam. The amount of lime we shall ascertain by analyzing. Preserve a sample as above, and label, "No. 4—calcareous loam."

We have now four good specimens of the principal classification of soils, consisting of *Silicious*, *Argillaceous*, *Peaty* and *Calcareous*. We make these classifications merely for convenience, as we have an endless variety by the mixture of the above with each other, and with other varieties, with which I have not thought best to trouble you. We have now all things in readiness for analyzing the soils; that is, separating the different substances of which the soil is composed from each other, and ascertaining their respective proportion, in order that we may be able to form a correct judgment of the fertility of the soil, and its adaptation to particular crops.

Before we proceed farther, I wish to impress on your mind the advantages and usefulness of a knowledge of the analysis of soils. I hope you are not one of those skeptieal men, who reject all "book knowledge," and regard agriculture as a mere tissue of practical drudgery; containing nothing beautiful or valuable, to occupy and elevate the mind; if you are, I can tell you it is too late in the day, to indulge such crude, and exploded notions:—Agriculture is a science, and a noble one too—worthy the best efforts of the greatest minds. No one is fully capable of profiting by his experience, unless he can tell the why, and wherefore, and this he cannot in most cases do, without a knowledge of the operation of Nature's laws as relates to agriculture. No man can be an efficient judge of land without he can analyze soils. I am aware many people by long experience have gained a certain knowledge of land, by which, from superficial inspection, they can in some measure judge of its productiveness generally, and its particular adaptation to the growth of certain crops. But such judges are exceedingly liable to be deceived; in fact, no certain confidence can be placed in their opinions. They don't know the constituents of the soil—they never trouble themselves about the subsoil; its capacity for retaining moisture in dry weather; its organic and saline particles; its lime, magnesia, or iron—all these things which bear a most intimate relation to the fertility of the soil they never inquire into. The consequence is, that they do not know how that land will act in very dry or very wet weather—they do not know whether it will grow wheat, tobacco or turnips—what manure it will require, or whether it does vegetably or geologically contain the means for producing that manure—in fact, their judgment is little better than mere shrewd guessing: it may possibly be right, but there is no demonstration or proof accompanying their opinion; the why and the wherefore, the reason and the foundation for their opinions are wanting; neither can they supply them. The man who understands the analysis of soils, knows all they do in a more perfect manner—and he knows more; he can inform you what the soil is composed of, and how its composition will act under certain states of weather; how in dry weather; how in rainy;—he will inform you what crops that composition will best grow, and what manure to supply to it to make good any deficiency. Hence this knowledge becomes of immense value. See a farmer or emigrant setting out westward into unsettled regions, in search of a piece of land. Suppose him to be able to analyze the soil. When he reaches a favorable piece of ground, he commences an examination of its qualities. Boring into the earth, he endeavors to ascertain the depth of the surface soil, and the nature of the subsoil.—With his humble apparatus he examines the nature of the soil. He will soon know its fertility and what it will grow: In a few hours, he will know the humus or organic matter, the lime, the clay, and the sand it contains. He will have ascertained its power of retaining moisture; and will judge at once with an accuracy nearly approaching certainty, of the quality and capabilities of a piece of land he never saw before, and from which the hand of labor and art has never yet extracted support and wealth. Set such a man on a farm which he has visited with a view of purchasing it, if suitable—it may be a farm exhausted by repeated croppings until its soluble salts and humus are taken out of the soil. In damp weather and certain seasons, such a farm would be possibly arrayed in a verdure of deceptive vegetation; but in its crops it would be considerably deficient.

The analyzer of soils knows this: a skin-deep survey will by no means satisfy him. He tests the soil; he finds its soluble extracts, its nourishments, its feeding principles gone—nothing remaining but a skeleton soil—a beggarly account of sand and clay, not worth the labor of recovering to a state of fertility. In some future publication I may give the mode of performing a more minute analysis; in the mean time I hope you will become practically familiar with the one I am about to give. You must not expect great accuracy, without much practice, and patience. First operate on those soils you know to possess certain qualities in a marked degree—compare these results, and you will be delighted and instructed; many familiar effects you will be able to trace to their appropriate causes. Draw your own conclusions from analogy, and prove by experiments; your thoughts and mind will be thus elevated and improved, and you will be able to bring the important aids of science to the practical pursuits of agriculture, and add alike to the source of your happiness, and temporal prosperity.

We will adopt the following rough, and very simple short analysis; which will enable you to form a pretty correct judgment of the principal, and most important qualities of the soil. By this method farmers, and country gentlemen as well as chemists, may obtain results sufficiently accurate for many practical uses. Take your calcareous sample (No. 4.)—dry before the fire or in the sun, until it is as dry as soil on the surface, in summer, where exposed to the sun—that is, until it feels quite dry to the touch—rub between the fingers till evenly pulverized; weigh precisely 1000 grains, put it on an iron plate or clean shovel, and place in an oven or over a gentle fire—drop in some bits of white paper—keep stirring constantly—let it remain until the paper begins to turn brown; it ought to take at least one half hour. You must not allow it to burn; your object being merely to expel all moisture without burning. When thus perfectly dry, empty on a clean sheet of paper being careful to raise as little "dust" as possible. I may as well remark here, that in your stirring, weighing, and all other manipulations, waste not a particle that can be avoided, be minute and precise. Weigh accurately—it only weighs 876 grains a loss of 125 parts, which is the moisture this soil is capable of retaining after it appears dry. The great absorbent quality, a very important item, of this soil is a considerable indication of its fertility; taken as a general rule, the greater the absorbent power, the better the land. A stiff clayey soil is an exception, it being frequently as retentive of moisture as fine loam—this must be remembered. Note down on a slip of paper—water of absorption 125. Next, rub through a fine sieve, (such as are used for sifting meal will answer) what remains on the sieve is fine gravel and small stones. When there is vegetable matter, entirely undecomposed, it will be separated in sifting; in such cases, you must "pick" it out and weigh, or weigh all that remains on the sieve, and burn out the "woody" fibres. What it loses in weight will be the undecomposed vegetable matter; in the "sample" under analysis we have none. You must not separate the "loose stones" and vegetable matter, before the water of absorption has been tested, for these substances are often highly retentive of moisture, and increase the fertility of the soil. We have 50 grains of small "pebbles"—let us examine these, to ascertain whether they be silicious or calcareous—if silicious they will appear "flinty," and cannot be scraped with a knife—if calcareous they will effervesce with acid, and if common slate stones they can be cut with a knife and will not effervesce. You perceive we have here about an equal quantity of 'lime' and 'flint' stones. Make your entry silicious and calcareous gravel 50. If you wish to be more minute, in ascertaining the amount of lime, in the coarse sand and gravel, you must pound the whole to dust, and dissolve out the lime with diluted acid in the manner I shall direct, when we come to ascertain the amount of lime in the sifted soil. Now replace the remaining 825 grains of fine sifted matter, on your shovel, previously heated red hot, and burn it thoroughly over a hot fire, until every thing combustible is burnt out, this will take from fifteen to thirty minutes. Again weigh—just 715. We have burnt off 110 grains which is nearly all organic. Care must be taken in inspecting the soil to ascertain whether it is peaty or full of rooty fibres, for in such cases the organic matter is not in a suitable condition to nourish vegetation; in this soil it is mostly decomposed—converted into what Liebig, and most chemists call humus; Berzelius and Dr. Dana, call the same substance geine; and in a suitable condition for vegetable use—note down—humus 110. Next, put the remaining 715 parts in an earthen bowl or Wedgwood mortar, pour over it two or three ounces of diluted muriatic acid—equal parts rain water and acid—stir it well and let it stand twenty-four or forty-eight hours, occasionally give it a stirring—by this all the lime will be dissolved; pour off the clear liquid—avoid riling it up in the least—add more water, stir and let stand till it again settles, pour off—repeat two or three times; by this process the lime will all be worked out. If upon applying the acid* to the original specimen, as directed above, no effervescence occur, this last process may be omitted, for there is no carbonate of lime where there is no effervescence. You may be surprised to see so little effervescence when the dilute acid was poured upon the soil in the above process; this is owing to your having expelled the most of the carbonic acid, by the heat necessarily employed to burn off the organic matter. All the lime, however, still remains; but in the form of an oxide, commonly called *quick lime*, instead of the carbonate. Throw the whole on blotting paper to drain, then dry on a hot shovel, and weigh. You perceive our 1000 grains have dwindled down to 565. We have washed out 150 grains, which we will set down as "salts of lime;" this is not quite true, for there is probably a small quantity of iron, potash and

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* Nitric, Sulphuric, or any of the strong acids will produce similar results, but not so certainly as the muriatic. Any acid that will unite with lime, and liberate the carbonic acid gas, on the escape of which the effervescence depends, will of course produce this pheaomenon.

magnesia, but for most practical purposes this may be regarded as salts of lime. Now if we get the proportion of sand and clay in what is left, we shall have pretty near the facts of the soil under analysis. The way we shall accomplish this is to throw the remainder in a pint of rain water; let it stand a few hours to soften, then stir well up and let the sand settle—the fine clay will be suspended in the water. Pour off this muddy water, taking good care to pour off no sand; throw more water in, stir well up and pour off as before. Repeat till the water no longer becomes muddy—the object being to get rid of every thing left but the sand—after being thoroughly washed, throw it on a hot shovel to bake off the moisture. The dry sand weighs 465—we have washed out by the last process 100 grains of clay. Now we can finish our notes—alumina 100, silicious sand 465.

By dividing the several amounts obtained by ten, we have the per cent.—that is, the proportion in 100 parts—which is rather more comprehensive than the greater number, 1000. Thus:

No. 4.

Water of absorption	12.5
Silicious and calcareous gravel	5.0
Humus	11.0
Salt of lime	15.0
Alumina	10.0
Silicious sand	46.5
	100.0

From this analysis, simple and rough—very rough though it be—we have obtained the most satisfactory evidences of the fertility of the soil. Any one acquainted with the principal ingredients in good soil, will pronounce this a most exccellent combination of sand, clay and lime, with an abundance of organic matter—a soil well adapted to the successful cultivation of wheat, oats, corn, potatoes, and in fact, it is well adapted to the growing of almost every valuable crop. It works free and light under the plow, and will abundantly repay the husbandman for all his toils—so says science, and experience proves it to be correct; for this is no *fancy* soil, but an actual analysis of a sample taken from a remarkably productive wheat field in Ohio—a field that had produced many heavy crops, without any artificial manuring.

The following is the result obtained by subjecting the clayey specimen to like analysis:

No. 3.

Water of absorption	11.5
Humus	5.0
Salts of lime	3.5
Alumina	42.0
Silicious sand	38.0
	100.0

Here we have a cold, heavy soil, that works stiff and clammy under the plow; it bakes if worked when wet, and becomes so excessively hard in a dry time that it cannot be plowed. It might produce a pretty fair crop of wheat and oats, in a favorable season, but would require expensive sanding in addition to barn yard manure and lime to make it good grain land. It is well adapted for meadow purposes; most grasses, especially timothy, flourish on such ground. Our peaty specimen gave the following:

No. 1.

Water of absorption	3.5
Humus	4.5
Undecomposed vegetable fibres	75.0
Salts of lime	0.0
Alumina	7.0
Silicious sand	10.0
	100.0

This is a good peat, you perceive what a large proportion of the entire soil is undecomposed combustible matter. When thoroughly dry it would burn well, and might be used for fuel in the absence of wood and coal. This will require thorough draining, lime, time, and exposure to the air, before any crop of value can be raised on it, unless it be cranberries. A small portion of such land would be valuable as a manure, to enrich land deficient in organic matter.

The following is the result of our analysis of the sandy specimen:

No. 2.

Water of absorption	3·5
Silicious gravel	12.0
Silicious sand	75.0
Humus	3.0
Alumina	4.0
Salts of lime	2.5
	100.0

This is our warm light sandy soil, near the lake; it works free and easv under the plow or spade, either in wet or dry weather. It would require but two or three crops without manuring to exhaust this 'thin land.' It makes a good foundation for gardens. With an extensive application of leached ashes, one of the best manures for sandy land, stable manure, and 'swamp muck,' it makes a fine soil for almost any crop.

I will add the analysis of a portion of soil, taken from the middle of a field, belonging to Walter Cooley, three miles north of Racine, which has produced nine heavy crops of corn, and one of oats in succession, without either rest or manure:

Water of absorption	12.5
Humus	12.0
Salts of lime	6.3
Calcareous gravel	4.0
Alumina	20.2
Silicious sand	45.0
	100.0

This fine surface soil extends from one foot to eighteen inches deep, and is underlaid at the depth of from four to eight feet by a spongy limestone. In appearance, and most essentials it differs but little from our analysis No. 4. Here is sand, lime, clay and organic matter finely blended; composing a soil capable of resisting, for a considerable time, a destructive system of agriculture. When will farmers learn it to be for their interest, to keep good land good, and make poor land better? instead of making good land poor, and poor land worthless—it is quite as absurd, and economical, to exhaust land by continual cropping, and withholding nourishment until the land can no longer produce a crop without it, before we resort to manuring, as it would be to starve a fat animal until it become poor, before we supply it with proper food.

THE INORGANIC SUBSTANCES IN SOILS—SAND AND CLAY.

Sand.—Silicious sand is the principal constituent in most soils. When analyzed it is found to consist of silica and oxygen in nearly equal proportions. Silica forms an average of at least from fifty to eighty per cent. of all arable lands. It forms the skeleton of the soil, rendering it permeable to moisture, heat and light—the three great promoters of vegetable life. Among its separate particles the tiny rootlets can, with ease, wind and twist, thereby forming a secure support to the stalk. Vast extents of country are composed entirely of sand: such as the almost boundless deserts of Africa and Asia, the universal sterility of which prove that sand alone is not capable of sustaining vegetable existence; but a due proportion renders the soil easy to cultivate, warm and productive. Sand enters into the composition of plants; in fact it is a part of their food "It is not only, as it were, a plate to hold the food upon which the living vegetable subsists, as most people suppose, but it is itself one of the things that plants absorb into their substance—on which they daily feed." You may easily prove this, by burning any plant you choose, and analyzing its ashes; in them you will find a very considerable proportion of sand. Wheat ashes contain 28 parts of sand in 100 parts. The ashes of barley contain nearly 50 parts of this material in 100. Oats 65 per cent. In the hard polished straw of which bonnets are made, the proportion of sand is much greater. Sand is always the most abundant in those parts of the plants, most requiring strength and hardness. The straw of any grain contains more than ten times the amount of sand that the grain itself does; and the joints or knees of the stalk contain more than the smooth shaft. Sir Humphrey Davy found sand most abundant in the epidermis or outer *bark* of plants—this part evidently requiring the most protection. Thus has nature provided that a coat of mail shall surround the finely polished shafts of plants, formed of the hardest of the *earth;* thus the bark of the bonnet cane, the sugar cane, the corn stalk, and the common reed, and all similar plants, are panoplied in an armor of flint, smooth and hard—at once forming protection, strength and beauty. The question hereupon naturally arises, how is the unyielding sand taken up by the plant; or, in other words, how can a plant eat sand?—they cannot absorb those hard, flinty grits. No, they cannot use the sand in its natural state; they do not eat it raw; it has, so to speak, to be *cooked* for them. Plants absorb sand in solution. Rain water will somewhat dissolve sand, owing to its containing a minute quantity of ammonia; but pure distilled water scarcely makes any impression on it. Sand is soluble in alkalies; in potash, for instance, you can melt sand. The ley that runs from wood ashes will dissolve sand in process of time. In all fertile soils there is more or less potash. It exists naturally in granite soils, from the decomposition of the granite rocks, which contain potash. It is given subsequently to soils by the growth and decaying of vegetable matter. One of the uses, and I have no doubt a very important use of potash in a soil, is to assist in dissolving the sand, which by this operation, and the assistance of rain water, is melted—liquified—dissolved—and in that state is sucked up by the spongy fibre of the plant. Clay always contains more or less potash, and as it retains moisture, considerably, acts perpetually as a solvent to sand. Lime also has considerable solvent action on sand, when in a moist state. Thus you perceive that sand with proper auxiliaries, becomes an important food for plants, and an excellent friend of man.

Clay—Next to sand alumina, or clay, is most generally present in soils; though, upon the average, in much smaller quantities than either sand or lime. It is the oxyde of the metal aluminum—that is, it consists of aluminum and oxygen, in the same way that sand consists of silican and oxygen—or as iron rust consists of the metal iron and oxygen. It is found in varying quantities, from one per cent. in a sandy soil, to fifty per cent. in a heavy, tough clay soil. Alumina is not found in all plants, and only in minute proportion in those in which it does exist. In wheat it can hardly be traced at all; inbarley and rye, 32 ounces only contain four grains, which is less than the five-thousandth part. It is, therefore, apparently of less importance as a direct food for plants, than as an integral part of a soil necessary to its general fertility. The great use of clay appears to be in giving fixity and substance to the sandy particles of the soil. In this respect clay is exceedingly beneficial. Many barren sandy soils, which would not produce crops at all—indeed, merely shifting sands have been converted into fine arable land by spreading clay over the sand. Besides the mere mechanical benefit of clay in uniting and binding a soil, it is of material service in absorbing and retaining moisture. Clay absorbs water more quickly and more abundantly, and retains it longer than sand; it does not heat so rapidly as sand, in the sun, and it cools again more rapidly, thus helping in hot weather, to maintain an equal temperature in the soil. Clay does not become as cold as sand in winter, and as frost causes it to contract, it closely embraces the roots of plants and prevents their being frozen. Clay has also preeminently the property of absorbing ammoniacal and other gasses, which are generated by decaying manure in the soil. If in a stable from whence the strong fumes of the escaping ammonia are issuing, you place a quantity of dry powdered clay, that strong pungent smell, which almost took your breath, and made your eyes smart, will disappear. Where has it gone? It is still produced as before, and yet its presence is not perceived. The dry clay absorbs it; and the escaping gasses are fixed in that earth, adding to its enrichment. Gypsum or plaster has precisely the same effect, but in a more marked degree. A clayey soil—or one containing clay—will more beneficially and completely use the manure laid on it. When manure is put on land and plowed in, the ammoniacal and carbonic acid gasses produced by its decomposition are partially taken up into the plants; but being formed faster than the plants can absorb, these products float away to waste or feed some overgrown marsh or forest, except the soil can attract and sustain them, and thus hold them over until they are required. This clay will do; this sand alone will not do—this lime cannot do—and hence it follows that lands containing clay, constitute the most *lasting* and prolific, and are the most economical for manuring.

WHEAT CULTURE.

BY E. A. CALKINS, MADISON.

The production of wheat is a labor of civilization. It is a labor to the profitable performance of which the disciplined care and industry of civilized men are necessary. It requires a careful preparation of the seed and soil, the culture which experience has proven as adapted to it, and the harvest is then generous as the tillage is skilful. In a rude state of society men depend for subsistence on the spontaneous fruit of nature, or the spoils of the chase. They do not devote artificial means, except those most nearly allied to the natural processes of vegetation, to the production of the means of life. They do not clear the land. They plant their seed in the ground as chance or convenience dictates, and as it can be done with least violence to the proverbial indolence of savage existence. They leave it to grow without further culture, and reap the scanty yield when it shall have matured beneath the adventitious influences of the sunshine and rain. With this slight and careless attention, the coarser grains are sufficiently productive to satisfy their necessities. Nature is kind where little is asked, but will not without encouragement repay a magnificent usury.

To the culture of wheat, high care, and the organized means devoted by intelligent calculation to all pursuits of industry, are requisite. A realization of the utmost possible profit with least expense is the great problem of civilized society. It is the leading and ultimate object in all schemes of labor and business, and to its accomplishment the application of means which science has demonstrated the best and cheapest, is necessary. The wheat plant is one that rapidly exhausts the sources of nourishment in the soil, which art must again supply. Seed-time and harvest must be determined by careful observation of climate, of fluctuations in the atmosphere, of the mildness and severity of seasons. The seed in the earth, the grain in the shock, the stack or the granary, equally require skill and experience to preserve them from injury.

Wheat in its various forms is the staple article of food in civilized countries. It forms a necessary, and enters into the luxuries of life. It is bread, it is cake, it is pastry. It supplies the necessities of the poor, it ministers to the tastes of the rich. The coarser grains satisfy the coarser appetites of barbarianism. This is adapted to the cultivated wants, and is a refined comfort, of civilization. Wheat is the finest and richest grain that grows. It affords more and better nutriment to the same bulk than any other grain. It is the most costly and best repays the labor of cultivation. In short, like the other comforts and discoveries of civilization, like the fine cloths and intricate machinery, which are the products and means of enlightened science, it marks the eras of advancement—it is almost a token of the progress of mankind. It would not, perhaps, be a wild figure of speech to say that the history of the wheat plant, its culture and use, would be the history of civilization.

There are but few plants, even the most important, the history of which can be traced with accuracy beyond a few centuries backward. Of the wheat plant, the earliest accounts mention its production in the island of Sicily, and afterwards in the countries included within the narrow belt of civilization along the northern shores of the Mediterranean, in Asia Minor, and in Egypt. As communities advanced, it was cultivated to a greater extent, and with greater success. It spread with the spread of civilization over the balance of Europe, was introduced into the temperate climates of Asia, and with the discovery of America it was brought hither. It is now a leading production of both temperate zones, enters largely into the staple articles of commerce, and gives employment to a large proportion of the civilized races. Of its importance to the trade and business of the world the following figures are illustrations. The first table is merely interesting as showing the sources of supply; the second table is as late information as was within the present reach of the writer:

Imports of Wheat into England for Year 1830.

From Russia	235,108 qrs.
„ Sweden	2,960
„ Denmark	88,103
„ Prussia	519,573
„ Germany	365,981
„ Netherlands	76,711
„ France	14,742
„ Spain	40,953
„ Italy	75,604
„ Malta	28,612
„ Egypt	7,268
„ British North America	76,654
„ United States	184,100
„ British Islands	17,349

Total, 1,675,430 qrs. or 13,403,440 bushels.

Imports of Wheat into Great Britain, 1840 *and* 1841.

1840..From Ireland	174,439 qrs.
„ From Foreign Ports	2,352,206

Total 1840, 2.526,645 qrs., or 20,213,160 bushels.

1841..From Ireland	218,708
„ Foreign Ports	2,704,481

Total 1841, 2,923,189 qrs., or 22,385,512 bushels.

Wheat raised in Great Britain, 1842.

No. of qrs.	17,500,000
No. of bushels	140,000,000

Value at average price for that year.............£45,500,000

Exported from United States from 1847 *to* 1853, *inclusive.*

Year.	Wheat.	Flour.
1847,	$6,049,350	$26,133,811
1848,	2,669,175	13,194,109
1849,	1,756,848	11,280,582
1850,	643,745	7,098,570
1851,	1,025,732	10,524,331
1852,	2,555,208	11,869.143
1853,	4,354,403	14,783,394

Amount of Wheat produced in the United States 1850.

States.	Bushels.
Maine	296,259
New Hampshire	185,658
Vermont	535,955
Massachusetts	31,211
Rhode Island	49
Connecticut	41,762
New York	13,121,498
New Jersey	1,601,190
Pennsylvania	15,367,691
Delaware	482,511
Maryland	4,494,680
District of Columbia	17,370
Virginia	11,212,616
North Carolina	2,130,102
South Carolina	1,066,277
Georgia	1,088,534
Florida	1,027
Alabama	294,045
Mississippi	137,990
Louisiana	417
Texas	47,729
Arkansas	199,639
Tennessee	1,619,386
Kentucky	2,142,822
Missouri	2,981,652
Illinois	9,414,575
Indiana	6,214,658
Ohio	14,487,351
Michigan	4,925,889
Wisconsin	4,286,131
Iowa	1,530,581
California	17,328
Territories	517,562
	100,485,944

The climate of Southern Europe is probably, of all others, best adapted to the production of wheat. Facts are deficient as to the comparative quantity of grain produced to the acre. Analysis, however, of the various kinds grown, in various parts of Europe, show that the southern varieties, derived from their own soil, yield a greater proportion of the nutritive property than any other. The following Table exhibits the amount of water and of gluten in several varieties of European wheat:

	Per Cent. of Water in the Flour.	Per Cent. of Gluten.
Red English	16.4	9.5
White do.	15.5	7.5
White Scotch	16.3	9.4
Saissette	15.1	12.7
Rochelle	12.9	11.2
Odessa	13.0	15.0
Tagaurog	12.6	22.7

And Sir Humphrey Davy says, that he obtained from the flour of Barbary wheat 28 per cent. of gluten, though doubts are expressed of his correctness.

These exhibits are sufficient to show, that in the countries bordering upon the Mediterranean, the wheat plant arrives at its greatest perfection, giving to the same bulk the greatest positive amount of nutriment. Other facts are not wanting: their harvests rarely, or never fail—the grain has few diseases, and those are rather accidental than permanent—the yield is uniform, and the labor of cultivation is light. It is reasonable to suppose, that the grain grows to the greatest perfection on the soil native and suitable to it.

Like other plants, perhaps owing to original and native distinctions—perhaps to the influences of climate, soil, and culture, wheat exists in almost endless varieties. The more common and vulgar distinctions are those between winter and spring wheat. The former is sown in autumn and ripens the following summer; the latter is sown in the spring and ripens a few weeks later than the former. But little doubt can exist whether there is any natural and essential difference between these two varieties. If winter wheat is sown in the spring it will ripen the following autumn; the quality will be greatly inferior, but the form, the properties, and the germ of the grain will be complete. If again sown in the spring, it will ripen a little earlier, and will ever after partake of the qualities of spring wheat. The same experiments have been reversed with occasional, but not satisfactory success. If not sown too early, and the season proved propitious, spring wheat has endured the winter, and ripened in July. Such experiments can be of no practical value—they are interesting merely as botanical studies.

Experience can easily detect spring from winter wheat, by the appearance of the berry. The flour of spring wheat is not as white, is more soft and moist, and is adhesive and elastic in kneading. The bread has a slight peculiar fresh sweetness of taste.

The next more noticeable distinction is that between red and white wheat. The red varieties are generally more hardy, less subject to disease, and less affected by the weather. They yield more bran in proportion to the flour, and the flour is coarser and harsher. The white wheats are more delicate, yield a thinner cuticle, the chaff is not so heavy, and the straw is clearer and smoother. The flour is white, fine and rich. Some kinds of red are less subject to rust, disease and insects, than most varieties of white wheat.

The next distinction is between bald and bearded wheat. This distinction, however, bears no relation to the grain, and no difference is discoverable after threshing and cleaning. What may be the purpose of the beard, or awns, is hardly susceptible of explanation. Experience and reason alike teach us that even the most careless and bounteous exuberance is not without an object in the economy of nature—that nothing lives, or is, but what has some definite purpose and end, not apparent to eye or sense, but no less existent, no less faithful to its appointed mission and service.

The minor distinctions are almost innumerable. Some of the leading varieties are as follows:

Old Red Chaff.—This is one of the oldest and most substantial varieties. Its cultivation, in the Eastern and middle States, may be traced backward for sixty or seventy years, and at the West back to its first settlement. It has been regarded as one of the best kinds under cultivation. It is without beard—straw long, and stands up well—chaff, slightly brown. Its flour is white. It is not so reliable of late years as formerly, and suffers from blight, mildew, and winter-kill. In short, it is regarded as about worn out.

White Flint.—This grain is of Spanish origin, and is an esteemed variety. Its color is white, heads awned, medium length and well filled—straw white, clear and strong at the root, by which it is prevented from lodging—kernels very adhesive to the stalk. It is cultivated with success on loamy soils, and is easily susceptible to injury from frost or insect. The kernel is very hard, from its silicious cuticle, in consequence of which it is less injured by fall rains, and will stand in the shock a long time without sprouting. A variety has been obtained, which is merely, as its name indicates, an improvement upon this, and is called the *Improved Flint.* It was procured by a careful selection of the best seeds, and by superior care in cultivation.

Canada Flint.—Whether this is a variety of the preceding, is undetermined. It resembles it to a great extent, except that the bran is thicker and it spreads less in growing, which may be reasonably attributed to the process of acclimation in a colder latitude. It is also called the *Hutchinson Wheat.* The *Kentucky White Bearded* is a different variety—the beards extend farther down the head, the leaf is wider, and the straw is softer.

White Provence Wheat.—This variety is of French origin. It has been cultivated with great success in New York. It is of rapid growth, has large blades, without beard, and has a beautiful, large, clean, white thinly cuticlated berry. Its only defect is the weakness of the straw. A large number of straws spring from the same root, and it does not support itself well.

Velvet Beard—also called *Crate Wheat.* This has been cultivated from twenty to twenty five years. It requires a strong soil—has long awns—red chaff and bran—flour yellowish. It is not highly esteemed.

Indiana Wheat.—We first hear of this wheat in the State from which its name is derived. It is beardless—straw stout—kernel large and white, with thin cuticle. It ripens a week or ten days earlier than the flint, and is free from rust. It shells easily unless cut when quite green.

Mediterranean Wheat.—This grain is now in better repute than a few years since, as millers' succeed in getting better flour from it than formerly. It is an unobjectionable grain. It is heavy in weight, yields prodigiously, ripens early, and thus far has been proof against diseases and insects.

Tuscan Bald Wheat.—This wheat was introduced from Tuscany in 1837. The flour is white and fine, and the head fills well. The straw is soft and spongy, rendering it very liable to rust.

There are other varieties, among which may be named Soule's Wheat. Skinner's Wheat, Virginia White May, Aguira, Verplanck, &c. They have not, however, an extensive celebrity as superior grains to those which have attained a prescriptive respectability from the successful cultivation of years.

The following are the leading varieties of spring wheat:

Siberian Wheat.—This is also known by the name of Tea Wheat. It is a good variety, giving a fine berry, and fine white flour.

Black Sea Wheat.—This is an import from Eastern Europe, but is not a valuable variety. It ripens early, and escapes many of the casualties of later grains. It yields a dark heavy flour, and a coarse thick bran. It is sown in the New England States as a surer crop than finer grains.

Rock Wheat.—This is of Spanish origin. It has been cultivated in this country about forty years. It is not a fine, but is a successful, variety.

Egyptian Wheat.—This kind has been cultivated more as an agricnltural curiosity than for an good quality it possesses over others—in fact it is unequal to many of the common varieties. It has a head, consisting of from three to six or seven branches. It is bearded with a small berry and thick bran. The flour has a yellowish color, resembling that of barley, and has a coarse, harsh feel. This variety is principally notable from the fact, or fable, that it has been produced from seeds that were infolded in the cloths in which mummies had been enwrapped and where they must have lain, and preserved the prineiple of germination for thousand of years.

Red Bearded Wheat.—This succeeds best on stiff clayey soils. The beard stands out from the head—reddish chaff—white berry and yielding good flour.

Italian Spring Wheat.—This was much prized when first introduced, some twelve or fourteen years ago, but it has rapidly run out, and is now much neglected.

Talavera Wheat.—Without beard—chaff, white—long, stiff straw—head large and plump. This kind is subject to the attack of the fly, and is not sufficiently hardy to stand severe winters.

Hedgerow.—This variety has been greatly cultivated in Wisconsin. Of its origin, or whether it is elsewhere known by other names I am not informed. Of late years its cultivation has been entirely neglected in the Eastern and Southern portions of the State, in consequence of its liability to rot. In the West it has not suffered to so great an extent. It is distinguished by its short heads, which are filled out in such a manner as to give them a rectangular form. It is bearded—white chaff—bright, strong straw—round plump berry.

Canada Club Wheat.—This variety has been cultivated in the Eastern part of this State about five years, in the West about three years. It is at present a great favorite with our farmers. It is beardless, white chaff, beautiful white berry, which, if cultivated on the prairie, has a small black speck on the *teat*, or germ—a mark which it is totally without when cultivated on woodland. The straw is stiff, hard and wiry, more so than any other wheat known in this State, and is a principal feature of this grain.

These are the principal varieties under cultivation. There are others, but the limited extent to which they are produced would render a description of them rather interesting as an account of a rarity, than of practical use or benefit.

The disasters to which the wheat crop is liable are not numerous, but some are extremely injurious—others are fatal. A brief notice of some of them in this connection may be of more than passing account.

Wheat brand, or Smut is a disease that affects no grain but wheat—to that it is fatal and peculiar. The appearance of smut in the field is easily detected. The straw is large, coarse and dark—the leaves wide and rough. The head is short and imperfectly filled—the chaff brown—the seed is rounder and shorter and when crushed shows a fine-grained, greasy substance, with a foul ammoniacal smell, and which when dried falls to a smutty, earth-colored powder. A close inspection shows a total disorganization of its structure. Its cellular layers have disappeared—there is no trace of gluten—there is disease and decomposition pervading the entire organism of the grain. Flour, into the composition of which smutty wheat has entered to any extent, is darker and *deadish*, and has a decayed, slightly bitter, pungent taste.

Smut is, truly speaking, a disease of the grain. It is not the effect of weather or culture. No cause can be assigned for it, more than for other disarrangements of organic functions by secret and hidden causes, and the results of which are disease and death. It is, apparently, infectious. If not guarded against, a single head to an acre will, in a few years, corrupt an entire crop. It is supposed to spread from the adherence of particles of the dry, smutty dust to the furzy end of the seed, by which its entire composition is infected, disease fastens upon the germ and is developed in the future harvest.

The remedy for smut is very simple, and if carefully applied is effectual. The seed should be soaked in water and then rolled in lime. This treatment destroys the virus, smut or whatever the infection may be, or, at least, under it the infectious principle disappears. Followed for a few years it will cure an entire crop of this troublesome and injurious disease.

This is the only disease, properly so called, to which wheat is subject. The other accidents are mere influences of the atmosphere, or unfavorable seasons. Upon these causes are dependent a number of agents from which the wheat crop suffers more or less. The principal of these is rust—a formation upon the stalks, the nature of which is disputed, while the grain is still growing. Whether by some poisonous property, or by obstructing the surface pores through which the sap circulates, it destroys the life of the plant, and the berry withers and dies without arriving at muturity. This is the cause of shrunken wheat. The grain loses all its plump, healthy, full proportions, as well as its best nutriment and sweetness, yields light measure, and a dark, poor, lifeless flour.

Many theories have been advanced in regard to rust. It was once attributed to the honey dew—a vapor which the vulgar imagined distilled in virulent particles along the halm and chaff. Late speculators have supposed it to be produced by a superabundance of sap generated in moist weather, and which burst the pores, producing an exudation that formed on the surface of the stem. The more probable theory is that it is a parasitical fungus that forms on the straw in wet, *muggy* weather, operating upon the grain by some poisonous quality, or by obstructing the circulation.

A remedy for rust will doubtless continue an impossibility till human control shall be acquired over the incidents of natural change, over fluctuations in the earth and air—over storms and seasons. It can only be guarded against by the cultivation of hardy varieties of grain, by the careful drainage of wet portions of the field, and by early harvests.

Those grains of which the stem is hard, stiff and brittle, are less liable to rust than others. Those of which the halm is soft, thick and spongy are hardly safe under the most favorable circumstances.

Blight, mildew and rot are kindred accidents that affect the heads of wheat. They are probably caused by wet, or by some unknown influence which prevents the maturity of the grain, perhaps changing the sap by stagnation and fermentation into a decomposing agent. It is seldom that a crop is injured to any great extent by these causes—when injury is extensive it is temporary and probably unavoidable. They are the accidents which befall this, as other accidents befall other pursuits of industry, against which foresight is vain and prudence cannot provide.

A number of insects have for the last fifty years, been the worst enemies of the wheat crop. The principal of these is the Hessian Fly, the ravages of which have been so general and so fatal as to render a more particular account interesting.

This insect is known in science under the name of *Cecidomyia Destructor*. Its vulgar appellation arose from the traditional belief that it was brought to this country in some straw by the Hessian troops, under Sir William Howe, in the Revolution. No accounts are given of its existence in America before that time. It was first observed in the neighborhood of an encampment occupied by the Hessian mercenaries on Long Island. Having multiplied there, they spread over Southern and Eastern New York and Connecticut, proceeding inland at the rate of fifteen or twenty miles a year. They appeared about Saratoga in 1789, and west of the Alleghanies in 1797. They appeared in Osage county, North Carolina, through which some Hessian soldiers passed in company with the British army, soon after the battle of Guilford. These facts would seem to leave little doubt of the truth of the common notion relative to their appearance in this country. The head, antennæ and thorax of this fly are black. The hind body is tawny, and marked with black on each ring, and clothed with fine grayish hairs. The wings are black or tawny, and fringed with short hairs; the legs are a pale brown and the feet black. The body is one-tenth of an inch long, and the wings, when expanded, are about a quarter of an inch from tip to tip.

Two broods of this insect are brought forth in the course of the year, one in spring and one in autumn. The lives of some extend to more than a year in length—patriarchs of vast and destructive hordes. The eggs are lain on the leaves of the young plant, in the creases between the little ridges, being ejected by the female through a tube, or sting, and having the appearance of minute reddish specks. In four or five days, a small reddish maggot is hatched, which crawls down the leaf and works between it and the main stalk, to the first joint. It there remains with its head downward, a little below the surface of the soil, and never moves till a transformation is effected. As it grows in size, and becomes plump and firm the pressure imbeds it in the stem, and it appears to derive nutriment by the suction through its pores of the sap of the young plant. One of these maggots is not fatal, but two or three will entirely destroy the plant. They come to their full size in five or six weeks. The skin then gradually dries, and loosens itself and falls off, the insect still retaining the grub form. In this state it exists, and the transformation to a fly gradually proceeds. Some six months after the egg is laid, the winged insect appears, and be takes itself to depositing new germs for future generations. The first deposit is made in Otober, the second in May.

This is the history of the Hessian fly. A remedy, or preventive has not, thus far, been discovered. Various means have been tried, and have proved partially or temporarily successful. Fresh seed from localities which the fly has not visited, is generally safe from their attacks for a year or two. Late sowing in the fall, after the time at which the eggs are deposited, is a remedy as against the insect, but subjects the crop to the danger of winter-kill. If cattle graze on the fields in the fall, they will destroy a great many of the eggs—perhaps it might be added, and many of the wheat plants. Burning stubble after harvest has been attended with good effects on the subsequent crop. Wood ashes sown on the wheat in the fall and spring, seems to destroy great numbers of the little grubs. Any means to render the growth of the grain rank and luxuriant enables it to withstand their attacks. A fire built on the lee side of the field at evening by which the smoke will be blown over it, and settle in clouds close to the ground, has proved partially effective. There are large armies of parasitical insects that feed on the eggs and larvæ of the Hessian fly—one of the wise and kind provisions of nature to check and destroy the scourges that are occasionally permitted to visit and afflict the earth.

The European wheat fly has appeared in some parts of New England, and has proved very injurious in localities. It is a small orange colored gnat, with long legs and tinted wings. They appear from the first of June till late in August. In the morning and evening duskiness they deposit their eggs in the flower of the grain. The eggs hatch in about eight days, and little yellow maggots, otherwise known as the grain worm or weevil, appear in the chaffy scales of the young berry. They live on the pollen and on the soft milky matter which they extract from the base of the green seed. In consequence of their depredations, the kernels are but partly filled and pinched, the hull breaking open in the process of drying and shrinking, after the contents have been sucked out. Towards the end of July, or the first of August, the grub is full grown, fat and round. It then leaves its outer skin, and falls from the heads of wheat to the ground. After remaining in a torpid state for a few days, it burrows in the earth a short distance from the surface, and there winters. The following spring the winged insect emerges from the ground to deposite the germs for a succeeding brood.

Fumigation has been practised with partial success as a remedy for this insect. Weeds, old woolen rags and brimstone have been used for the purpose. Lime or ashes strewn over the grain in blossom has had a good effect. Deep plowing after harvest, and when the maggots have fallen to the ground, by which they are covered so deep as to be unable to emerge the following spring, is probably the most effectual remedy.

The chinch-bug is a virulent little insect that has proved somewhat injurious to the wheat crop in the southern and eastern parts of this State.

The eggs are deposited in the ground, to the depth of an inch or more. The young bugs make their appearance on wheat about the middle of June, and may be seen in all stages of growth throughout the summer, on all kinds of grain, corn and herds grass. This insect is apterous, or unprovided with wings, and is about three-twentieths of an inch long. In color and scent it resembles the bed bug. I have heard no remedy suggested.

Whether wheat will turn to chess is a question which has been so much discussed to so little purpose that I have no idea I could add to the present stock of knowledge upon that subject. The vulgar are not yet convinced that such transmutations do not take place, while to science it appears as reasonable to suppose that oats turn to herds grass, or barley to red clover, as that wheat turns to chess.

On the subject of the analysis of soils and special composts, much has been written and more said. This is, however, a problem not yet altogether solved. Seience has done much. It has accomplished important revolutions. But it has left still greater things unaccomplished, and whether its past triumphs have not been exaggerated is not a question of mere sciolism. When the scientific speculations of Liebig were first published, men dreamed that a new era had dawned upon agriculture. They thought that it was to be no longer a pursuit of arduous and doubtful endeavor, in which results impended on secret laws, on the adventitious changes of climate, on mysterious and inscrutable processes. They thought he had opened the hidden laboratory of nature, and exposed to art the application of means to extort from the soil what it had refused to pay. The enthusiasm was natural. The difficulties which science had encountered were great. If its victory was not complete, at least a creditable advantage had been gained, and, while reason was afforded for congratulation in view of present accomplishment, a wide field was opened for future hope.

The prospective are no less than past difficulties. There are a thousand things, a knowledge of which would add greatly to the profit and certainty of labor, which science has striven for ages, and must probably strive for ages more, in vain to know. The operations of nature are mysterious. They are not open to the investigation of the curious or the thoughtful. It cannot be known how the blighted stalk revives under vernal and "skyey influences"—how the stem produces the flower—how the flower produces the fruit. That it does, is outward and apparent. How it does, is invisible and mysterious. If man knew the process of vegetable growth he could produce it. We call it a chemical change, because we can call it nothing else. It probably bears a greater analogy to what we call chemical changes than to any operation known to human sense. There are many of the natural phenomena for which we have plausible theories. The winds and tides, rain and snow, attraction and heat, have received explanations, which, because not absolutely repulsive to reason, have received the sanction of the common sense of mankind. But of the means, the causes, the growth, the decay of vegetable life we have no theory. None has been suggested. None can be suggested. The understanding is lost at the first attempt to produce a theory. No rational idea is held—none exists. It is one of those common mysteries which familiarity has stripped of awe, but which study has not solved, nor scrutiny exposed.

There are other obstacles in the path of science. They are many, and, though not impossible, are difficult to overcome. A knowledge of them will not impair our confidence in the results which have been already demonstrated, but will inspire us with a higher admiration for the triumph of human industry and genius, and a grander hope in their efficacy to achieve future triumphs.

The constituents of soil that are deemed most valuable as sources of fertility are lime, potash, ammonia, organic matter, and phosphoric, sulphuric and muriatic acids. The most fertilizing of these substances exist in the minutest qualities. It is not difficult to ascertain the amount of organic matter in the soil, but nothing is known as to the essential portions in imparting vitality to new vegetation. It is not known whether the process of decomposition must be complete, whether it must be already resolved into that fine pulverulent substance, the dusty and uncognizable remains of organized growth, which we call humus, to render it valuable as a fertilizer,—or whether the gases generated by the process of decomposition are the sources of new growths and organisms. The volatility of chlorides during evaporation, and the presence of organic matter, render exceedingly difficult and uncertain the determination of muriatic acid. The precise estimation of potassa and phosphoric acid is attended with equal difficulties. The small amount of less than one per cent. of these which is returned as existing in the soil may be often due to errors in the analysis, or may be greatly above or below the true amount. The amount of lime may be easily ascertained with sufficient accuracy, but lime is far from being the most important part of the compound. It is precisely those the determination of which is attended with the greatest difficulty that are the most bounteous sources of fertility—upon which the growing plant feeds and fattens.

A single instance only will illustrate the facts. The amount of guano usually applied to the acre is 200 pounds. The soil to the depth of one foot—and vegetation often reaches far deeper for its supplies—weighs 3,920,000 pounds. The guano thus applied contains six pounds of potash, 24 pounds of phosphoric acid, and 34 pounds of ammonia; or 1 part in 600,000 of the first, 1 part in 150,000 of the second, and 1 part in 100,000 of the last—grains so minute as to be indistinguishable except to the nicest and most intricate analysis, if not even then beyond detection.

Again, embedded in the earth at a greater or less depth, or lying on the surface—often turned over by the plow, broken by accident and decomposing in varying lengths of time, are substances harder than the soil, differing in size and in the properties that compose them. We call them rock, stone, gravel. We know not but they may have an important influence on vegetation. We know that they do effect it to a certain extent by attracting or evaporating moisture in their cooler, or hotter, neighborhood. They are constantly undergoing a process of pulverization, and their smaller particles mingle with the soil. There may thus be chemical agencies entering into the soil, which, though not great in bulk may possess quickening properties and principles. The extent of these operations may be great—it may be small. It may be important—it may be trifling. The very doubts upon the subject are difficulties. When considered at all, the subject is prolific of uncertainties that disturb and impair confidence in all the niceties of calculation.

It may be that from the remote depths of the soil, which spade or plow never reaches, influences are exhaled that intimately affect the productiveness of the surface. Perhaps volatile vapors and secreted gases circulating through the inner pores of the soil, shed propitious qualities that strengthen the growth and improve the luxuriance of the plant. The surface may not furnish all the nutriment to the growing blade. There may be airs, healthful and pestilent, which impart nourishment, or infection to the waving blade. There may be innumerous agents which are fructifying or baleful, of which observation has made no discovery.

There are doubts upon the subjects of which most is known. There are questions suggested to the superficial which the profound observer cannot answer, and they are such as affect the common practical effect of applications that are daily made to the soil. That certain articles possess fertilizing properties, is proven by all experience. It is known that applications of ammonia, of lime, of vegetable matter, will increase the yield of certain plants. The same facts are arrived at by scientific analysis. But it is not known what exact amount is necessary to be applied in order to secure the proper luxuriance of leaves and stalk consistent with the just support of the fruit—by which the greatest yield at the least expense is secured. Much may be wasted by over application—much lost by insufficient supply, of fertilizers. It is not known, the proportional value of these agents to the multiplicity of crops; whether there may not be better and cheaper fructifying agents than any now known; and whether the effect is wrought by single qualities, or by a combination of single causes with each other, with the soil, and with undiscovered or apparent elements in the air and earth. It is not known by what process moisture enlivens the plant—whether by an innate and fertilizing property it possesses, or by dissolving other fertilizers in the soil, and enabling them to enter the minute pores of the roots and rootlets, or by forming gases that the breathing leaf may inspire. Finally, nothing is, or perhaps can be known, that will remedy the unpropitiousness of seasons, that will supply the want of moisture in the atmosphere, that will preserve the plant from its native and peculiar accidents, from the severities of winter and the unwholesome heat of summer.

These are the difficulties that science has overcome, or has still to encounter. Its triumphs have been great. Its labor has been one of beneficence. The benefits which it has confered on mankind are substanstial and enduring. But science is slow and long. It is not based on speculation or hypothesis, but on the experience of ages. Science is the reduction of facts to their primal causes and principles. It must be consistent—it must be sure. If without either consistency or certainty, it is not science but empiricism. A few modern instances are insufficient warrant of a principle. Science requires an age to verify its simplest truths—an era to achieve and substantiate its important discoveries.

The theory of special culture and manuring is a very simple one. Experience shows that the plant derives its sustenance from the soil. Analysis discovers in the fruit the very identical properties that before existed in the earth. The reproduction from year to year of the same crop in the same field, is attended with an annual decrease in quantity, and depreciation in quality of the yield. By supplying the soil with the agents which vegetable growth has extracted from it, its productiveness is sustained. These are simple and practicable facts—the foundation of principles to the elucidation of which science has devoted the labor of years.

The mechanical changes effected in the soil are by plowing, fallowing, and drainage. To turn over the surface, the bare crust of the soil, from year to year, is productive of little benefit. Plowing should be deep and thorough. It should expose to the action of the atmosphere the inner strength and wealth of the soil. It should effect a mixture of the under and compact strata, with the upper and lighter. Much of the essential support of the plant comes from depths to which light plowing does not reach. The little roots and rootlets must pierce the hard ground beneath, in the smaller pores of which, unexposed to the sun, necessary moisture is secreted. To loosen this, and bring it near the surface, is to relieve the plant of a great part of the labor used to reach it, which will then be applied to developing the mature stalk and the fruit.

Fallowing is of great benefit as well to a strong as to an exhausted soil. It may not be that the soil tires in the labor of production, but, at least, rest revives it, and restores the fertilizing properties extracted by the productiveness of years. The reasons are probably various. It affords opportunities for clearing the land of rank and noxious weeds, which have burdened the soil, at the expense of virtuous and healthful plants. The vegetation that springs up in the absence of the crop, is turned under, and serves to manure the soil on which it grew. Land that is cropped for years loses in a great degree the properties which enter into the grain, and which cannot be supplied except by natural means, by the process of decomposition, and by atmospheric and other influences. Organic matter often reposes in the soil, in what has been termed an innate state, undergoing decay but slowly, and in but a small degree discharging the functions of fertilization. Frequent, or prolonged exposure to the air, the sun and rain, will render them active agencies in vegetation. The rains bring down in their periodical visitation supplies of all the native substances as they exhale from the sea—common salt, gypsum, salts of lime, of magnesia, and of potash, in greater or less quantities, with nitrate of ammonia generated or present in the atmosphere, and foreign substances blown about by the wind and lodged in the air in minute solid particles, or as liquids and gases. If the soil has become deficient in these elements, they will accumulate on it and in it during its year of rest, and yield to the succeeding crop a rich and luxurious nourishment.

The process of seeding, or green fallowing, is of similar benefit to the soil. The green crop demands a comparatively small supply from the inorganic substances that afford the material and peculiar nourishment to grain. The additional vegetable matter and manure which they introduce into the soil, by being plowed under, adds greatly to its fertility, and compensates for the loss of those benefits which a naked fallow would have produced.

Drainage is of great efficacy on hard, heavy, clayey soils, by leaving them open and porous. It is valuable on all low, wet soils, by carrying off the stagnant water and giving passage to the excess that falls in rain. It arrests the ascent of water from beneath, whether by the force of capillary attraction, or from the action of springs, preserving the surface from an improper moisture, and the subsoil from lingering and noxious substances lodged in it that impair the wholesome growth of the plant. It allows the water which falls from above to make its way through the soil instead of washing and bearing away the surface. It opens the pores, so that fresh air can get to the roots of the plant. Wet lands are always cold, from the influence of evaporation. Drainage removes the source of too much evaporation, rendering the soil warmer. It makes the soil drier, sweeter, looser, and more friable. It greatly increases the fertilizing properties of many artificial manures, such as wood ashes, bone, lime and nitrate of soda, which are greatly injured by sour and stagnant water resting in the pores of the soil.

The manures best fitted to the wheat crop are those which give it a vigorous but not too luxuriant growth in the autumn, to sustain it from the severities of winter; a rank and stout growth in the spring as protection from the ravages of insects; and which form a hard, clear, brittle straw, that will not be liable to rust and blight.

Lime is a good manure for wet and for hard soils; for light porous soils it almost always hurtful. Its effects on proper soils is to increase the quantity of the grain, to give it a thinner and clearer bran, and to increase its proportion to the same amount of straw and chaff. The quantity of gluten is greater in wheat grown on limed soil than that grown on others. Districts underlain with lime are almost universally good wheat districts. Its effects are more marked on spring than on winter wheat. It is not a durable manure and soon loses its peculiar fructifying power. It should be frequently repeated, and applied only to the surface, where the atmosphere can act readily upon it.

The use of alkalies upon soil is simply to neutralize the superabundant acids, generated by decomposition and other influences, which obstruct the further decay of vegetable matter, and are unfavorable to the healthy growth of the plant.

All straw, stalks, leaves and chaff are excellent manures for wheat. It is the growth of the straw which most rapidly exhausts soil, extracting from it the silicates, the lime, the phosphoric acid, and the alumina, which are its principal elements, as well as its other constituents, which are not indeed great in quantity, but which do not exist in great quantities in the soil. To again apply the straw, whether dry, or in any of its various stages of decomposition, is to restore to the soil the same elements which the previous crop extracted from it.

Guano is the name given to the extensive deposits of dung, chiefly that of sea-birds, upon the rocky promontories and islands of South America. The climate is dry and the process of decomposition goes on exceedingly slow—so slow that beds have been formed from twelve to sixty feet in thickness. At the proper stage of decomposition, it is the most active and powerful manure known. The usual application is about 200 lbs., as a top-dressing, to the acre. Its quality is very variable, as it is exposed to the atmosphere, by which its more volatile constituents escape, or as it is kept tight and dry. From various experiments with similar results, the four following will illustrate the efficacy of this manure:

1. Guano, top-dressing, 1 cwt. to the acre	48 bushels.
Undressed, same field	27 „
2. Guano, top-dressing, 3 cwt. per acre	30 bush. 40 lbs.
Undressed	24 „ 56 „
3. Guano, top-dressing, 2 cwt. per acre	32 „ 20 „
Undressed	18 „ 09 „
4. Guano, top-dressing, 1½ cwt. per acre	45 „
Undressed	29 „

The effect of special manures, is well illustrated by the following analyses, given by Hermstadt, which were prepared with great care and are probably correct:

Manures.	Return.	Water.	Gluten.	Albumen.	Starch.	Sugar.	Gum.	Fatty Oil.	Soluble Phosphates, c.	Husk and Bran.	
Ox Blood	14 fold	4.3	34.2	1.0	41.3	1.9	1.8	0.9	0.4	13.9	99.8
Night Soil	14 „	4.2	33.9	1.3	41.4	1.6	1.6	1.1	0.6	14.0	99.7
Sheep's dung	12 „	4.2	32.9	1.3	42.8	1.5	1.5	1.0	0.7	13.8	99.7
Goat's dung	12 „	4.3	32.9	1.3	42.4	1.5	1.5	0.9	0.7	14.2	99.7
Human urine	12 „	4.2	35.1	1.4	39.9	1.4	1.6	1.0	0.9	14.2	99.7
Horse dung	10 „	4.3	13.7	1.1	61.6	1.6	1.6	1.0	0.6	14.0	99.6
Pigeon dung	9 „	4.3	12.2	0.9	63.2	1.9	1.9	0.9	0.5	14.0	99.8
Cow dung	7 „	4.2	12.0	1.0	62.3	1.9	1.9	1.0	0.5	14.9	99.7
Vegetable Manure.	5 „	4.2	9.6	0.8	65.9	1.9	1.6	1.0	0.5	14.0	99.8
Unmanured	3 „	4.2	9.2	0.7	66.6	1.9	1.8	1.0	0.3	14.0	99.7

These experiments are interesting illustrations of a theory, but can hardly become of practical value. They can rarely be repeated on a large scale, especially those of blood and urine, from the impossibility of obtaining a supply, and the inconvenience of application.

The manures of animals change greatly from the manner in which they are kept, their food, and the stage of decomposition at which it has arrived.

The foregoing are facts relating to the wheat plant, wherever grown. They possess little novelty, being the results of careful and published observation since it has been directed to that object. Such a subject it is difficult to enliven with the charm of originality. The length to which this essay has already extended, is almost preclusive of that particular remark upon wheat culture in Wisconsin, to which I originally intended to devote almost entirely the considerations I should offer. My limited remaining space will be occupied with that subject.

Fourteen years ago, and till 1846, it was thought that Wisconsin would become the greatest wheat bearing State in the Union. The crop was sure; the grain was of superior quality; the yield was abundant, almost beyond precedent, often amounting to thirty, forty and fifty bushels per acre. In addition to these substantial facts, there was the enthusiasm of the early emigrants to new countries—cultivation was easy—the earth yielded its fruit almost spontaneously—there was the prestige of triumph over the first rude obstacles of nature to the husbandman's toil—there was the lightest labor rewarded with the magnificence of the harvest—there was the encouragement of hope.

Now, these things are looked upon but as the dreams of an unreasoning enthusiasm, that was as blind to present facts as to future prospects. After a little reflection, however, they will not be so viewed. There are reasons why it was all possible—if possible it was probably true. The soil was new. It was strong and rich with the decayed and decaying vegetation of centuries. It was a fallow, which had lain idle immemorial ages. The seed was new to the soil, and found in it new and rare elements of life and vigor. The earth brought as tribute its wealth of virgin fertility to enrich the growing crop.

The reason of a failure in this extraordinary productiveness is equally apparent. The little amount of labor required to raise the few first crops inducted the farmer into a shiftless method of farming. In plowing he but skimmed the surface; he seldom or never fallowed his fields; he sowed one crop after another of the same kind—there was nothing careful, calculating and thorough in the whole system of agriculture. There were other reasons. The large majority of emigrants were poor. They were striving for the first necessities of life. They could clear but few acres; upon those they of course expected to produce from year to year the staple crop. To many it was a new and untried avocation. Perhaps from want of means to follow their trade or business, perhaps from false and painted expectancy of Saturnian quietude and plenty that had fled, and were to be found, in boundless wilds; of industry that was not toil; of bounteous harvests that were to be enjoyed with labor that was but pastime; they had entered upon the cultivation of the soil, but to learn that the curse might fall with double weight—that by the sweat of his brow even, man should not always eat bread. By these classes prosecuted—those who knew nothing of it, those urged by necessity to realize something immediately at whatever future cost, by those whom success had rendered reckless—husbandry could not be permanently and reliably successful.

The truth is, farming in Wisconsin has been a shameful abuse of the soil. Its present resources have been taxed almost to exhaustion by the crops of a few years; its future fertility has been impaired by extracting the best properties from the surface without mixture with the native strength of the soil below. The grain has depreciated in quality by its constant reproduction on the same soil, by carelessness in the selection of seed, and by disease and mixtures never guarded against. These are plain facts. They may not be creditable, but they are true. And they are the causes which have made late harvests, the yield uncertain and scanty, poor grains, and a bad reputation in the market for the wheat and flour of our State.

From 1847 to 1851 the wheat crop in hardly a single instance escaped injury from the severities of winter. It did not suffer by the usual "winter-kill" of the Eastern States, but from the early spring winds, which blew the dirt from the roots, leaving them exposed to the cold, the air and the drought. There was not sufficient snow upon the ground to protect the plant, and there seemed to be no possible remedy for the evil. For the last two winters the crop has suffered less, or but little from this cause. There may, however, lessons be derived from experience, that will be valuable in case of future returns of open winters. If the spring is wet and favorable to vegetation the plant will not suffer, the earth remaining wet and compact about the roots. If it is not, there are various partial remedies that have been, and may again be, applied with success. Some have covered the field with straw. This, however, is a laborious undertaking, and it is difficult to spread it is so evenly as that some places will not remain bare, while others will be covered so deep as to prevent the growth of the grain. There is also danger of injury to the plant by driving over, and treading upon it; and further, the straw is quite as liable to be blown off as the dirt is. Good effects will arise from leaving the ground rough and uneven after sowing. Every little elevation will operate as a protection to the plants in its own neighborhood from the wind. To effect this it would be a good plan to seed the ground, and create a sward, which when turned over by the plow will be left as rough as is desirable. Fields to the windward, according to the prevailing spring wind, off woodland will be protected to a certain extent. A still more efficient remedy may be obtained by drilling in the seed, so that the harrow can pass over the field in the spring without great injury to the plant. Then as the ground thaws and dries on the surface the harrow should be run over it, loosening the soil, to be followed by a roller, settling it compactly about the roots.

Insects, with one or two exceptions, have never troubled the wheat crop here. A few years ago, a small black fly, called by some the Hessian Fly, but its identity may be doubted, visited Walworth, a part of Rock and a part of Kenosha counties. Its ravages were considerable in some fields, but after two returns it disappeared and has not since been heard of. It may be superfluous to add that no great anxiety is felt on account of its prolonged absence. The chinch-bug has committed some depredations in the Southern part of the State, but is really a more troublesome than destructive insect.

A singular and interesting manifestation of disease in the hedgerow variety, a few years ago, has caused its cultivation to be entirely abandoned. Entire fields rotted in the head, producing a destruction of the whole crop. No remedy was found for it, and as the disease continued to appear from year to year, the production of this wheat has been relinquished. The hedgerow was a hardy variety, and very productive, and was abandoned with great reluctance.

A variety of spring wheat that has been cultivated with good success in this State, is the Canada Club wheat. What is its origin I have been unable to ascertain. It has been under cultivation some five or six years in the Eastern part of the State, and three or four years in the West. An intelligent farmer with whom I conversed on the subject supposes it to be derived by changing Soule's wheat to a spring variety. There are certainly reasons for the supposition. The resemblance between them is striking. The straw has the same remarkably hard, brittle texture; the berry and the flour are almost indistinguishable.

I have seen specimens of a variety of winter wheat raised in the western part of the State, which they call the Yellow Farilla. It was brought from Southern Ohio about eight years since. It bears a smooth, thin, yellowish chaff, the berry is plump, clean and white, the straw bright and clear, but limber and does not support itself well. It is free from rust and smut and is a great favorite with western farmers. It produces best with early sowing.

The best time for sowing wheat in this climate is from the first to the tenth of September. The best piece of winter wheat I ever saw in this State was sown the 28th day of August. As a general rule, however, that is a few days too early, and in a long, growing autumn the grain might get too far advanced before winter. But I am satisfied that nothing can be worse than late sowing. A field of wheat sown in the last days of October or the first of November is almost certain never to see a profitable maturity.

Wheat should be cut before it is ripe, rather than afterward. It is not liable to loss by shelling, is preserved from a late attack of the rust, the straw makes better fodder if used as such, and the wheat itself is better, as the following facts show. Three patches of wheat from the same field were cut, the first twenty days before maturity, the second ten days before, and the third when fully ripe. The following was the result:

WHEN CUT.	GRAIN.			FLOUR.	
	Flour.	Bran.	Sharps.	Water.	Gluten.
20 days before ripe	74.7	17.5	7.2	15.7	9.3
10 days before ripe	79.1	13.2	5.5	15.5	9.9
Fully ripe	72.1	16.0	11.0	15.9	9.6

I have seen various calculations of the real cost of raising wheat in the Western States. How nearly they approached correctness it is difficult to tell. It is probable that the real cost, including the interest on the value of the land, the seed, and the labor of raising, threshing and cleaning, will amount to between forty and fifty cents per bushel. During the last three years the price of good winter wheat, for which the above calculations were intended, has ranged from 70 cents to one dollar per bushel.

The distance of the farmer from market will determine the amount of his profits.

The rotation of crops is a part of the subject which should have been alluded to in another place. In this State the want of it has been the bane of the wheat crop. Wheat does the best following clover. The second best crop for it to follow, is peas mixed with oats. Oats alone are nearly as exhausting to the soil as wheat itself, but with peas they are a good preparatory crop for wheat. The last and worst crops which wheat can follow is corn, and wheat after wheat.

After what has been said it may be unnecessary to enlarge upon the importance to this State of a more thorough, more careful, it may be added more honest, system of farming. The ground should be plowed deep; it should be manured, fallowed and seeded. By these means only can the exhausted soil be reclaimed, and the weakened energies of nature restored. By such a system of farming as has made old and barren States a garden, might this be made a paradise, the very home of the harvest—the abode of wealth and plenty—the prolific source from which human necessity and comfort would be supplied. The ground must be thoroughly tilled, to be tilled with success. The earth is a poor giver, but a grateful borrower. The support it receives will be bounteously repaid, and in due time.

A satirist, whose philosophy was as profound as his wit was brilliant and severe, puts into the mouth of the royal Brobdignagian—a gigantic and barbaric king sixty feet high, the following words: "Whoever could make two ears of corn, or two blades of grass to grow upon a spot of ground where only one grew before, would deserve better of mankind and do more essential service to his country, than the whole race of politicians put together."

This is a noble maxim. It estimates the worth of men by the substantial good which they do—by the means of social comfort they provide—by the human wants they supply—by the necessities for which they furnish the means of relief. It is wise—it is true. He is the true benefactor of our race who lessens our burdens of toil and adds to our strength to bear them.

HORTICULTURE IN WISCONSIN.

BY ALFRED L. CASTLEMAN, M. D., DELAFIELD.

I propose in the following article to supply the thousand little rills which form the great river of Horticulture. In doing this I shall not pour my contributions into the river itself, presuming that it will flow backwards to its sources. That course has been too much followed by those who have preceded me. They have presumed that their readers were already scientific men; or else they have written a *book* to make them so.

Now it should be borne in mind, that the great bulk of our market fruit is raised, not by scientific horticulturists, but by farmers; growing in connection with other agricultural products from ten to one or two hundred trees each—further, that many of these farmers are not familiar even with the elements of vegetable physiology and chemistry, and that they have not leisure to study a book for the purpose of learning how to cultivate their little orchard to advantage.

It has occurred to me that general rules for planting and cultivating an orchard, with reasons for their propriety, may be set forth in an article at once intelligible to the humblest reading capacity, and yet within a space so limited that any one with energy to buy and plant a dozen trees may find time to read and study it.

In just such an article I propose to comply with your request, to furnish you something for your next volume of "Transactions," and my vanity will not be in the least surprised if I succeed in the undertaking. If, whilst writing for the million, I shall chance to drop an occasional hint, correcting some errors into which scientific horticulturists have fallen, they will of course consider it accidental, and take it for only what such a hint may be worth.

So soon then as the farmer has a small piece of land cleared and in cultivation, well manured if not already rich, he is ready to commence his orchard. What trees must he buy? He will of course go to a nursery of established reputation; and he should go with a catalogue of his wants already made out. He desires to have trees which will produce fruit for all seasons of the year. A few Early Yellow Harvests, Red Astrachans, Early Red Margaretts and Risleys will form a row or two nearest his dwelling, and will give him a supply of delicious fruit from the latter part of July till the middle of October. Let the next row or two be filled with Rambo, Porter's Fall Pippins, Maiden's Blush, and Jersey Sweets, to which he may add if he intends a large orchard, Canada Reinette, and Fameuse, and he will not be in want till the middle of January. These are to be followed by the Rhode Island Greening, Northern Spy, American Golden Russet, Boston Russet, Lady Apple, Baldwin, Swaar, Peck's Pleasant, Rawles Janette, Herefordshire, Pearmain and Esopus Spitzenberg.* These last varieties arrive at maturity, commencing with the Rhode Island Greening, from about the first of January till, under good keeping, July, or even August. I would add here that the Newtown Pippin has not been sufficiently proved in this State for me to recommend it, and I must even qualify my recommendation of the R. I. Greening, Rambo and Spitzenberg, so far as to say, if the planter has not good, dry rich loam he had better leave them out of his catalogue.

So much for selection of Apples, the only tree fruit that has yet been fully tested with us. I shall treat of the Peach, the Pear, the Plum and the Cherry in another part of this article.

But before we do that, and even before we commence selecting our trees, although we have arrived at the nursery, we must take a short but general view of some of the elementary principles of vegetable chemistry and physiology.

The vegetable, like the animal, has a starting point for its existence. As in the egg you discover the first rudiment of the chicken centering at one point, thence sending out blood-vessels, nerves, muscles, &c., so the seed is the centre from which in vegetable life start all the parts which constitute the tree. From it the root is sent downward to gather such nourishment as is found in the earth; the stalk with its branches and leaves is sent upward partly in search of the nourishment which the earth does not afford, partly to protect it from the effects of the burning summer sun, and partly to develop those organs of reproduction with which every vegetable and animal is supplied for the perpetuation of its species.

* It is not to be understood that this list contains *all* the best, nor even *the* best varieties of apples; but only that they have been tried here, and found suited to our climate and soil.

Providence ordained the vegetable products of the earth, for certain natural purposes, and in their natural unmolested growth, the root, the trunk, the leaves and the fruit are in the proportions precisely adapted to the purposes of nature. For example, take any forest trees and crowd them together in a thick grove, the necessity of their reproduction will be but little felt, because the ground upon which they stand is already burthened and taxed to its capacity to supply nourishment for their growth, and the consequence is that the fruit and seed—their means of reproduction—are produced in small proportion to the other parts of the trees. Thin out those trees, nature feels the loss, and makes an effort to restore it by the production of an increased proportion of fruit and seed that the perpetuation of the species may be insured beyond peradventure. It is by taking advantage of this law of nature that we are enabled so to alter the proportion in the growth of different parts of our trees as to give us a preponderance of any part we may desire. This year we wish a large growth of wood. We so manage the law as to acquire it. In a year or two more we feel that the tree should render us some return for our nurture and our care. The same law governs, and by its proper application we produce fruit at the expense of the wood. But to accomplish this it is necessary to know, first, the materials of which the wood and the fruit are severally formed; and secondly, how to furnish to the tree the articles of nourishment which form wood and those which form fruit, at our option. And this brings us to a consideration of the constituent parts of vegetables—in plain language, the materials of which they are formed.

All vegetables are formed chiefly of four simple elements, or substances, viz.: oxygen, hydrogen, nitrogen, and carbon. Chemists call these the "organic" elements of vegetables. They constitute from 92 to 98 per cent. or nearly the whole of every vegetable substance—combined in a certain proportion, they form wood—in another proportion, fruit. The remaining 2 to 8 per cent. of vegetable matter is made up of certain substances which chemists call the "inorganic" elements of vegetables. But I will not take time to discuss these here, as chance will pretty generally supply them to the trees in Wisconsin soils, at least all of them except potash, which can be supplied by frequent washing with soap suds, and occasional manuring with leached ashes. Nor will I stop to describe the four simple, or organic elements above named, as a knowledge of the sources from which vegetables derive them, is sufficient for the purposes of this article. But the questions—Whence are they derived? and how are they distributed to form the different parts of the tree? is of vital importance to the success of the fruit grower, and these questions I now propose to answer:

1st. Oxygen is found every where, and there is scarcely a known substance into the composition of which it does not enter. It forms one-fifth part of the healthy atmosphere—of all the water in and about the globe eight in every nine parts are pure oxygen. It enters as a component into every part of the vegetable, and into every substance with which it is in contact. The only trouble then, which we need give ourselves, about a supply of oxygen to our trees, is to see that the earth about the roots is kept in that light and porous condition which will readily admit the air to them.

2d. Hydrogen.—This, though not so abundantly diffused as oxygen, exists in small quantities in almost as many substances. We have just said that oxygen constitutes eight in every 9 parts of water—the ninth part is hydrogen. It is found in almost every animal and vegetable substance—the tree, so long as it has a supply of moisture, will have no difficulty in supplying itself with this element.

3d. Nitrogen forms four-fifths of the atmosphere, and is consequently at all times largely in contact with the branches and leaves of the tree—but let it not be forgotten, that very little of it is taken into the tree by these parts.* It is mostly taken up by the roots, being derived by them from the ammonia with which they are in contact. It is no less important to remember that a very large proportion of all the nitrogen taken into the plant or tree is used for the production of the flower and the fruit, and that it is the great stimulant to the production of these important parts. I call particular attention to this fact, as upon the proper application of it will depend much of the success of the horticulturist. The reader unlearned in vegetable chemistry may here ask, "Where is the ammonia from which the tree derives its nitrogen?" I answer, that although it is contained largely in the atmosphere, and is washed into the earth by the descending rain water, yet the chief supply, or that abun-

* I am aware of differing on this point with Liebig, but as the limits of this article will not admit of a discussion of this question, I must rest satisfied with my own statement, supported by the opinions of a large majority of agricultural chemists.

dance which provokes the prolific propensities of the tree, is found in the decaying vegetable and animal matter supplied to the roots. It is that substance which rises to your nostrils, and almost stifles you with its sharp, pungent smell, when you are cleaning out your horse-stable of a very hot day. Yet, notwithstanding the great abundance in which it exists, it is in consequence of its volatility, the one most likely to be deficient in your manures. It is a powerful and necessary stimulant to animal as well as vegetable life, and I must be permitted to refer here to one of the most beautiful provisions of nature in regard to this active and useful agent. Whilst all decaying animal matter is throwing it off in so great abundance, that unless rapidly consumed it would prove highly dileterious to animal life, the vegetable world is rapidly converting it to its own support, and preserving, as nearly as circumstances will permit, that balance of production and consumption so necessary to the health and comfort of all animated beings.

4th. Last and largest of the four simple compounds of vegetable matter is carbon, derived largely from the atmosphere by the leaves and twigs, as well as from the decaying vegetable matter by the roots. It forms nearly the entire woody parts of all vegetable matter. Hence if you wish your tree to grow it must have a liberal supply of carbon. If to fruit, see that a supply of ammonia, from which it may derive its nitrogen, is at hand.

As it is important to the application of what is to follow, that the reader should be familiar with the statements just made, I will briefly recapitulate them :

Oxygen and Hydrogen are always in contact with every part of the tree, are taken up as food by every part, and are appropriated mainly to the formation of its watery parts.

Nitrogen, though held in the air to its leaves and twigs, is hardly food for them, but is collected by the roots from the ammonia contained in the rain water, in the decaying animal and vegetable matter about them, and in the barn yard manure applied to them; and is chiefly used for the formation of their flowers and fruit.

Carbon is derived largely from the carbonic acid gas of the atmosphere, by the leaves and twigs, and is also absorbed by the roots from the decaying vegetable matter in contact with them, and is appropriated almost entirely to the formation of the solid woody matter.

I might here add a paragraph or two on the subject of the inorganic elements of vegetable matter. But the horticulturist proper, will find them in other places; and the farmer who raises his fruit in common with his other agricultural products, would hardly be benefitted by it. I will only say that if he will dig in about the roots of his trees all the old bones he can pick up from year to year, adding a little lime occasionally, and a frequent wash of strong soap suds, chance and our fine fruit soils will constantly furnish him all the rest; provided that he shall not exhaust the soil of them, by growing too many other or improper crops with his trees.

Having taken a cursory view of a few of the laws which govern vegetable life and growth, and of the sources from which vegetables derive their nourishment, I shall proceed more directly to the consideration of the culture of the orchard, intending to refer to other physiological laws in places where their consideration will be better understood and appreciated. I proceed in the first place to

THE SELECTION OF FRUIT TREES.

Having already given a catalogue of a few of the apples best adapted to our climate amd soil, I will here remark, in passing, that although I dissent in toto from the common opinion that our climate is not adapted to the growth of the peach and its kindred fruits, including the cherry, yet I would advise the farmer, who cannot devote much time to the care of his orchard, that he had better, for the present, abandon the idea of raising any of them in perfection. But in a subsequent part of this article I shall notice them again, showing the reasons why we have hitherto been unsuccessful in our attempts to grow them, and how to apply the remedy.

From the multitude of fine plums adapted to our soil, it is almost impossible to make a selection, without passing over many of the first class. My chief object, then, shall be to advise such a selection as will give good fruit during the whole plum season. I begin then with the Jaune Hative, ripening from the 15th to the 30th of July, and go on with the Imperial Ottoman, Imperial, Green, Yellow and Bleeker's Gages, Washington, Jefferson, Columbia, Smith's Orleans, Coe's Golden Drop, Downton Imperatrice and Autumn Gage, which will give a constant succession of the very finest plums down to the middle, and, in favorable seasons, to the last of October. I do not recommend this as the *best* list which can be given, but they have all been tried here, and found well adapted to our climate.

I shall not attempt to give a catalogue of pears, as they have not yet been sufficiently tested with us to enable me to give any reliable information, as to the varieties which succeed best. In selecting these the cultivator must, for a few years yet, trust to chance for getting such varieties as will best suit our climate.

With a catalogue of his wants, already made out, let the farmer go himself to a nursery of established reputation. Let him select his own trees, not giving preference to the old ones because they are going to bear soon. The old trees are the cullings of the nursery, and were left to grow old only because they were poorest. By taking young, thrifty trees from two to three years old, from the bud or graft, they may be trained into any shape or habit of growing, which the taste of the horticulturist may require; and will with proper care and culture not be more than one year behind a tree taken from the nursery at five years old, in coming into full bearing.

Let him be careful to ascertain how his trees were grafted. The phrase "grafted in the root" means different things at different nurseries. In one it means that the root of a tree is taken from the ground and divided into small pieces, into each of which a scion is grafted. In another, it means that the stock was cut off even with the ground, and the scion inserted just above the neck or collar of the tree.

In the first case, the vital energy which nature intended for one tree, is divided amongst a dozen, and by the time the tree has reached the ordinary age of perfection its vital energy is spent, and it commences a rapid decline. In the other case, it has not only the whole vital energy intended for it by nature, but the graft derives its support from just that part of the stock which is best culculated to impart to it all the energy it possesses. Ascertain then to a certainty that the tree was grafted above the collar, but with very few exceptions; amongst which, if in damp soils, may be the Rambo and Greening apples, the nearer to this point the better.

Having selected his trees in the nursery, let him take them up himself, and never allow a root, however small, to be broken, if it can be avoided—and now let him not throw them into his wagon and run home with them, even though he have only three or four miles to go ; 'tis the small fibrous roots which give to the tree its early support. If these once dry, many of their sporules will close, never to open again, and by this apparently little neglect, the tree will often lose a whole year's growth—let the trees be wrapt then immediately on being taken from the ground, in such manner that every root, however small, may be kept constantly damp till it is in the ground again ; by attending to this advice he will save time, trouble and expense.

Having arrived at home with his trees well selected, so carefully dug that all their roots have been preserved, and so carefully wrapt that not one has been allowed to dry, they are well worth the enquiry—"How shall he plant them ?"

Let one fact now be borne in mind, that the tree must be to a certain extent matured, before it can bear fruit—till that stage of maturity then, attention need be paid to the growth only. Treat it in this respect as you would rear your farm stock for breeding. Till they have arrived at a certain age the farmer's whole attention is given to a rapid and vigorous growth—they are then in fittest condition to improve in propagation. The same principle applies to his tree—the growth of body first—the fruit afterwards. During this time then, the tree must have a full supply of carbon. That of ammonia (nitrogen) should be limited. To give it this let the holes be dug large and be filled with a liberal proportion of black earth, decayed vegetable matter, and well rotted barn yard manure, no matter how much this last has been washed of its ammonia.* For apple trees, the holes should be dug from three to five feet in diameter, two feet deep and from thirty-five to forty feet apart—fill them even with the surface with a compost formed by working thoroughly together, about equal parts of barn yard wash, or well rotted chip manure, and the earth which was thrown out—if the land be clayey, the addition of a little lime and sand will be beneficial. Let the tree now be set lightly on this even

* By giving the tree at this time, and for the next three years, an occasional washing with soap-suds, by digging in about the roots a little leached ashes, and old bones, you supply it with such inorganic substances as stimulate it to assimilate a large quantity of carbon, in other words, to grow rapidly.

surface, and place the same compost amongst and upon the roots, keeping them straight and working the light earth amongst them with the hands. When the roots are thus covered, the tree seems to be standing upon a small mound—let the outer edges of this mound be raised a little so that it will form a kind of basin leading water to the roots of the tree—pour very slowly a pail of water into this basin, so that in settling it will wash the earth closely about the roots. This done, the tree should be well mulched by a covering of long stable manure, or half rotted straw, about its roots, of the depth of three or four inches, and covering a space equal at least to the size of the hole dug for the reception of the tree. It is now planted, and however dry the season will seldom need watering, provided the ground be kept free from weeds, grass, and small grain.

Should any one be disposed to enquire "why the tree should be set upon the ground?" let him remember that it is the oxygen contained in the atmosphere which decomposes the inorganic elements, and reduces them to a condition to be absorbed by the roots—that this atmosphere can never reach the roots if they are covered to any great depth with earth—that he has placed underneath the tree a large quantity of loose earth, which, when settled, will allow the neck of the tree to be just about on a level with the natural surface of the ground, leaving the roots just deep enough to admit of the earth about them being kept light by the plow or the hoe. The mulching placed about them, whilst it prevents the too rapid escape of moisture, is constantly decaying and furnishing to the tree an additional supply of carbon to promote its rapid growth, and is yet so light and porous as to exclude neither air nor water. Plum and pear trees should be planted in the same manner as here recommended for apple trees, the former from fifteen to twenty, the latter from twenty five to thirty five feet apart.

In the second place, we will consider the Culture from Planting to Fruiting:

Taking into consideration the subject of pruning, this is a most important division of horticulture—the most important era in the life of an orchard. It corresponds to childhood and youth in the human family—'tis the age at which the bent is given—the character formed for all its after life; and if left to itself the tree is just as certain to grow up rude and uncivilized, and to acquire improper habits, (aye habits,) as the child turned into the street to find its teachings there.

In considering this subject then, I invite attention, first, to the culture of the ground. It were certainly much better if farmers could be induced to set aside one acre or two for their orchards solely; it would pay them much better than to raise corn, oats, wheat, or timothy, amongst the trees. The orchard should be kept as clean of every other growth as the corn field; but as farmers can seldom be induced to do this, the question arises "what is the best crop to raise amongst young trees?" I answer, that growth of crop which produces the smallest amount of solid woody matter in proportion to its foliage, and for the simple reason that the wood being formed of carbon, which is collected by both leaf and roots, and there being at all times a surplus of carbonic acid gas floating in the atmosphere, and often a deficiency of it in our soils, the crop should have sufficient leaf to take the little it requires from the atmosphere instead of from the earth. Now by this rule melons, pumpkins, squashes, or buck wheat, will do comparatively but little harm, whilst every kind of small grain is very bad. Indian corn is not a bad crop, unless the trees have commenced bearing, for whilst it produces an immense amount of leaf, the stalk, though large, contains but little woody matter. Potatoes require but little carbon from the earth, and are therefore not a bad crop. All crops which prevent the frequent plowing and hoeing of the land should be kept out of the orchard, whatever crop is raised, the orchard should be kept free from weeds, and the soil kept light and mellow; and it will require an extra supply of carboniferous manure, proportioned to the amount of crop taken from it.

As I shall advance some opinions on the subject of pruning, at variance with the teachings of the day, I must, before entering on it, call the reader's attention to a principle in animated nature, which is equally applicable to vegetable physiology. It is what surgeons call "the shock of injury."

If a man receive a gun shot wound in almost any part, although it may produce but little pain, and the loss of scarcely a drop of blood, there is an immediate sinking of all the vital powers. Often a man dies in the hands of a surgeon amputating a limb, where neither the pain nor loss of blood were sufficient to produce the death—a limb crushed by a sudden falling weight, or a dagger wound of some important organ will produce the same effect. The philosophy of all this is simply, that nature finding that a material injury has suddenly befallen some particular part abandons her general duties, and rallies all her powers to the restoration of the part thus suffering; and this abandonment of general duties for the reparation of particular injury is proportioned to the extent of the damage done, or to the importance of the part which has suffered, and the sinking of the system which is induced is called the "shock of injury." In the philosophy of pruning, this principle should be ever kept in mind.

One other fact, from which valuable conclusions may be drawn, should not be lost sight of—the *wood-making*, and the *fruit-making* functions of the tree, are not only different but antagonistic; and neither can be pushed beyond a certain point without at least temporary injury to the other. Now the shock of injury caused by the pruning of the tree falls almost wholely on the formative or wood-making function, at least until the shock has become so severe as to injure permanently the vital powers.

I now proceed directly to the subject, with the premise that you might as well expect the farmer to give a general rule applicable to particular cases of feeding his stock, as for the horticulturist to lay down a rule of pruning applicable to all kinds of trees. What if the former should turn his horses, cattle, hogs and sheep into the same pen, and feed them together on some general principle, he would succeed about as well as the latter applying one rule of pruning to the hardy plum and tender peach.

The habits of the tree, and its duties, at particular seasons must all be considered, for it has duty for every season—a season for every duty. The warmth of spring expands the buds into leaves with their thousands of little mouths collecting nourishment from the surrounding air. It opens the countless sporules of the roots to receive whatever of food the earth may provide, and thus prepared it undertakes the rapid and triple duties demanded by the short summers of this northern latitude—the production of new wood, the formation of buds which are to produce the fruit of the next year, and the growth of the present. This triple duty accomplished, autumn presents the more tardy but not less important one of ripening its burthen of fruit. Having thus done its duty to the world, self preservation demands different efforts, and as the hoar-frosts of autumn betoken the coming hardships, it yields up its rich treasures, and prepares "to battle with the winter storms." In the interval of these storms its only duty is to repair any injury it may have sustained, and thus fit itself for a resumption of its vernal labors.

In applying these facts to the subject of pruning, we commence with the apple, as a fair representative of that class of fruit trees which well bears the severe frosts of our winters.

On this subject Downing says, "Our own experience has led us to believe that, practically, a fortnight before midsummer is by far the best season on the whole for pruning in the northern and middle States. Wounds made at this season heal over freely and rapidly, and all the stock of organizable matter in the tree is directed to the parts that remain." Now Downing is generally received as orthodox authority in matters of this kind, but the deductions which he draws from the first fact above quoted, are so directly at war with all physiological principles, that his advice is calculated to do, and has done incalculable injury to young orchards. The "rapid healing of wounds" is not the only object to be obtained from pruning. On the contrary, it proves an insuperable objection to the pruning of hardy trees at that season. Why do they heal more rapidly then than at other times? It is because nature having most, just now, to accomplish in the economy of the tree, is not only most busy, but is well provided with the force to accomplish it. It is the season appropriated to the formation of wood, to the production of the present year's fruit, and to the deposit of the germ, or bud, of the next year's fruit. Having all this business on hand, she is as sensitively alive to any interruption of her labors, as would be the farmer in the midst of a hurried harvest. At every touch of the pruning knife, now, the shock of injury is keenly felt, and all these forces are withdrawn from their legitimate duties to repair the injury. In our short growing seasons, there is no time to spare for such reparation. For, let it not be forgotten, all the growing energies of the tree must be expended in this business. Leave pruning to be done. then, when the tree has no other pressing duties to perform. I will be excused here for repeating the opinion, that it is not the loss of sap, occasioned by pruning at this or any other season, that checks the growth of the tree; that it is too slow and inconsiderable to affect it materially; but it is the diversion by the tree of its usual and natural functions to the separation of artificial injuries. And as soon would I think of cutting off the shanks, and tail, and horns of an ox, in the midst of feeding for the beef market, that "all the stock of organizable matter be directed to the parts that remain," as of lopping off the superfluous branches of a tree, at this season, with a like expectation.

Prune them at the season of the year when your tree has no active duties on hand, and although the healing of the wounds may be less rapid, no shock will be produced, no sap will be lost, nor valuable time consumed. Prune at any time from the falling of the leaf in autumn to the swelling of the bud in spring. The earlier the better. The tree is now in a state of comparative torpor, and but slightly feels the shock.

It must not be forgotten that this advice is given in reference only to such fruit trees as bear our winters well; and that even for them it is adapted more particularly to the trees of the young orchard, where the great object is a robust constitution and a rapid growth. After the trees are old enough to bear, it often happens that the formative or wood-making function maintains the ascendancy over the fruit bearing function, and the tree continues to grow rapidly, but does not come into bearing. In this case occasional touches with the knife in the growing season, will correct the difficulty and restore the equilibrium.

Having decided on the time to prune—how shall we do it? The first and most important rule is, "Don't do too much of it."* The next, make up your mind what you prune for before you touch a twig.

Supposing that you have planted trees of two to four years old, I advise that you give them no pruning at all the first season. No matter how many shoots start out from all parts of the trunk—the more the better—let them alone. Every shoot and twig will send out leaves which are constantly taking up more nourishment than is required for their own support, and all the surplus is appropriated to the assistance of the roots, which have been crippled and debilitated in removing the tree. Nor is this all, they serve to protect the trunk from the scorching heat of the summer's sun, and by depositing their surplus nourishment around the

* With the hardy fruits.

point from which they arise, expand the stock to that size and vigor which in after years will be demanded for the support of a spreading head and a crop of fruit.

During the fall or winter after the first summer's growth, if it have been vigorous, the knife may be called for, with a view to forming the head at the proper height. To ascertain what this is, it is necessary only to observe the appearance of the trees about you. You will see those headed at from six to eight feet from the ground, with trunks spindling and delicate, their branches "scraggled," short, and standing out nearly at right angles to the tree, and bearing less fruit at ten years old, than a tree of six years with the same culture, and headed at two and a half to four feet high. Take hold of the two trees—the tall one, by means of the great leverage given to the wind, will be found loose and rickety about its roots, leaning to one side, whilst the other will be found firm by its hold in the earth, with its branches shooting as nearly perpendicular as is proper for forming a compact and well shaped head. In addition to all this, my own observation has convinced me that trees forming their heads near the ground are much less liable to be infected by the flat bark louse than those heading higher.

As soon as convenient after the falling of the leaf, select one or two thrifty sprouts, at two and a half to four feet from the ground, which must be left to commence the head of the tree—let all below this be neatly cut off—above cut nothing, except dead and sickly limbs, or one of any two which so cross, that the motion of the wind causes them to rub. The novice will sometimes be at a loss which of these two to spare—let him step back a few feet and see which way his tree is likely to hang—he will then select the one by the removal of which the heavy side will be lightened—cut no more; and especially let me caution against a custom which prevails in many parts of the country, of cutting out the centre branch with the object of giving the tree an open and spreading head. By cutting this, I cannot tell why, the vigor of the tree is greatly impaired, and the time of its active bearing is delayed at least from one to three years.

So much for pruning the young apple tree. The same directions are equally applicable to all the fruit trees which are sufficiently hardy to bear our winters. After the trees have come into bearing no pruning is necessary, except to take out decaying limbs and to preserve the balance of the tree.

I shall say nothing on the subject of gathering and keeping the fruit, except that that for winter use should be allowed to hang as long as possible without freezing—it should then be picked, not shaken off—it should then be placed, not thrown into barrels—put into a dry cellar or fruit-room, and be exposed as little as possible to light and air.

Having finished what I had to say of our hardier fruits, I now proceed to redeem my promise to refer again to some of the tender ones—the peach especially; and what I shall say in relation to this delicious fruit, is the result of many years observation, not in one place, but in a range from the thirty-seventh to the forty-fourth degrees of latitude.

First then, can peaches be grown successfully in Wisconsin? I answer, unhesitatingly, in the affirmative; but it must be done as it is done in all other countries north of 35 degrees of latitude, by depending solely on the fruits native to the climate in which you would cultivate them, accompanied of course by proper culture and pruning.

From 1823 to 1833, almost the entire of the State of Indiana north of Knox county, was twice robbed, by cold weather, of almost every peach tree in the country—the same thing occurred, north of the same line, in the State of Illinois—these are now two of the finest peach growing regions in all the Western and middle States. I was myself a great sufferer by loss of peach trees in both of these States within the above named periods. I used either trees brought from abroad, it being then a new country, or trees which were budded there, from varieties brought from abroad. In their liabilities to suffer from the climate, I saw no difference in these two kinds of trees, and we were not successful in either of the States, until, from the seedlings raised there, we had selected good varieties and propagated from them—precisely the same thing we are now witnessing in Wisconsin; we have been taking trees brought from abroad, or propagating directly by budding from varieties brought from abroad, and by the time the tree has arrived at maturity it has dwindled into such a worthless thing, as to have contributed to the significant result, that nearly three quarters of all the premium peaches at our fairs in the last two years have been seedlings. But few varieties of the peach will bear transplanting from one latitude to another, without in a few years losing its identity as a variety, and generally whether moved from north to south, or vice versa, they will degenerate.

First, then, propagate from varieties native to the climate.

Secondly, a great error has obtained, based on erroneous reasoning in relation to the proper exposure for the peach tree in this climate. In consequence of its coldness it is generally supposed that tender trees should have a warm southern exposure. The fatality of this error alone would cause a failure of the peach tree, even if the difficulties above stated did not exist. The peach is a fruit of the south, and of southern habits. One of those habits is, that it requires a long time to mature its wood—now this habit in a northern latitude must either be broken up, or in some way counteracted. The wood does not mature during a rapid growth of the tree; the growth therefore must be gradually checked, so that it will harden before the commencement of very cold weather. One way of imparting this habit to the tree is by giving it such an exposure, that it may not be stimulated too much by receiving the full force of the autumn suns—rather give it a northern exposure, where it will be late in starting in the spring, and where, by early feeling the full effect of the cool weather of autumn, it begins early to prepare for the severe cold of winter, stopping the deposit of new wood, and ripening that already formed. From this reasoning we are taught

Secondly, to select for our tree a northern or north eastern exposure.

Thirdly, the culture of the ground is a matter of much importance, and let it be kept in mind that I am writing directions for growing a southern fruit in a northern latitude, and as the shortest way of giving my own opinions and reasons in this matter, I shall quote Downing and criticize him: He says "most of the cultivators at the South say, never plow or cultivate an orchard after it has borne the first crop. Plowings bruises the roots, enfeebles the tree, and lessens the crop. Enrich the ground by top dressings and leave it in a state of rest. The best northern growers say, always keep the land in good condition—mellow and loose by cultivation, and crop it very frequently with the lighter root and field crops. Both are correct, and it is not difficult to explain the seeming difference of opinion.

"The majority of peach orchards," he continues, "South of Philadelphia, it will be recollected, grow upon thin light soil, previously rather impoverished. (!) In such soils, it is necessarily the case, that the roots lie near the surface, and most of the food derived by them is from what is applied to the surface or added to the soil. Plowing, therefore, in such soils, wounds and injures the roots; and cropping the ground takes from it the scanty food annually applied or already in the soil, which is not more than sufficient for the orchard alone. In a stronger and deeper soil the roots of the peach tree penetrate farther, and are mostly out of the reach of serious injury by the plow."

Now I fully agree with Downing that on this subject both the northern and the southern peach-growers are correct, but I differ in toto as to the reason of their correctness; and as this reason is necessary to the establishment of other important suggestions, and as a link in a chain of scientific reasoning on this subject, I am unwilling that this link should be broken; and my readers will excuse me for giving *my* reasons why this is so.

It will be a matter of surprise, if not of consternation, to the peach-growers "South of Philadelphia," particularly to those in the Southern parts of Ohio, Indiana, Illinois, Missouri, and a great part of Kentucky, that their lands are poorer and more exhausted than those of the northern part of New Jersey, of New York, Pennsylvania, &c.; and as I am confident I cannot make people believe it, even if I try, I must find some other way to reconcile these apparent discrepancies, or this *prize essay* of mine will not be received as orthodox. I prefer rather to reconcile them in this manner. The peach tree is indigenous to the South, the seasons there are of sufficient length for it leisurely to perform all its functions, make a large growth of wood, and ripen it before the winter becomes sufficiently cold to endanger its life; or even if it should not be fully matured, the winter is rarely so severe that the life is endangered by it. During the season of its growth, then, the nutritive functions of the tree should be as little disturbed as may be. Its roots and its leaves should be allowed to collect all the material they can for the growth of the tree and the perfection of its fruit, and leisurely to appropriate it. But in the North, the season is so short, and the growth of the tree (as of all vegetation) so hurried, that if it be allowed to go uninterrupted, it deposits in the early season more new wood than it can possibly harden in the autumn. The winter surprises it in its immature state, and death, or the frozen blight, is very apt to follow. To prevent this, plow early in the season; let the roots be occasionally cut—By this you arrest the too rapid flow of sap, and at the same time divert some of the energy of the tree from the function of creating new wood to that of repairing an injury to its roots.* 'Tis true, your tree will not make so great a growth, nor set so many buds for next year's fruit, but what wood buds it does form will be fully matured, and in most instances, capable of withstanding the cold winters of this climate. From this I deduce the rnle:

Thirdly. Keep your ground well manured, and well cultivated with the plow and the hoe.

Lastly—Let the above guide as to the time of pruning. Here the rule for hardy fruits must be reversed. The shock of injury must occasionally be felt. A part of the tree's energy must be diverted from the formation of wood to the healing of wounds. And proportioned to the soundness of the discretion and the judgment exercised in this branch of peach culture at the North, will, generally, be the success of the cultivator. For as the peach requires more pruning than almost any other tree, the whole work performed at one time, and in the growing season, would produce a shock incompatible with the performance of the healthy functions of the tree.

I lay down the following as the best general rule to guide in this business: Immediately after the ripening of the fruit, select about one-third of the twigs which have grown during that season, and cut back one-half their growth. This will arrest all growth, and set the tree at once to hardening its new wood. Late in the autumn, but before the hard weather of winter sets in, cut back another third in the same manner. If left till the severe weather, the twigs thus cut back are apt to die down for two or three inches below the cut, and leave unsightly dead stubs. Immediately after the frost is out of the ground, and you have a promise of swelling buds, let the remaining third be treated in the same manner. By this pruning the tree is again kept busy for a few weeks in repairing its injuries, and a too early start in the spring is prevented. Your pruning is now done, unless you should discover a too rapid growth

* You also, by cutting a part of the roots, prevent the too rapid absorption of those inorganic elements, which require a like absorption of carbon for their proper assimilation.

through the summer, in which case a slight diversion may again be made by an occasional touch with the knife.

The above theory and practice are based on an experience and observation of over twenty years in a range of eight degrees of latitude, and the best guaranty which I can offer for their correctness in reference to the peach, is the fact that I have in Wisconsin raised from the same trees, five good crops of peaches in six successive years. And I now venture the assertion, that this is a rare occurrence in even the best fruit-growing State in the Union.

That portion of this article devoted to the subject of hardy fruits is applicable to the apple, the pear, the plum, and the hardier varieties of cherry—the latter part to the peach, nectarine, apricot, and the tenderer varieties of cherry, with this single qualification, that the method of culture must lean to the directions given to one or the other of the two classes of fruit, in proportion as the particular fruit leans to either class.

Having now brought our trees to a state of maturity, but little remains to be said. If we would bring them early into bearing, we may prune even the hardier kinds occasionally in the growing season, to arrest the two rapid formation of wood; we should at the same time change the character of our manures, and use those only in which the ammonia has been fixed, thereby furnishing a full supply of nitrogen by which the prolific propensity is actively excited. After the tree has arrived at full bearing let the ammonia always be fixed in your manures, by the addition of plaster, sulphuric acid, or common salt, to your manure heap, as additions are made to it from the barn, and by keeping it covered from the rains. If in addition to a supply of this kind of compost, given to your orchard every April or May, a little air-slackened lime and leached ashes be added, you need never fear that your trees will be "alternate bearers;" they will bear every year, and the only duty remaining to you is to prevent them from bearing too much, by plucking off a portion of the fruit as soon as it is fully formed, and to keeping your orchard free from noxious weeds, grasses, and cereal crops.

I should have been glad to add to this article a few paragraphs on the diseases of fruit trees, but it has already attained a length which was never intended; and I must defer writing more till I learn what confidence the public may accord to what has already been said.

MORAL INFLUENCE OF HORTICULTURE.

BY REV. JOHN J. MITER, MILWAUKEE.

"But rather to tell how, if art could tell,
How from that sapphire fount the crisped brooks,
Rolling in orient pearl and sands of gold,
With mazy error under pendant shades
Ran nectar, visiting each plant, and fed
Flowers, worthy of Paradise, which not nice Art
In beds and curious knots, but Na ure boon
Poured forth profuse on hill and dale and plain."—MILTON.

Paradise, in all the beauty and magnificence of its natural scenery, was chosen by Divine Wisdom as the delightful home of the first human pair. Its untainted atmosphere, loaded with the breath of fragrance, its perennial bloom, sparkling in "orient pearl," its varied luxuriance, and the rural employments to which it invited its blissful proprietors, were wisely arranged for the purpose of unfolding and refining all that is God-like in the human soul. By breathing its pure air, by training its graceful vines, pruning its prolific shrubs, and wandering at early morn and evening twilight through its decorated walks, the body was invigorated and developed in all its pristine beauty and perfection. The wisdom displayed in the variety of its productions, in the magnificent arrangements of its scenery, and in the wonderful mechanism of each form of animated existence, contained within its ample inclosures, were adapted to elicit thought, and to refine those intellectual powers which were designed to reflect the Divine intelligence. In like manner, its innumerable specimens of beauty and sublimity, when sparkling in the morning dew, or bathed in the splendors of mid-day, or tinged with the golden hues of the setting sun, were pre-eminently fitted to cultivate a finished taste. In fine, the uncorrupted heart of man would need no more powerful incentives to prayer and praise. It could not fail to adore and love when its Great Original was revealing himself in the beauties, the luxuriance, and the harmonious voices of Eden. Such was the natural scenery which surrounded man when admiring angels first looked down upon him in his pristine purity and happiness.

Now do we not find a clear argument in favor of the benign tendencies of horticulture from this delightful position of our first parents, in "the blissful garden?" By Divine appointment, its cultivation and embellishment was made their first employment. It is, therefore, reasonable to infer, that this selection would not have been made, for the trial of human character, unless infinite wisdom had seen a fitness in the rural occupations of Eden to preserve man's primeval innocence and happiness. Nature, spread out before him in all its charming forms and splendid luxuriance, was the first unsealed volume in which the Divine attributes were revealed. And so long as he maintained his high position among God's unfallen creation, he needed no other revelation. To explore and admire the profound mysteries of nature was a sufficient stimulant to his intellect; and to move amid the everlasting bloom and loveliness of paradise, to cultivate its soil, and to add th eembellishments of art to the beauties of nature, were adapted to train his heart for the highest and purest forms of communion with God.

If we now turn to man's mournful history as an exile from Eden, we shall find that his recovery from barbarism, and his progress in all the arts and refinements of civilization have been intimately connected with horticulture. It is not a mere rhetorical embellishment, but the utterance of a great historic truth, when we affirm that "the first seed which" barbaric man "planted, was the first act of civilization, and gardening was the first step in the career of refinement." A wild, wandering, or nomadic life must be barren in all the prolific fruits of civilization. The wandering Arab, and the untutored savage of our own continent, have made no progress. In their intellectual and moral attainments, they have not advanced one step beyond their remotest ancestors. This is an historic fact familiar to all. And the philosophy of this fact is just as obvious. Man must cease to be a wanderer, or remain in barbarism. He cannot cultivate letters, establish schools, embark in commercial enterprise, or make any progress in science and the fine arts till he becomes stationary, having "a local habitation and a place." But the moment he locates, his first dependence for subsistence must be upon the cultivation of the soil. He can no longer depend upon the chase, or wild fruits, or plunder for a living. Therefore, as soon as he contracts his plantation from the dimensions of a whole island or a continent to that of a few acres, nature will no longer supply his wants without cultivation. The savage who abandons the wild and wandering life of a warrior and a hunter, must first become a gardener. But his incipient efforts at horticulture are confined to the useful—the indispensable. He has neither time, nor taste for horticulture in the higher sense of an ornamental art. This must be the result of a far greater advance in civilization. The humble garden—the nucleus of the future rural paradise—must expand into the luxuriant plantation; the mechanical arts must be promoted; commerce and manufactories must yield their golden fruits, and man must ascend to a condition of wealth and ease, before horticulture will be carried to its advanced stage of embellishment and perfection. In the order of nature, we first behold the rude cottage with its little clearing, through which the sun's rays find a path to the earth,—then the cultivated farm with its annual crops and growing thrift—and last the spacious mansion with its library, statuary, painting, music and pleasure grounds, with their ornamental trees and exotic plants and flowers transplanted from every clime.

I have indulged in this train of thought for the purpose of showing that horticulture first lays the foundation of civilization, and is finally cultivated as one of the ornamental arts when civilization is in its mid career of progress. The barbarian commences his intellectual and moral progress in the garden, and when he has reached his highest advancement in civilization, he finds himself again in a literal paradise of his own creation. Is it not, therefore, evident that horticulture, for purposes of utility and ornament, is the natural employment of man—that its influence over him is preeminently elevating and refining. Its tendency is to raise him to his primeval state, and restore to him the innocence and bliss of Eden.

A glance at the progress of different nations will show the relation which horticulture sustains to the higher forms of human development. Egypt, the cradle of ancient civilization, was celebrated for the extent and the luxuriance of her plantations. But her highest attainments in gardening were not reached till she had ascended to the culminating point of her national glory. When the banks of the Nile had been cultivated into almost one continuous and splendid garden, the magnificence of her cities and temples, together with her stupendous pyramids, had become the wonder and admiration of the world. It was so with the renowned kingdom of Israel. Solomon stood before the nations of antiquity, arrayed in all the glory of his wisdom and power, before the historic fact is recorded, that he "delighted to dwell in gardens," or before he arranged and decorated the vineyard of Baalhaman." When the hanging gardens of Semiramis had taken their place among the seven wonders of the world, Ninevah and Babylon were rapidly rising to a point of unsurpassed magnificence. Greece, too, had produced her greatest statesmen, philosophers, orators and artists, before philosophy was taught in her sacred groves, and before the era of those magnificent gardens which were enriched with temples, the statues of her heroes, and her triumphal monuments. The rural villas and imperial gardens of Rome, also, date their existence to a period subsequent to her splendid conquests, and her proud attaiments in science and art. Thus ornamental gardening appears to have been reserved for the last efforts of ancient genius.

If we trace the progress of European civilization, we shall, also, find that horticulture, as an ornamental art, stands connected with the highest degree of national taste and refinement. The admired rural scenery of England, blending as it does the inimitable beauties of nature with the decorations of art, owes much to the polished taste of Addison and Pope, and the imagination of Milton. By the judicious criticisms of Addison, and the taste displayed by Pope in the model garden of his little villa, ornamental horticulture was brought back from a style of fantastic and artificial stiffness to the simplicity and beauty of nature. Through their influence nature was made the divine model of the gardener's art. Milton also, in his peerless description of Eden, inspired a national taste for the beautiful in nature, and a faithful imitation of nature in art. How life-like is his description of that "blissful bower" of human innocence. "It was a place," says this great delineator of nature:

"Chosen by the Sovereign Planter, when he framed
All things to man's delightful use; the roof
Of thickest covert, was interwoven shade
Laurel and myrtle, and what higher grew
Of firm and fragrant leaf: on either side
Acanthus, and each odorous bushy shrub,
Fenced up the verdant wall; each beauteous flower,
Iris all hues, roses and jessamine
Reared high their flourishing heads between, and wrought
Mosaic; under foot the violet,
Crocus, and hyacinth, with rich inlay
Broidered the ground, more colored than with stone
Of costliest emblem."

It was through the writings of these men of genius, together with the efforts of the Horticultural Associations of England, that the British Isle has been converted into a magnificent garden. And it is an interesting fact, that where Christianity has struck its roots so deep, and raised the nation to such a sublime position of moral influence, the people have acquired an intense passion not only for all that is useful, but, also, for every thing that is ornamental in gardening. And such has been the influence of these delightful rural occupations over the popular intellect and heart, that the literature of England is tinged with the exquisite colorings of nature, and her sweetest poetry is fragrant with the breath of her roses and jessamine.

Our own country furnishes another illustration of the truth, that horticulture is the legitimate product of a high degree of intellectual and moral cultivation. I now speak of horticulture in its widest significance—embracing, within the term, not only the cultivation of esculent vegetables, fruits, ornamental trees, shrubs and flowers, but also an elaborate arrangement of rural scenery for purposes both of utility and embellishment. It is not until recently, that our own country has become extensively and deeply interested in ornamental gardening. This is the result of our great progress in wealth, in a knowledge of the fine arts, and in our increasing taste for the beauties and luxuries of nature. America can now boast of her theoretical and experimental horticulturists who are vieing with those of the older countries of Europe to enrich the environs of our cities and country seats with the most admired productions and decorations of the garden. Much progress has already been made, in the older portions of the Republic, in this work of substantial utility and rural embellishment. Magnificent villas are beginning to stretch from our commercial marts along the banks of our beautiful rivers;—our markets already abound with the choicest fruits; and the green-house, filled with rare productions from every clime, is becoming an indispensable appendage to the mansions of those who have amassed a fortune, and are living at ease. Now the moral influence of this growing taste for both the useful and ornamental, in horticulture, must be very great. The mind of man cannot be held in close contact with nature, when she is revealing herself in all the brilliant coloring, and graceful forms and tempting luxuriance of a literal paradise, without yielding to her refining influence. The beautiful in nature will be reflected in lines of moral grace and loveliness from within.

Having thus shown that horticulture, in its scientific and artistic progress has been associated with the highest forms of national development, let us dwell more particularly upon the influence which it must exert upon the threefold nature of man.

1. Gardening, in the extensive sense of both a science and an art, is pre-eminently favorable to intellectual development. No man can be a scientific horticulturist without an extensive acquaintance with natural history and physics. He must be familiar with the researches and the conclusions of the illustrious Linnæus, and those who succeeded him in the work of elevating botany to the rank of one of the most fascinating and popular sciences of modern times. A knowledge of chemistry is necessary to understand the nature and properties of different soils, their adaptation to the nourishment and perfect development of all the varying families of plants, and to guide the practical gardener in the preparation of those composts by which his lands are enriched and prepared for all the different processes of cultivation. To secure all the important and often indispensable objects of irrigation, an extensive knowledge of hydraulics is required. If, for utility, water is to be raised by means of pumps and other engines, or if for embellishment, the artificial lake, canal, cascade, and living fountain, are to be constructed, this science is of the first importance. In like manner, scientific horticulture cannot be carried to a state of perfection without the aid of a finished taste in architecture. The highest effect, especially in landscape gardening, cannot be secured without its aid. It requires the science and the practical eye of the architect, to realize complete symmetry and elegance in the arrangement of the arcade of graceful vines, the majestic colonnade of evergreens, and the charming specimens of rural perspective. Now in view of these scientific relations of horticulture, and others that might be enumerated, it is evident that it cannot be successfully prosecuted, without enlarging, in a high degree, the intellectual powers. We shall be conducted to the same conclusion if we view it in its relation to the fine arts. Herder represents gardening as "the second liberal art, architecture," according to his classification, being "the first." In a district "adorned by beautiful gardens," he says, "art and nature are harmo-

niously mingled." To distinguish, in nature, harmony from discord; to discern the character of every region with a taste which developes and disposes to the best advantage the beautiful of nature—if this is not a fine art, then none exists." The artistic skill of the painter and sculptor consists in a faithful and life-like imitation of nature. The one transfers to the canvas her beautiful forms and exquisite colorings. The other, by the magic creations of the chisel, traces her perfect lines—her noble, and often god-like attitudes and expressions upon the unthinking marble. Now it is the grand achievement of the horticultural artist, that, by his close inspection and faithful imitation of nature, he is able to create his artificial paradise. In the natural arrangement of his pleasure grounds, in the disposition of his verdant sculpture, and the gorgeous display of his animated paintings, he comes up to the sublime conceptions of Homer and Milton, in their delineations of celestial gardens. Kent, who was the great artist and reformer in landscape gardening, carried the theories of Pope, Addison and Mason into execution. He had enough of the poetic to discover that "all nature is a garden," and with the keen eye of a painter he arranged the useful and the ornamental in horticulture, in all the gracefulness and charming simplicity of nature; blending in natural harmony, her lights and shades and endless forms of beauty. His beautiful ideal of a perfect garden may be gathered from the following extract from one of his admirers: "The great principles on which he worked were perspective, light and shade. Groups of trees broke a too extensive lawn; evergreens and wood were opposed to the glare of the champaign, and by selecting favorite objects and veiling deformities, he realized the compositions of the great masters in painting. Where objects were wanting to animate his horizon, his taste as an architect could immediately supply them. His buildings, his temples, his seats, were more the work of his pencil than his science as a constructor. Dealing in none but the true colors of nature, and seizing upon its most interesting features, a new creation was gradually presented. The living landscape was chastened or polished, not transformed." In this style of rural embellishment, the gracefulness of art flows gently into the simplicity and harmony of nature. There is not the stiffness of an independent, artificial arrangement on the one hand, nor an "inartistic" and servile copying of particular realities in nature, on the other.

From this brief allusion to horticulture as a science and an art, it is obvious, that its influence upon the enlargement and refinement of the intellect is worthy of high consideration. A subject, that has exercised the classic taste of such distinguished lights in literature as Addison and Pope, must be pre-eminently favorable to intellectual improvement, both in its theoretical and experimental aspects. And as a pure intellectual taste is intimately associated with refined moral sensibilities, we may infer the great moral benefits to be derived from experimental gardening. But the moral influence of horticulture rests upon more substantial ground than mere inferential evidence. It is easy to show—

2. That its influence upon the moral nature of man is direct and most salutary. There is much more in the rose than its beautiful tints and hues, or its fragrant breath. There is a moral essence to be extracted from this queen of flowers far more valuable than the admired otter that breathes its perfumes round "the toilet of the belle." Besides its natural beauty, it contains a deep moral significance. There is innocence in its delicate blush, purity in its spotless petals, and sweetness in its breath; and each of these qualities are suggestive of corresponding qualities in the human heart. Nature, through all her forms of rural loveliness and magnificence, speaks in words of eloquence and power to the contemplative soul of man. In the branches of the cypress, he beholds a mournful emblem which reminds him of the grave, and of the dear ones of other days "who slumber where no sound shall awake them." In the whispering foliage of the mountain pine, in the perpetual verdure of the symmetrical fir, and the moss-covered hemlock, he discovers an appropriate emblem of that fairer world, where

> "Everlasting spring abides;
> And never-withering flowers:"—

where fields, more glorious than primeval Eden,

> "Stand dressed in living green."

In short, rural nature abounds with emblems containing moral lessons of the highest significance. From the frail flower of an hour, to the lofty evergreen, that nods defiance at the tempests, and preserves its verdure through all the frosts and desolations of winter, the horticulturist, in his daily vocation, is admonished of the exceeding brevity of human life, and the certainty of immortality.

The sacred groves of the ancients were appropriate places for their great philosophers to impart their lessons of moral instruction. The immense rural lecture room, arranged and decorated by the God of nature, was adapted to add weight and solemnity to their discourses on moral and religious themes. Indeed, so intimately were the religious associations of the ancients connected with their rural scenery and retreats, that "the Elysian fields were the *heaven* of classic mythology," and, even to this hour, the imaginative, and "devout Mussulman hopes to renew his existence in a celestial paradise." Now this universal tendency of the human mind to connect a high degree of moral purity with the celestial garden, making it the sacred place where the soul enjoys intimate communion with the very essence of Divinity, shows how natural the transition is from the beautiful and luxuriant *forms* of nature to the glorious Author of nature. If it is true that

"The *un-devout* philosopher is mad,"

it is equally true, that the mind must be fearfully fallen, and the heart deeply corrupted, when the horticulturist can mingle with the almost endless forms of beauty, grandeur and glory, which rural nature presents before him, and not be led to admire the infinite riches of Divine wisdom and love. If that philosopher must be morally insane who can remain "*un-devout*" while he is journeying over the great highways of astronomical science, amid the mild radiance of stars, and the more intense splendor of suns, and the wide sweep of revolving worlds, it is equally difficult to defend the moral sanity of him who can, like Adam, dwell within the magnificent inclosures of a literal paradise, and not mingle his devout anthems with the morning and evening songs of the beautiful bird—

"When all things that breathe,
From the earth's great altar send up silent praise
To the Creator, and his nostrils fill
With grateful smell."

In short, but few of all the earnest and delighted students of nature can be thus embowered in the midst of her everlasting charms, without having their moral perceptions quickened, and their moral sentiments purified and exalted.

It is an historic truth, that virtue abounds most and presents her brightest examples in the rural districts of every country. Cincinnatus acquired his unyielding Roman virtue not in the senate, or the gay, dissipated city, but at the plow. The very air of the luxuriant grove, and the decorated garden is favorable to the cultivation of virtue. It brightens the eye and unseals and invigorates all the senses, and prepares them to drink in the perfumes of shrubs and flowers, and the harmonious strains which float from the great orchestra of nature. Indeed there is health, and gladness and devotion in the sweet, bracing, rural air. It imparts keenness to the perceptions, and thus intensifies the soul's appreciation of the works and wonders of creative love. In this respect the horticulturist is surrounded by far more propitious moral influences, than the merchant in the crowded mart. The former has one of the great volumes of Divine Revelation open before him continually. He sees the wisdom of Deity, in the curious structure of every plant—he sees the exquisite taste of the infinite Artist in the more than velvet texture of the blooming cactus, in the glittering gold that tips the insects wing, and in the inimitable penciling which decks the garden with all the brilliant coloring of the rainbow; and in the wise adaptation of nature, in all her varieties to minister to human happiness, he beholds the clearest evidence of Divine goodness. Here is an easy ascent from nature's great gallery of the fine arts, up to the glorious mind who spoke all nature into being. But the anxious tradesman, in the midst of the noise, the ceaseless occupancy and confusion of the great emporiums of commerce, is removed from all these hallowed influences of rural nature. She is a sealed volume to him, almost as completely, as God's inspired Revelation is to the incurable skeptic. He sees none of her beauties, he catches none of her delightful melodies, he feels none of her inspiration, and his heart is refined and exalted by none of her beautiful emblems which point upward "to those everlasting gardens, where angels sing, and seraphs are the wardens." The history of the world has shown, that man's confinement in these great marts of business, and his seclusion from the rural charms of the country, have been unfavorable to his virtue. There have always been many noble exceptions to this statement. But the virtue of the masses, in our cities, will not bear comparison with the virtue of those rural districts where our intelligent and enterprising yeomanry are at home in the bosom of nature.

This great disparity between the influence of the city and the country, upon the advancement of public virtue, will be in a measure removed by the progress of horticulture. Like Cimon who "established the Academus; and presented it to his fellow citizens for a public garden," the wealthy and public spirited citizens of this country are surrounding our older cities with their magnificent mansions and beautiful gardens. These have their influence upon the taste and refinement of the masses. Every mechanic and child who looks upon their luxuriant foliage and breathes their morning and evening fragrance will receive a moral benefit. The celebrated "Boston Common" and "New Haven Green" have not only improved the health but the moral nature of thousands who annually wander through their spacious walks, or repose under the shade of their ancient elms.

Such, we believe, are the benign moral tendencies of horticulture. And whoever plants a shade tree, or trains a graceful vine round the column of his verandah, or cultivates a fragrant flower beneath his window, is a public benefactor. He is improving the moral sensibilities of his children, and stimulating his friends and neighbors to emulate his noble example. It is in this way, that a taste, both for the useful and ornamental in nature, is to be cultivated, till it becomes an universal passion. By a process like this, commencing in all our villages and cities, an interest in scientific and experimental gardening is to become general, until the environs of the city, and the pleasure grounds of the farmer, and the magnificent country seat of the millionaire, shall be embellished with all that is rare and beautiful in nature, and graceful in art.

Our country is pre-eminently adapted to carry practical horticulture forward to its highest degree of perfection. Nature has been exceedingly bountiful to us, in the bestowment of every thing that is beautiful and magnificent in her productions. An eloquent writer observes that "many of the most useful and magnificent acquisitions of the groves, fields, gardens and conservatories of Europe are natives of the western hemisphere. The indigenous forest trees, ornamental shrubs, flowers, fruits, and edible vegetables of North America, are remarkable for their variety, size, splendor or value. Extending from the pole to the tropics, and from the Atlantic to the Pacific; North America embraces every clime, and every variety of soil, teeming with innumerable specimens of the vegetable kingdom. With such advantages, most of which are included within the United States, it is to be expected that the citizens will be as distinguished for their advancement in rural economy as in civil and religious freedom." All that is necessary, to ornament the whole face of our luxuriant country with those rural embellishments "which Shenstone might have envied," is to diffuse a taste for useful and fancy gardening among our enterprizing population. This is to be accomplished by encouraging horticultural associations, and public exhibitions, by bestowing liberal patronage upon the proprietors of our public gardens and nurseries, and by the employment of intelligent and experienced practical superintendents. Every citizen may add his influence to the improvement of the public taste in this regard. If the first seed that was sown was the first step taken in the progress of civilization, every plant that is stimulated into a luxuriant bloom is the harbinger of a higher form of moral development. And when, in the progress of horticultural science, the fertile prairies and openings of the Great West are raised to a high degree of artistic rural embellishment, the genius of Michael Angelo will be transferred from its Italian home to our shores, to reproduce its wonders of art amid the enchanting scenery of the New World. For when American taste and genius shall have converted our luxuriant fields and rural districts into a vast magnificent garden, in the number and finished attainments of our artists, we may not be second to Greece when the poetry of her Euripides attracted thousands to the theatre, and the genius of her "Phidias was displayed in rearing the Parthenon, and sculpturing the statues of the gods." But if we shall never attain to such a splendid triumph of art, one thing is certain—if our citizens devote such attention to useful and ornamental horticulture as the taste and refinement of society require, they may raise our country to such a state of rural loveliness as will excel the fabled gardens of the Hesperides with their golden fruit. Here is a great field opened before us. If it is cultivated and embellished, according to the abundant facilities at our command, its influence will endure to purify the intellectual taste and shape the moral character of future generations.

FLORICULTURE.

BY MRS. LAURA A. SMITH, PLYMOUTH, WIS.

In complying with your request, to prepare an article upon 'Floriculture,' I shall trust that the desire for awakening a love for the culture of flowers, in the minds of my fair states-woman, will be a sufficient apology for undertaking a task to which I can bring neither the knowledge nor the experience requisite.

An elaborate essay I cannot write, but if the results of my simple experience, will have the effect to plant one solitary garden, "where garden there was none," I shall be entirely satisfied. I trust also that the few directions I shall offer, may induce some who may have been discouraged by the elaborate rules of florists, to consider a fair and beautiful flower garden not incompatible with the means of the humblest rural home within our State.

It is very pleasant to remark that, in this utilitarian and money-making age, there are those, even in our infant State, who can both appreciate and delight in the employments of rural taste. There are few, indeed, of so unrefined a nature, but will acknowledge the pleasant influences of a love for the culture of flowers, its power of increasing the pleasures of home, and the improvement of heart and taste, which an intimate association with God's beautiful creations in the floral world, must necessarily produce,

> "Your voiceless lips, oh flowers! are living preachers—
> Each cup a pulpit, and each leaf a book,
> Supplying to my fancy numerous teachers,
> From lowliest nook."

To those valuable improvements, in the science of agriculture, which more materially effect the wealth of our State, all praise is due; but as even these are but as aids to our comfort and happiness, we must not forget while ministering to our physical necessities, to provide those gratifications of a taste for the beautiful, which is inherent in us all. To do this we should combine the useful with the beautiful in our rural homes, remembering always that He who implanted in us a desire for forms and colors of beauty, has always placed the means of its gratification within reach of the humblest.

In the culture of flowers none should more properly lead the way than woman; it seems indeed one of the duties of her sphere; she should remember that while yet a sinless inmate of the first "home" on earth, and that spot a garden, she tempted man to his destruction; and that in making her home now attractive "with the sweet incense of flowers"—and there are few who can resist such attractions—she will render the paths of virtue and truth more pleasant to her husband, and will create a pleasant spot, wherein memory will ever linger in the hearts of her children.

Nothing more beautifully indicates the purifying influence of a love for flowers, than the appreciation which innocent children always bestow upon them; and our Saviour, while he blessed little children, did not fail to bid us heed their favorites "the lilies of the field." It would indeed be well for those who toil and labor in the world's dusty warfare, to follow the example of these "little ones" and find more of their happiness,

Where still the love of childhood lies
  Where its first treasures lay,
Among the greenwood's countless leaves,
  And lovely flowers of May.

In the intervals of labor and business, nothing can be more invigorating and cheering than the pleasures of a garden. Its flowers and fruits naturally lead our minds to that infinite Creator who has given us so much to enjoy, even in this world—such reflections must tend to nought but good in the heart of man; they would insensibly lead him, perhaps, to a recognition of the particular care of Providence, in His most humble creations, and thus he could but become an humbler and a better man—a more genial friend, and a more tender parent.

Wherever we see a man who loves to plant and foster flowers, we instinctively commend him in our hearts as a man of true refinement; and when we are so unfortunate as to meet with a woman who does not delight in them, we have good reason to suspect a lack of all that constitutes the true beauty of the feminine character. Let our wives and daughters, then, lead the way, and in a path so pleasant our husbands and brothers will surely follow. Let it not be said of our lovely land, that therein

> "Many a Tyre our steps may find,
> But no Arcadia now,"

while we possess the elements of so much beauty at our very feet.

Let us draw a picture, by no means an ideal one, of a rural home as we too often behold it; and then form a contrasted picture of the same home transformed by the hand of a simple taste, in gratifying which the material is at hand without money or price.

It is a log-house, and a stick-chimney; upon one side, in full view of the cabin's one door and window, is a log barn, and the cows and pigs make a common bed in front of the house; old boxes, barrels, refuse wood, chips, &c., add confusion to the scene; no tree has been spared, though numerous blackened stumps too truly indicate where once they waved in leafy pride. A few straggling stalks of mustard, possibly a tall sunflower, some thistles—*introduced* from Canada—and burdocks, flourish in the yard. Perhaps, the good wife has planted in a plowed patch near by, a few onions and cabbages; all, indeed, wears a most comfortless and uninviting aspect,—while perhaps the owner of this very establishment is getting into his barn, or stacking in his field, hundreds of bushels of wheat, and other crops in liberal abundance; while his home indicates poverty the most abject, and a mode of life for which he would have blushed, before he "moved West," where people "do as they can;" that most miserable excuse for the careless and idle.

But change the scene—tear down the old barn—remove by a few hours labor the rubbish so long collecting; construct a neat fence, even if it be of tamarack poles. A few hours will collect from the woods several varieties of the honey-suckle, climbing the first year over the trellised doorway—its beautiful foliage in summer, and its autumnal berries, always rendering it attractive. A wild grape-vine hides the window and clambers here and there, concealing the rough logs with its profusion of green foliage—and some one appreciative of the beauties of "autumnal leaves" has carefully nurtured the American ivy, (Virginia creeper,) one of the most beautiful objects of our woods in the time of "falling leaves."

From our fields and woods transplant—the splendid cardinal flower (lobelia cardinalis)—several varieties of the wild phlox—the hair-bell—

the gay Indian pink—the delicate dodecateen, called by some American cow-slip—the curious Moccasin flower, and many other natives of our wilds which display new beauties when cultivated, and are worthy a place in any collection. The 'waxberry,' so much cultivated in eastern shrubberies grows here abundantly in the woods—and the wild rose, as common as a weed, should not be omitted. The high bush cranberry is also a handsome shrub, and the sumach is certainly worthy of attention. The trees alas! must be replaced, and here we are at no loss—the maple, linden, elm, &c., and, in certain localities, the mountain ash, pines, and even hemlock are abundant—the tamarack, though not an evergreen, is not to be despised; all these, or a portion of them at least, can find a place about the home of the poorest settler within our borders. The scene is certainly changed, most delightfully improved; and all this may be done without the outlay of a single dollar—a little time and labor, joined with a 'hearty good will,' will accomplish wonders.

Again—It is to be deplored that an idea of the 'fitness of things' is not more an element of our national tastes; and thus in our rural homes, we often observe, a tall, straight house, perched upon some site, unshaded by trees—(of course these were levelled to begin with)—exposed on all sides to sun and wind, as near as possible to the dusty highway—while all around we see broad and fertile fields, and at a distance an oak embowered eminence, where we inwardly wonder that the owner of so much wealth and beauty did not build his house. But supposing the house had been built according to our tastes without consulting the owners—imagine this residence, to be erected for comfort, for pleasure, and for living in—this pleasant grove, a beautiful oak opening shall be our choice—allow plenty of room for a wide lawn in front; let all the rooms most occupied command a view of the lawn and flower garden; let it be furnished with wide verandahs, whose pillars and lattice work are entwined with climbing roses and fragrant honeysuckles; let the grounds, already furnished with trees of nature's own planting, be agreeably diversified with other varieties of our native forest trees, with a group of evergreens here and there, and embellished with shrubbery—

The lilac and the snow-ball flower,
And the laburnam with its golden strings
Waving in the wind, and when the autumn comes
The bright red berries of the mountain ash—

'Look on this picture, and on that,' and who will object to the change?

But to particularize,—although not strictly within the limits of my subject, I will venture a few words upon the selection of a site for a residence, so as to combine natural advantages most easily with such artificial improvements as are most convenient and desirable.

The house itself should be built so as to command a pleasant view from as many points as possible; and in our beautiful State, how few who own a few acres of ground but can find some spot which possesses this advantage at least. It is not desirable that the site should be the highest ground near; on the contrary, a sheltered though elevated position is preferable. The out-buildings should be easy of access, yet not conspicuous, and where nature has too soon been rifled of her treasures by the cruel ax, shade trees should be planted immediately, the sooner the better; our own forests furnishing abundantly all that is necessary in this respect—these should not be planted in rows, nor at regular distances from each other, but should be arranged in groups, so as to both form a pleasing contrast, and an harmonious whole.

I trust in time to see many of our farmers, while arranging their grounds permanently, paying more attention to the growth of plants for hedges; the common cedar hedge is one of the most beautiful objects I ever saw, and a most appropriate division of the flower-garden from the lawn; privet, sweet-briar, hemlock, locust, &c., have all been recommended, though I presume none of them can be used as a substantial barrier against cattle; but as objects of beauty, and as interior divisions they deserve attention.

The selection of shrubbery, roses, lilacs, honey-suckles, &c., should be made with reference to their habits, time of flowering, growth, height, &c., all of which can be learned from books, and from a little experience, in much less time and with less trouble than one would suppose.

In most cases a wide lawn in front of the house is practicable; and it is also desirable that on each side there should be ample room for orchards, shade trees, &c. The carriage way should not approach the house in a straight line, and it will generally be found, if the house is upon an elevation, that the easiest ascent is most agreeable to taste.

Foot-walks should lead to some desirable object—a pleasant view, or, perhaps, a summer-house. They should be formed of gravel and lime, and a few leisure hours could easily be spared to construct at intervals a rustic seat, where one could rest if desired. "Downing's Landscape Gardening" is an excellent guide to one about to lay out his grounds, modifying of course its directions according to means or inclination. The flower garden should be near the house, perhaps upon one side, where it can best enjoy the sun, and should be so placed that the windows of some principal room can open upon its beauties. A southern aspect is to be preferred; and it should not be separated from the lawn by any more substantial barrier than a hedge, and even this is unnecessary—though very ornamental—it is, of course, supposed that hens, turkies, &c., are not permitted to run at large, in this case.

Flower beds are now frequently cut in circles and various other forms in the turf, using the turf as a walk; this is very beautiful in extensive grounds, or even in a small grass plat. The usual manner, however, is to form beds in various pleasing figures—leaving wide walks between the principals beds. For full directions I will refer my lady readers to "Breek's Book of Flowers," which no one should fail to consult when arranging a flower garden. For the borders, box is generally used in Eastern gardens; I have not seen it growing well, however, in this State, but doubtless it would succeed well if slightly protected in winter. The fringed pink is a most beautiful bordering, particularly while in bloom; this requires a slight protection in winter. Thift is another pretty border plant—and grass is sometimes used, though requiring considerable attention. Those beds which are planted with low growing flowers, blooming in masses; such as phlox drummondii, portulacca, petunia, verbena, &c., do not require necessarily any bordering.

The best time to lay out a flower garden, is in the fall, when there is plenty of time to arrange it; it also gives an opportunity to plant out hardy bulbs, &c.

In selecting bulbous plants, shrubs, perennials, annuals, &c., taste and judgment are equally necessary where the garden is small, and it should be no larger than can be well cared for—it is not desirable to have a great variety; we should aim at the greatest *effect* in a small space, which can best be produced by a few showy and handsome varieties planted in masses; while many kinds crowded in a small garden, would produce but a weedy and unsightly appearance. Let, then, your selection be a good one, combining beauty, brilliancy, fragance, and a succession from spring till fall. All these qualities are combined in such plants as are both easily obtained and cultivated.

Whether the beds of a flower garden are cut in the turf, as before mentioned, or set apart in a spot expressly reserved for that purpose, that arrangement should be carefully studied which will produce the most beautiful effect. Planting each bed with one species is entirely the most proper way of doing this; whether the plants are annuals or perennials they should be arranged in masses, each bed so placed as to form a beautiful contrast, or an harmonious blending with its neighbor; and thus a little care and study will enable one to have something attractive from spring till fall.

Again, much attention should be given to the growth and height of different plants, taking care to place the tallest shrubs in the back-ground, or in such a position as that they will not over-shadow smaller and lower growing plants.

In selecting shrubbery and climbing plants for a lawn and flower-garden, it is to be hoped that the old fashioned flowering shrubs will not be neglected in search of more rare and expensive ornaments. The lilac, snow-ball, honeysuckle, &c., should not be forgotten, if but for the sweet and pleasant memories connected therewith in the minds of most of us; to these, additions can be made as means will allow, and it is no expensive matter after all, to furnish many valuable varieties, such as will make a home a place of beauty beyond imagination.

Among bulbs, the tulip, hyacinth, crocus, narcissus, &c,, are all perfectly hardy, and require nearly the same treatment.

All these should be planted out where they are intended to remain, in the fall; and as they flower so early, the same bed may be afterwards planted with fall blooming flowers. They should be taken up once in a year or two, in June or July, removing the off-setts and planting them out immediately, while the flowering bulbs should be kept in a dry place until October, when they are again planted out; any good garden soil is proper for them. The tulip is a 'florist's flower,' but there is nothing to prevent any person of common sense and understanding from enjoying their spring beauties—although each bulb may *not* cost a king's ransom, as once it might have done.

And here I may say that, there is even in the delightful pursuit of floriculture, a sort of floricultural pedantry, among those most learned in such matters. Valuable as their efforts are, and pleasant as it is, to see the wonders produced by their improvements in new flowers, still we sometimes see an unwillingness to aid the ignorance of those willing to learn, and a desire to place their floral beauties beyond the reach of the many; frequently laying down rules for the cultivation of simple flowers which none but the wealthy could follow, and which would cause a novice to despair in the multitude of elaborate directions.

Next in succession after the bulbs I mentioned above, we have the peony, of which there are many varieties; of which the old double crimson peony (peony officenalis) is a familiar friend; peony rosea, (rose colored,) peony rubra, (red,) peony abbicans, (white,) are all of this species, and flower the last of May and first of June. A bed of these would make a splendid appearance. The tubers should be planted in rich garden soil, and should not be disturbed in the spring. Other varieties of the family are very desirable, particularly the tree peony. All the varieties are hardy, standing the winter without protection. The Iris (flower de luce—a corruption of fleur de lis) has many beautiful varieties, some of them, however, not perfectly hardy—flowering mostly in June. The bulbs to be planted in the fall.

Next in succesion is the lily. Most of the species are quite hardy, but would flower stronger for a winter's covering of manure. The lily should not be often removed—the proper time for transplanting is soon after flowering. They require a deep moist soil, muck is their natural home. The old white lily, (lilium candidum,) flowering the first of July, is very beautiful, and delightfully fragrant. There are many others of the cultivated sorts which are desirable, among which is the tiger spotted lily—which never was known to die out, even when unfairly treated. The spendid Japan lilies are now considered hardy. The lilium canadense, (nodding meadow lily,) and lilum Philadelphicum, (common red lily,) are both natives of our State, and are certainly worth transplanting to our gardens—they are much improved by cultivation.

Gladiolas are valuable, blossoming in August when flowers are scarce; the bulbs should be taken up about the first of November, and kept in a dry place in the cellar and planted out in May.

Dahlias succeed very well in this State—there were some very fine ones exhibited at the Sheboygan County Agricultural Fair of the past year, which could not well be surpassed farther south. After all, dahlias return as little for the amount of care bestowed upon them, as any plant I know. After dividing the tubers, every piece of which will grow, if possessing the essential 'eye,' place them in a common hot bed frame about the middle of April. After all danger of frost is over they should be carefully transplanted to a deep rich soil, driving a stout stake to each plant for its support; they should be planted in a bed by themselves five feet apart, giving each plant room to grow; they will seldom produce fine flowers during the heat of summer, therefore a slightly shaded situation is preferred. Pinch off at least half the flower buds as they appear, giving a better chance for a few to develop themselves finely. If the varieties are handsome and frost holds off, we may be well repaid for all trouble; but too frequently an early frost leaves nothing but the tall blackened stalks to console one after so much patient waiting. The tubers should remain in the ground after cutting off the stalks until the first of November, when they should be taken up and placed upon a dry shelf in the cellar.

The varieties of bulbous and tuberous plants which I have enumerated would form of themselves a pleasing succession from April to October. I have mentioned few, with the culture of which I am not familiar; but additions are easily made when one has the love of flowers at heart.

In selecting varieties of roses, it is very desirable to secure a continuance of this favorite above all flowers, as long as possible; to effect this we should choose, with a share of June roses, a portion also of the Remontant, or those blooming at intervals until fall; thus when we can obtain but a few varieties we can yet enjoy this delightful flower a good share of the season. Of those that bloom but once in the season, we have the white rose, damask, deep red, purple and moss, &c., many varieties from which to select of each kind.

The Scotch roses, briar roses, including the common sweet briar, which must be remembered for its exquisite fragrance, also the old fashioned cinnamon rose which blossoms so early, all come under this head.

The Boursalt and prairie roses also blossom but once, but are to be preferred for climbing roses above all others for the north. The Boursalt endures the hardest of our winters, blooming next after the cinnamon—it makes a very rapid growth. The 'queen of the prairies' stands the winter as far north as Sheboygan, and is truly the 'queen' among climbing roses. The single Michigan rose is a beautiful ornament for the porch or window trellis, and is perfectly hardy. The prairie roses are late, blooming after the summer roses.

Of the Remontant, Breck recommends Prince Albert, Crimson Perpetual, La Reine, Madam Laffery, &c.

Such are the varieties enumerated even of the hardy and easily cultivated sorts that in looking over a catalogue for selection one is almost bewildered—still ten dollars for a good selection of roses would be better spent by my fair states-women, and more productive of true enjoyment than ten times that sum (shall I say it?) expended in superfluous articles of finery.

In keeping up a succession of fine flowers, no variety is more desirable than the different kinds of phlox, a fine bloom can thus be kept up from May to October. This plant is propagated by dividing the roots by cuttings and by seed; by the last many new and improved varieties are obtained. I will enumerate a few varieties in their succession:

Flowering in May—P. subulata, moss pink, P. nivalis, snow white.

" June & July—P. maculata, Flora's boquet, P. suavolens, sweet scented, P. picta, white with red eye, &c.

" Aug. & Sept.—P. pyramidalis alba, P. undulata, and many others.

Beside all these, and others, the only annual phlox, P. Drummondii, fills up all gaps. This should have a place in every garden; it can be sown in a hot bed in April and in the open ground in May. It should bloom in masses and makes a most brilliant appearance. All the varieties of phlox are hardy.

Among perennials the pink is deservedly a favorite. The true carnation is seldom cultivated to perfection in this country, but the garden pink (Dianthus Hortensis) is easily cultivated, and combines both beauty and fragrance. The double sorts should supercede the single pink, and a bed of the different eolors would be a most attractive object. Cover the roots slightly in winter. The double China pink and Sweet William are also very handsome—the former flowering the first year from seed, though a perennial; the latter an imperfect perennial, flowering the second year from seed—both hardy.

The Canterbury bell (campanula medium) a biennial, and the fox glove (digitalis) blooming from July to September, are both handsome and perfectly hardy. The fox glove is perpetuated after the second year by dividing the roots.

Verbenas are among the most beautiful autumnal flowers; a bed of the finer varieties is very brilliant—they will, however, when kept through the winter, bloom throughout the season. They are difficult to preserve either in pots or in the cellar, and will not live in the ground during the winter months. They will blossom from seed the first year, though where cuttings can easily be obtained, this is the better way as you are then sure of your kind; I think they might be kept in the cellar, but have no personal experience on this head.

The pansy, now the delight of florists, requires considerable care and skill in its culture; the novice in floriculture might fail to produce fine flowers during many trials—it is well worth the trial, however. For full directions see Breck's Book of Flowers.

The hollyhock, old fashioned as it is, is worthy of a place. From the seeds of fine double kinds many new varieties can be produced—all single stalk should be discarded—an improved perennial perfectly hardy blooming in August. It can be perpetuated after the second and third years by dividing the roots.

We come now to annuals, as we have no farther room for extending the list of perennials, I have mentioned a few only of those worthy of attention in a small garden.

Portulacca, scarlet, crimson, white and yellow—although a purslain, makes a showy appearance from July to October. The seed once sown, will never be wanting in a garden; let it occupy a bed by itself—it can scarcely be killed even by careless transplanting.

Larkspur is another hardy annual. The different colors of the double rocket larkspur, make a very fine appearance, when sown in circles, in a bed by themselves—they should not be transplanted—they flower in July. They flower stronger when sown in the fall.

Chrisiis, phlox drummondii, sweet pea and mignonette—the two last for their fragrance never to be omitted—nemophila, convolvulus (morning glory), and the dwarf convolvulus, (much to be preferred over the former), mourning bride, globe amaranths, gilliflowers, petunias, scarlet and orange nasturtium, asters, &c., are all hardy and easily managed.

The annual gilliflower, when double, does not perfect its seed; the seed is obtained from single sorts ripening in its immediate vicinity—it is called by some 'the ten weeks stock'; it is best to sow the seed in a hot bed, and transplant.

Asters are the finest ornament of the garden in autumn; as those who saw the splendid bed of German asters in the garden of Rev. L. W. Davis, at Sheboygan, last year, can testify that nothing finer could well be seen this side of Germany at least; the seed was sown in May, and the plants transplanted to the bed prepared for them, about a foot apart; their appearance, when in bloom, was quite sufficient to repay for the little care necessary for them, and attracted the admiration of all who beheld them.

The petunia is a beautiful and fragrant flower for blooming in masses, perfectly hardy; the odor is not agreeable to some persons.

The balsamina, by some improperly called lady's slipper, is rather tender. The single sorts should be thrown away at once—sown in a hot bed and transplanted about two feet or more apart, the double varieties make a very showy appearance, flowering in July and August.

The cypress vine is a beautiful tender annual—the seeds must be soaked in hot water before sowing—blooms in August and September. The seeds of the amaranth will seldom germinate without soaking either in water or milk.

The varieties which I have enumerated are all desirable, and form a good succession; the list may be much enlarged, but space will not admit.

To my lady readers I will say, that the culture of flowers is by no means a difficult matter; with few materials, a little energy, and a genuine love for the work, all seems easy.

A hot-bed frame is most desirable, a garden trowel, a light hoe, a garden rake, and a watering pot, are all that is absolutely necessary. A little practice will open new fields of floral knowledge. I need not say that health and happiness to yourself and your friends will be promoted by an hour of each day spent in this pursuit. The advocates of 'womens rights' have not appropriated this field, while they are becoming reverends, lawyers, doctors, steam-boat captains, &c., let us seek for our true sphere among the duties of home; and while we cultivate and weed carefully our floral treasures, let us still more sedulously 'keep the garden of our hearts.'

Lest I trespass in occupying too much space, I shall find it necessary to omit a portion of what I first intended for this article. It is difficult always, you are aware, to stop feminine volubillity.

I remain, respectfully yours,

Laura A. Smith.

To Albert C. Ingham, Esq.

Sec. of the Wis. State Agr. Society.

WILD RICE.

Benton County Agricultural Society, Secretary's Office,
Northwood, Minnesota, Dec. 24, 1853.

My dear Sir—I have the pleasure to acknowledge the receipt of your favor of the 8th inst., and will, in compliance with your request, endeavor, as correctly as possible, from my limited observation, to give you some information relative to the wild rice of Minnesota.

The wild rice is found in great abundance in this territory, and flourishes in its lakes. As to the nature of the soil upon which it grows most luxuriantly, I am ignorant—though my opinion is, that a rich muck or bog best suits it, as I have seen it grown in lakes whose shores were of that nature; while but a few rods distant, another lake, with high banks and sandy beach was entirely free from it. The water where it is usually found varies in depth from one to three feet; whether it can be cultivated with success upon dry land I have not yet determined. This fall I sowed a small quantity upon land that is annually overflowed, though I am inclined to believe it will flourish best in soil too moist and swampy for cultivation. I have distributed a considerable quantity of the seed, and hope to hear soon concerning the success met with by those who have sown it. We must first ascertain if it can be cultivated, and experience must then instruct us in what manner. The crop is gathered by the Indians about the middle of September. Their method is of course primitive, and shows a lack of that Yankee ingenuity which, no doubt, will soon display itself to good advantage if the crop should, upon cultivation, prove productive. As to its value as an article of food, I have no hesitation in saying, that it is full as nutritious as the Southern white rice, while its yield, I should judge, is about forty bushels per acre. But upon this point I have no data, and it may be double the quantity or it may be less; but if circumstances permit, I shall endeavor to participate in the coming harvest, and thus be enabled to report more correctly.

The Indians gather it in this manner: Taking a light bark canoe, two of them push into the field; and bending the heads of rice by the handful over the canoe, with a light blow from a stick they beat or shake the rice off into the canoe. It is then taken to their camp where it is put into pans and roasted over the fire until the hull assumes a reddish cast, or is dry and brittle; they then put it into sacks, and pound it up by striking on the outside with sticks so as to clear the rice from its hull—it is then winnowed, and the wild rice is ready for use. It makes, when well winnowed, excellent puddings, though the favorite way of cooking is to boil, and eat it with sugar or sauce—many preferring it with cranberry sauce; and after making the two my principal food for one winter, several years since, I must acknowledge that it is palatable, and a dish not easily tired of.

There are thousands of acres undoubtedly in your State that may be sown with this crop to good advantage, and as there may be some among the members of your Society who desire to give it a trial, I will, during the present month, send you a small quantity by express. The rice which

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NOTE.—We have a plant growing upon dry land, whose seed very much resembles the wild rice. I am much inclined to believe this to be the upland rice, and a variety originated from the other rice being dropped by birds. Its head is different in form, but the stalk and leaf is similar; and the seed, when hulled, is exactly like the rice in appearance, size and taste.

I shall send is not prepared for cooking, as I obtained it expressly for seed, in the autumn. Age may cause it to deteriorate, though I think not. As to the proper time for sowing, I should say the middle of September, as when left untouched it drops off the stalk at the time it is fully ripe and plants itself—presuming it is an annual, which I think it is. It grows to the height of from six to ten feet, and when ready for harvest presents a beautiful appearance, as the heads are delicately formed, being a foot or more in length, upon which the rice hangs by the fine thread-like stem.*

I think the wild rice increases in bulk by cooking at least one-third more, and it needs a little more cooking than the common rice.

I enclose in this letter a small quantity of the seed-rice; by breaking off the hull you can observe the rice, and its color, when cooked, is much lighter, as many of the kernels are nearly white inside. If, upon trial, the rice should prove to be easily propagated, and of value, I can easily furnish a good supply of seed from these parts.

Yours most respectfully,

O. H. Kelley,

Cor. Sec. Benton Co. Agr. Society.

To Albert C. Ingham, Esq.,

Sec. of the Wis. State Agr. Society.

THE POTATO—ITS HISTORY AND THEORIES OF DISEASE.

BY R. W. WRIGHT, WAUKESHA.

It is now nearly three hundred years since the common potato, or tuberous-rooted night-shade, was first introduced into Europe, and cultivated as a table esculent. It appears to have been at first exclusively confined to the gardens of the nobility and gentry, and was regarded by them as a great delicacy. Subsequently, its cultivation became more general, and as early as 1663 the Royal Society of England recommended that it be more extensively cultivated as a means of guarding against famine. It was not, however, till about sixty years ago that its extension

* See Plate—Grasses of Wisconsin.

became general throughout Europe. It is now largely cultivated in Great Britain, France, Italy, Switzerland and Germany; and has been successfully introduced into India, Bengal, the Madras Provinces, Java, the Phillipine Islands, and China; forming a very considerable portion of the food of some of those countries. It even matures its crops in Siberia and Iceland; but does not appear to flourish in the tropical parts of Asia and America, unless raised at an elevation of 3,000 or 4,000 feet above the level of the sea.

How long and to what extent it had been previously cultivated by the nations of this continent, is a question upon which it were idle for us to speculate. Its history is comprised within the last three centuries, in which it has had, as it will continue to have, if successfully cultivated, a most powerful influence on the condition and welfare of mankind; having already furnished, in some parts of the world, nearly three-fourths of the entire food of the people. An article of such universal cultivation and invaluable properties as an esculent, cannot be too highly prized. And the question as to the origin and tendency of the disease which has lately threatened it with destruction, is one of great and paramount interest to the whole civilized world. We do not propose to discuss this question so much with a view to establishing any new theory of disease, as for the purpose of confronting some of the theories supposed to be already successfully established, and one or two, in particular, which have found the greatest number of advocates within the last eight or ten years.

In 1851, the Legislature of Massachusetts offered a reward of ten thousand dollars to any person, within the commonwealth, who should discover a sure and practical remedy for the potato rot. This reward called forth something over an hundred communications from persons in different parts of the State, and different portions of the United States and the British Provinces, and the similarity of the views presented on the subject by the most intelligent and experienced writers, was thought by some to be an auspicious circumstance. This circumstance deemed so auspicious, however, was not so much attributable to the individual observation and experience of the writers, in the field where the plant had been successfully cultivated by them, as in that where its cultivation had been scientifically treated by others. The most important papers presented, contained scarcely anything more than a repetition of the views and arguments of previous writers, with nothing substantially new on the subject. The "wearing out" theory, which locates the productive power of the plant in the seed only, seems to have been the favorite one adopted.

It is this theory, so imposing and plausible in its several propositions, which we propose first to consider. It is said by some writers to have passed through a most rigid and searching ordeal of objections and certicisms; and to have become, if not fully established, at least generally admitted, by scientific men. A vast amount of ingenuity and learning have been expended to establish its hypothetical propositions, and to apply them to the present apparently enfeebled condition of the potato. It starts with the hypothesis, that all plants which are propagated by buds, cuttings, layers or roots, are nothing more than an extension of the original plant, which has only a determinate existence commensurate with the life of the individul thus propagated. Thus, the potato produced from the tubers, is only an extension of the life of the individual plant, the same as a scion when engrafted upon another tree; which is only an extension of the original tree from which it was taken. It is no *new* life, but only an extension or prolongation of the *old* plant. Each successive tuber must, therefore, feel the debilitating effects of age which the next preceding one inherited from its immediate ancestor; and so on, till the individual plant is completely exhausted by age! This is what is assumed by the advocates of the wearing out theory, as a *point d'appui* of hypothesis. It is this basis, and this alone, upon which their hypothesis rests. The constitutional vigor of the plant has been affected, say they, by successive cultivations, and each succeeding year adds to the degeneracy of the particular variety cultivated; so that this process has only to be continued a sufficient length of time to result in the total extinction of the individual variety. Let us subject this theory to a few simple facts and objections, and see if it do not rest upon an entirely visionary foundation. We will do this with all possible deference to the opinions of those who have promulgated the theory with such great zeal and ability, and who have been regarded as among the most infallible of our vegetable physiologists.

And first, as to the degeneracy of varieties. Take the assumption that the only natural mode of propagation is by the seed. Is the same law of propagation to be applied to an annual plant as to one of five hundred years growth; to one that propagates itself naturally by runners, or tubers, as to one that is rarely, if ever, propagated in that way? The Jerusalem artichoke, which, in one respect, is an annual plant, and dies as naturally at the end of the season as the oak does at the end of five hundred years, has been propagated for more than two hundred years by the tuber only; and yet this single variety of the Helianthus, exhibits no symptoms of decay as an individual plant. It retains its constitutional vigor and hardiness the same as when first cultivated. Each year exhibits a new individual of the species, springing from the tuber, as manifestly and incontestably a reproduction, as the oak that springs from the acorn at the end of five hundred years. The one is no more an extension, or multiplication of the individual plant than the other. Each bud in the tuber is a separate being, or embryo plant, in itself, as much so as the oak which lies in the germ of the acorn. They are both modes of propagation by which the variety remains unchanged in each, and by which each retains its species distinct—the only difference is, that the one has reproduced itself five hundred times, the other only once. Nor are the two modes of propagation essentially dissimilar. The manner in which the young plant is reproduced from the seed-eye of the tuber, is precisely analagous to that in which it is produced from the seed. The roots first develop themselves, projecting downward from the germ. These absorb nourishment from the soil. The plumula, or rudiment of the future stem, is then developed, rising upwards in the opposite direction to the roots. The principal nourishment in both cases is taken up from the soil by the roots, and chiefly by their small and extensive fibres; the materials thus absorbed consisting of water holding in solution small portions of saline and organic matter. These are carried upwards in the vessels of the stems into the leaves, and afterwards return in their appropriate vessels and constitute the annual accumulations of the plant. If the plant be an annual, the process terminates in a single accumulation; if perennial, in as many accumulations as there are years of growth. What is called the extension of the plant, in the one case, is precisely the same, received as a result, as that effected by reproduction, in the other. They are, in effect, the same phenomena of germination; both resulting in the extension of the life of the plant as a species, the one without any apparent impregnation, the other with it.

A very important question naturally suggests itself here, and that is, whether it is necessary that a plant should be generated by an actual impregnation in order to propagate its life beyond what is called its 'determinate period;' in other words, whether there must be a reproduction from a germ, obtained under the sexual system, in order to realize an entirely new plant? Whether impregnation is such an immutable law of nature, as to subject all forms of life, and all organized matter, to its necessity? If so, what shall we say of the sporules of the cryptogamia and the reproductive organs of the asexual plants. These are multiplied without the aid of sexual intercourse. They have, in fact, no definite and predetermined points of growth; but the young plant springs forth from the surface of the parent stem as naturally, and with the same apparent eagerness of vitality, as the new blade of couch grass springs from the runner of the old.

Buds and bulbs are the viviparous offspring of vegetables, furnished with placental vessels which answer the purposes of nourishment till they acquire lungs, or leaves, for the elaboration of their nutritive fluids, the same as seeds are the oviparous offspring of their respective plants. Thus, vegetables have two methods of propagating themselves, both of which are strictly in accordance with the known laws and operations of nature, as exhibited even in the animal kingdom; the oviparous method, or the propagation by seed, and the viviparous, or the propagation by buds an dbulbs. The annual production of a plant from a bulb or bud, is no more wonderful than that of many kinds of insects, which perish in the autumn, after producing an embryon. The bud or bulb is in fact the hybernacle of the future plant, the same as the embryon of an insect, which lies torpid in winter, and developes itself the succeeding spring or summer. It was this resemblance, no doubt, which led Linnæus to call the buds and bulbs the winter-lodges, or hybernacula of the plant. Many plants are known to be both oviparous and viviparous, and there is a very extraordinary instance of this double method of propagation in the animal kingdom; the same species of aphis being viviparous in summer, and oviparous in autumn.

It is said that many of the alpine grasses, whose seeds are perpetually destroyed by birds, frequently become viviparous; bearing roots or bulbs instead of seed, which, falling off, take root, and thus continue the life of the plant. This is frequently the case with the Anthoxanthum, or vernal grass, as well as the fescue grass of the bushes, which produces bulbs from the sheaths of its straw. A most wonderful exhibition of viviparous propagation, and one which would seem to indicate its superiority over the oviparous method, is to be seen in the Allium magicum, or magical onion, which produces buds on its head instead of seeds. The same extraordinary attempt of nature is seen in the case of the Polygonum viviparum, whose beautiful flowers are succeeded by bulbs instead of seeds. The buds fall off, take root, and propagate, in precisely the same way as the buds, or seed-eyes, of the tuberous plants. To charge upon nature a defect in her generative economy from these exhibitions of her productive power, is not only unphilosophical in principle, but illogical in fact. It is reasoning from unknown causes to impracticable results, and predicating infertility of an inexpungible law of life.

It is a well known fact in vegetable physiology, that buds are occasionally developed, even in oviparous plants, from the axillæ of the petals and sepals, and that branches shoot forth from the centre of pistils independently of their sexual arrangements. Stamens not only become petaloid, but petals essentially antheriferous. Theoretically considered, these, and other like modifications, may be regarded as accidental, or abnormal, results; but not so with those plants which invariably propagate upon the asexual system. All that we know, or care to know, of those *vital forces* of nature, is that they exist, and are constantly resulting in development. Each plant, or species, has its distinctive vitality, which results in organization; which builds up and develops itself in definite living forms. This vitality is distinguished from mere chemical force, which results in decomposition and combination only; which does not build up except geometrically. Physiologists may object to the expressions vital force, or vitality, as scientifically inaccurate; but how can we conceive of organized being without admitting of vitality? And this vital force, when acting, never fails to produce specific forms. It exhibits its individual quality, so to speak; its directive and formative character, the same as chemical force exhibits itself in decomposition and combination. The oak and the maple always produce their specific forms; result in distinctive individualities. It is this specific, formative, directive force which we call life; which is to the vegetable and animal kingdoms what chemical force is to the mineral. This life is always functional and active, individualizing itself into species, and invariably producing its like.

Now, this vital force resides, or is supposed to reside, in the delicate little organs of plants and animals, called cells. Each minute cell is a separate and independant organ and performs all the functions of an individual, while it expends its force in combination with other cells, and determines the general character and functional arrangement of the plant. The materials which undergo an organic change, come in contact with these cells, and are reared by them into a living structure. Thus, each plant becomes a symmetrical whole, made up of diversified organs; and each system of organs determines, by its combinations, the individuality of the whole. The individuality of the plant; the determining power of the species; lies in the cells, which perform their functions in independent unison with the groupe. The "wearing-out" theory must assume, then, that there is functional derangement in the congeries, produced by the abnormal, or diseased, condition of the individual cells. But the cells are separate individualities, or organs, and any hypothesis which affects the vitality of one cell, considered as an independent force, would go to affect the whole congeries of cells alike. The theory would be as fatal, then, to the law of the propagation as to that of extension; because, in both cases, there is only a continuation of the same indentical cell, determining the individuality of the species.

It is now only about fifty years since the "wearing out" theory was first promulgated, and not more than ten years since the application of it to the degenerate condition of the potato. To say nothing, then, about the want of accurate and extended observation, adverse or favorable to the theory, it is evident that it must be based mainly upon hypothetical propositions. In point of fact, the degeneracy, or diminished vitality, of the tubers, is itself an assumption; for the prevalence of the disease itself furnishes no more proof of exhausted vitality in the potato, than the prevalence of the cholera would of the same fact in regard to the human races. The cholera took up its line of march from the delta of the Ganges, and travelled in the very face of the monsoons. It was everywhere evident that the virulence of the disease was not due to any local causes. The disinfectant qualities of the atmosphere would have soon rendered its morbific exhalations innocuous in any one locality. No excess of heat, nor humidity; nor excess or deficiency of electricity; nor, in fact, any of the known physical agents constituting the power of the climate, will account for the propagation of the cholera, any more than they will of the potato rot. Why not assume, then, the degeneracy of the human race as a predisposing cause of cholera, as well as to assume that fact in regard to the potato to account for its rot? The one assumption, it appears to us, would be just as logical and philosophical as the other. The impaired constitutional vigor of the potato is assumed as a starting point, and disease is predicated upon that condition of the plant. The argument is, that the impaired constitutional vigor, which limits the duration of the individual plant, is transmitted through the cuttings and tubers, and reappears in the extended plant with the same fatal virulence as in the parent stem. Nature has assigned, say the advocates of the theory, different periods of existence to different species of plants, as well as to different races of animals. It is a law irrevocably and inexorably ordained that none shall live forever. The period of existence varies according to the constitutional power and tendencies of different plants. The oak, the lordly denizen of the forest, bows to the same inexorable decree as the ephemeral dust of the parasite propagated upon its branches. It is a law of nature that each shall spring into existence, fructify and die, 'as a species.'

Admitting all this to be true—how is the theory of propagation by extension affected by it? If the potato, considered as a species, is doomed to degeneracy, decay and ultimate extinction, how is the propagation of it to be extended beyond the period assigned by nature? The foundation of the proposition upon which the 'wearing-out' theory is based, is as impregnably laid against the renewal of vitality by the seed, as against the extension of it by the tubers. If the duration of the potato as a species, is as inevitably fixed as that of an individual plant, there is no such thing as abrogating or evading the decree assigning the determinate period. Seeds are as inadequate and powerless to that end as tubers. But suppose we apply the theory again to varieties instead of species, and assume that the debilitating effects of age are felt, after a certain period, by each succeeding plant continued from the tubers of a given variety. Does the extermination of that particular variety, or of its individual life, depend upon the method of cultivation? If each succeeding plant has a less hardy and vigorous constitution than that which preceded it, and if nature has doomed the variety to ultimate extinction, we see no reason why plants raised from its seeds should escape the general contamination. A deteriorated plant produces deteriorated seed, and *vice versa;* and this law applies as well to species as varieties. If the hypothesis be well-founded, there is no reason why plants produced from seed-tubers should feel the effects of degeneracy sooner than those produced from seed-balls. The potato propagates itself as naturally by tubers as by seed; and nature never fails to take the right direction in her generative economy.

We have spoken of the two methods of propagation which nature has assigned to the vegetable kingdom; the oviparous as by seeds, and the viviparous as by buds and bulbs. By carefully examining the difference between these two methods, we shall see what is meant by the word 'extension' as applied to viviparous propagation. Properly speaking, each bud is a separate individual plant. If cut from the branch, or stem, to which it belongs, and placed in the earth with a glass vessel inverted over it, so that its exhalation shall not exceed its power of absorption, it will throw down its roots and become an independent plant. If the same bud, however, were left to grow on the parent stem, instead of putting forth roots at its axillary point, it would send down its nutritive sap, elaborated for that purpose to the old roots, causing them to increase in size and give out new fibres, or rootlets, to supply the wants of the parent tree, with its increasing family of branches. Thus, the thousands of buds which spring forth every year from the branches of a tree, are only so many separate plants whose roots constitute the bark and annual accumulations of the old tree. The plants of each year envelope with their descending sap, or material elaborated for their roots, those of the next preceding year, and so on, till the whole becomes a series of concentric trees, of which the tree of the last year's growth is always the most vigorous and hardy of the group. The central tree, or internal wood, ceases, in process of time, to perform its vital functions, and, decaying, ultimately involves the whole structural system in a common ruin. Grafting, then, is only detaching the last tree from the family group and placing it upon a vigorous root; a process by which the individual series may be indefinitely extended. It is not an extension of the old tree, but a new offspring transferred from its native to a foreign stock; not a prolongation of life, but a renewal of it. Each new crop of buds is a swarm of young trees from the hive of the old; not a migrating swarm, but one making additional space in the mother hive. The process of extension by grafting, is thus referred to by that wonderful 'scholar of nature,' who seems tohave had an intuitive perception of all natural truths:

> "You see, we marry
> A gentler scion to the wildest stock,
> And make conceive a bark of baser kind
> By bud of nobler race. This is an art
> Which does mend nature."

It mends nature in this respect, that it transfers the young swarm of buds from the old hive to a new. Now, the difference between the perennial herbaceous plants, and the perennial ligneous, is this: the former being too tender to endure the cold of winter, place their buds, or young offspring, in subterraneous winter-cradles, where they remain till the ensuing spring; while the latter, needing no such protection for their viviparous offspring, leave them exposed upon their branches. The former throw off their annual accumulations, while the latter build upon those of the preceding year. Herbaceous perennials, then, are constantly renewing their life, colonizing their swarms of buds, while the ligneous plants are encumbered with the old family group, and obliged to supply the 'superannuated workers,' or unproductive branches, with their own mellifluent juices. Thus every bud and bulb is a perfect plant of the future year, complete in all its parts, and hence, they canuot be a prolongation of life, but are an actual renewal of it.

The fact is, the 'wearing-out' hypothesis, whether applied to species or individuals, is, in our judgment, nothing but an ingenious piece of exaggeration. It is as vague and unsatisfactory as the theory of transmutation, requiring a metamorphosis of marine into terrestrial vegetation. It belongs to that class of natural fictions which delights in mere fable and romance. It neither stands upon experience, nor is it supported by any well attested facts. For if there is any one fact more completely demonstrated than another in natural history, it is the *fixity of species;* the fact, that immensely extended periods of time are necessary to effect specific changes, even in the slightest particulars, whether in the vegetable or animal kingdoms. Species of the Norway fir, and of the yew tree, existed long anterior to the deposition of the bituminous coal fields.

Geology discloses to us the fact, that at certain periods of time species began to exist, and that it was only after the lapse of untold ages that they cease to be. It discovers no particular season for their rise or decline, or why certain species should have appeared at one period of time rather than at another. It shows that a single species, springing from some primitive centre, distributed itself over the face of the globe, or over certain definite areas, by the slow process of dissemination, and flourished during immensely extended periods of time, without any apparent diminution of vitality, or any change in its generic ties. The remains of the primitive flora show that vast vegetable migrations have taken place upon the globe at different periods of time; and that the different species of plants, springing from various and widely separated centres, have gradually covered the earth with their vegetation and propagated themselves by seed, bud or scion, for many thousands of years. It is utterly impossible, then; nay it is assuredly so; that human observation should be sufficiently extended to furnish the requisite data of testing the wearing-out theory.

We are speaking now of the theory in its application to the potato as a species; for it is contended by its advocates, that the plant, 'considered *as a species*, has progressively deteriorated;' and the cause of this deterioration is attributed to the manner in which it has been propagated. But our answer to this is, that nature understands her own economy; propagates in her own quiet way; and always with a view to the constitutional hardiness of the species. If she directs her efforts at reproduction through the seed-eyes of the tuber, instead of elaborating seeds in the pericarps of the potato, it is because she adapts herself to the wants of the plant and to the circumstances under which it is engendered. She always avails herself of the requisite material at hand—of the immediate resources of the plant to be propagated, and invariably selects the method best adapted to its wants. This is true not only in regard to individual species, but to the plant in all its collateral relationships, generic branches, and hereditary ties. In every instance, nature adapts her means to the specific end. If a rose-bush be transferred from a rich to a dry and arid soil, it ceases to extend itself by runners, and *naturally* runs to seed; whereas, if the same bush was transferred from a dry and arid to a rich and fertile soil, it would *just as naturally* extend itself by runners, instead of elaborating seed. And for the simple reason, that there would be no necessity of perfecting seed, as long as the life of the plant could be extended without that exhausting process. Plants are no more propagated artificially by tubers, layers and runners, than they are propagated artificially by seed. The one is just as much a natural process as the other. A cutting emits its roots from the amended section, in consequence of its accumulated sap, or the joint action of its accumulated sap and leaves, in the same way as a young plant springing from the seed emits its roots. The only difference is, that the plant produced from the cutting is invariably the hardier and more vigorous of the two. The reason is, that it has already acquired hardiness from the parent stem, instead of debility and weakness, as the wearing-out theorists contend.

It is strange that a theory which is so completely at variance with the every-day knowledge and experience of mankind, should have found its present number of advocates. Every body knows, who knows any thing at all on the subject, that a forest of trees reproduced from the suckers, or side shoots from the roots, of an old forest previously cleared away for that purpose, is not only the most vigorous and rapid of growth, but inherits in a great measure the accumulated vigor and hardiness of the forest immediately preceding it on the same soil. It is no longer the old forest, borne down by the weight of years, and bald with dry antiquity, but one of a new and vigorous growth, which soon becomes as independent of the parent forest as if it had been produced entirely from seed. As soon as the young off-shoot has exhausted the vitality of the old roots, it throws down roots of its own and becomes a separate and independent tree. It has inherited the wealth of the parent stock, and is enriched with the accumulations of a whole line of ancestors. The stump and roots of the old tree soon disappear, and after a few years no trace of them is left. There is nothing in the new forest out of which to construct a hypothesis of progressive degradation. Nature has been active, not in perpetuating defects, but in restoring to the offspring the stately trunk and giant limbs of the scarred and mutilated parent. Thus, the great law of reproduction and restoration, which, in the vegetable world, preserves the integrity of species, is as active and certain as to its results, as the law of gravitation in maintaining and perpetuating the motions of the heavenly bodies. And one might as well argue, from the occasional irregularity of their motions, in favor of a general law of disturbance in the solar and stellary systems, as to found a theory of hereditary degradation upon any of the known laws of vegetable, or animal life. The hypothesis of gradual development—of progressive improvement from lower into higher orders, genera and species, is, not only much more rational, but accords far better, and more philosophically, with the experience argument.

How is the fact of the new and vigorous fruit of trees, reproduced in the way above described, or successively reproduced, as it may be, in that way, to be reconciled with the numerous experiments of Mr. Knight and other eminent physiologists, which are said to place the wearing-out theory 'beyond the reach of controversy.' Have any of these gentlemen determined the point of exhausted vitality? Has any of them kept his 'crow a thousand years,' so as to settle the question to the satisfaction of the doubting *scholastikoi?* The experience argument is certainly an important one, and ought not to be dispensed with in any case where it is at all practically possible.

But it is seriously contended that we have been violating the laws of nature in the cultivation of the potato 'by extension;' that we have been seeking to make an individual plant live for ever, when nature designed that it should live only for a determinate period. That from parents invariably worse than their ancestors, we have perversely sought to get an offspring without the hereditary taint. And human ingenuity has so completely exhausted itself in theorizing on this subject, that it has finally run into a hypothesis of complete exhaustion, from which it seeks, no doubt, the ultimate restoration of itself and the species. It is devoutly to be wished that the anticipations of its friends may be realized.

The most rigid and sober conclusion to be drawn from the whole theory is, that nature is turning back into a rudimentary state, and will ultimately vanish away into primitive inanity. Instead of a progressive chain of advancement from lower organizations into higher; of matter advancing, in the first instance, from a state so rare as to be almost inanity, or infinite diffusion, into a more solid and permanent condition of things; giving rise to vegetable and animal life; we have the reversed process; a system of general degradation, or regression from higher organizations, or conditions, into lower, until we reach the ultimate point in the descending node. It is to be hoped that a vacuum of some sort may be wanting in the space we now occupy, when we reach that interesting point in this 'wearing-out' system!

It is historically certain that the practice of propagating plants 'by extension' as it is called, by budding, grafting, striking layers, &c., has existed for at least two thousand years. At Rome not only grafting, but the more delicate process of budding, was well known and extensively practised in the time of Augustus. Virgil enumerates the different methods of propagating by extension, which he reduces to seven. Among these were grafting, budding, striking layers, planting off-shoots, and setting cuttings from the top branches of the tree. The description of Roman budding shows that the process was as well understood then as now:

> Nec modus inserere atque oculos imponere simplex.
> Nam qua se medio trudunt de cortice gemmae,
> Et tenues rumpunt tunicas, angustus in ipso,
> Fit nodo sinus: huc aliena ex arbore germen
> Includunt, udoque docent inolescere libro.

His description also of grafting shows to what a dangerous extent this practice of propagating by extension have been carried even in the Augustan age. The wonder is that the wretched practices of that period did not entirely extinguish the species thus absurdly propagated:

> Aut rursum enodes trunci resecantur, et alte
> Finditur in solidum cuneis via: deinde feraces
> Plantae immituntur. *Nec longum tempus, et ingens*
> *Exiit ad coelum ramis felicibus arbos,*
> *Miraturque novas frondes, et non sua poma.*

The emphasis is our own; but the writer speaks of the rapidity with which the mighty tree shoots to the skies with its happy branches, wondering at its new foliage and unaccustomed fruit, after the degrading process of extension is commenced. Even our English word *graft*, as applied to the shoot, or scion, to be inserted into the stock of the tree, is unquestionably derived from the latin word *graphium*, from the resemblance which the shoot, when cut for insertion, bore to that instrument. The latin word signifies a little style, or iron bodkin, one end of which was sharpened, and which was used to write on waxen tablets.

All the numerous varieties of apples which are now cultivated in this country and Europe, some of which have been introduced even from

Persia and China, have been slowly originated from the improvements made in the *Pyrus malus*, or wild crab of the hedges. It is not known at what precise period the process of amelioration commenced. It must be assigned, however, to a very high antiquity. Pliny mentions several varieties in high cultivation in his time. Apples were known in England long before the conquest, and pippins, or seedling improved apples, were in cultivation in the southern parts of Europe as early as the sixteenth century. Tooke, in his work on Russia, refers to several kinds of apples growing there, and originally introduced from Astracan and Persia. One variety, the *Kirefskoi*, often grew, he says, so large as to weigh four pounds ; possessing an agreeable acidulous flavor, and keeping for a long time. He speaks also of one variety, originally brought from China, as very transparent, full of juice, and extremely well flavored. It was called the *nalivuli* (full-melting,) and was so full of juice as to be almost ready to burst. It was very transparent, and when held to the light, the core could be distinctly seen and its seeds counted. From these facts, it is evident that the apple has been propagated, not only as a species but in its several varieties, from very remote times, and by the very mode of culture which is so obnoxious to degeneracy and decay. The same is true of the pear. The Curstumean pears were celebrated by the early poets. The favorite *Syrius pyrus*, which Virgil mentions in his Georgics, was originally brought from Syria to Rome. It was also called the *Tarentina*, and from its description is believed to be the Bergamot pear of the present day. This pear was cultivated by extension at Rome, and had been in Syria, no doubt, long before its introduction into Western Europe. It is hardly necessary in this connection to mention the cultivation of the grape. Every scholar is familiar with its history from the time when old Phanaeus, the king of vine-bearing mountains, rose up in token of respect to the Amminean vine. We might refer to a large number of grasses, which propagate themselves almost exclusively by stoles or scions under ground, but we have already exhausted our limits on this branch of the subject. The fig tree, however, affords such a remarkable instance of asexual propagation under the sexual system, that it demands a brief reference in this connection. The fruit of this tree is not a seed vessel, but a receptacle enclosing the flower. The male and female flowers are produced on different trees, and both sexes are completely immured within the fruit. The fecundating dust cannot be transferred from the one to the other so as to impregnate the female fig, unless there be some artificial perforation as by birds or insects. Some naturalists have supposed that there is a kind of gnat produced in the male fig which performs this fecundating process. The fig trees of some countries, however, are all females and their seeds consequently unprolific; and yet, they have been propagated for many generations exclusively by layers and suckers, without any apparent diminution of vitality.

We submit whether these facts, with hundreds of others that might be named, tend to establish, beyond the reach of controversy, the alleged degradation of species; the progressive deterioration of higher organizations into lower, for which the 'wearing-out' theorists contend. If it be true that the evil lies in the *modus colendi*, in the propagation by extension; then, the argument stands good against every individual plant thus cultivated. Nay, the argument is more impregnably laid against those which are not furnished with a double method of propagation than against those that are. For nature in supplying the potato with the two modes must have intended the one as a substitute for the other only when the exigencies or wants of the individual plant, should require it. If by being continuously propagated by the tuber for nearly two hundred years, it has at length arrived at a point when its existence depends upon a new impregnation; then it demands no more for the purposes of regeneration after two hundred successive reproductions, than a plant propagated by seed only, does after a single reproduction.

The potato is, in one respect, an annual plant only. Its flowers and stems die annually; the act of reproduction exhausting its vital energies so as to limit it to one season of growth. It differs from the herbaceous annuals and biennials only in respect to its mode of propagation. Each individual plant dies at the end of the first year the same as annual plants die; and unless we consider the tuber as a sort of underground stem and its eyes as young shoots; or rather unless we consider the tuber as a kind of hybernating plant itself; one that has retired into winter quarters, and only comes out in the spring after thermometrically gauging the weather, it is to all intents and purposes an annual. But call it perennial and its terminology only applies *a lasting throughout the year*. Now, if we were to apply the same theory of exhaustion; of wasted vitality;

to the oak that we do to the potato, how would it affect its vitality. The oak, if grown under favorable circumstances, lives a thousand years as naturally as the potato does one season. If we were to multiply, then, the duration of a single oak by the number of successive periods of growth through which the potato has been extended, we should have an individual oak of over two hundred thousand years growth—a most 'unwedgeable and gnarled oak,' certainly!

But the advocates of this degenerate theory refer us to certain varieties of carnation propagated by cuttings and layers, which, they say, have so deteriorated by extension or artificial division, that florists have been obliged to abandon them for other and more recent varieties. But if this proves any thing, we apprehend it to be an argument against their theory. For the carnation in its natural state experiences no such deterioration. It sprang originally from its specific centre and propagated itself, we know not how many centuries, without deterioration, until it fell into the hands of the florists and was forced by them into unnatural conditions. If the hybrid carnations and 'streaked gyllyflowers' ('nature's bastards,' as Shakspeare calls them,) of the florists, have not the same loving tendency to propagate themselves as flowers which have not been forced into unnatural copulation; if their fertilizing particles have not the same specific power, over their species, it is no argument against the continuation of the carnation which has not been thus artificially, and we might say, unnaturally impregnated. If it be a law of nature that monsters shall not propagate their species, is it any argument against propagation? If there is exhibited in all natural phenomena a repugnance to hibridity; first to prevent its taking place, and then, to limit the generative power so as to admit only of a return to the original specific form; instead of being an argument against, it is certainly a most powerful argument in favor of *the fixity of species.* The fact is, nature is all-producing, all-cherishing, all-nourishing.

"Suis hic omnia plena muneribus;"

and if she manifests an insurmountable repugnance to hibridity, to infertility and degenerate intermediate races, it is only that she may maintain without contamination the integrity of her productive energizing power. If the salacious mare must be blindfolded before she will be lined by an ass, it is no proof that she will fly at the approach *d' stalon.* We have no more apprehension in regard to the extinction of species, whether of plants or animals, than we have of the sky's falling, or of the earth's being brushed out of existence by the tail of the next comet. We may theorize upon the matter, and build up elaborate propositions against the productive power of nature, but the next year's growth of the potato will be much more likely to topple down all our theories than to estabish any legitimate conection with them and the first physiological fact.

We are not inclined to speak lightly of this 'wearing-out' hypothesis. We believe it to be false, but are willing its advocates should attach any and all the weight they wish to its hypothetical data. Whatever may be its merits as a theory, it is absolutely incapable of verification by facts. There can be no experience argument in the case; and a hypothesis without being supported by experience, or scientific evidence of some kind, is at best a mere dream—a piece of idle and vagrant fancy.

We propose, however, to comply with the demands of this hypothesis for facts, to see whether such as we have, verify or contravene the several propositions it necessarily involves.

And first, the general diffusion and simultaneons appearance of the disease over extensive regions of country, is a fact wholly irreconcilable with the theory of gradual exhaustion. The malady everywhere appears like a broad-spread epidemic. The plant instead of being exhausted by age seems suddenly to have contracted a malignant and fatal disease, from which no variety appears to have wholly escaped. Even the seedling varieties, those recently produced from the ball, have not escaped the general contagion. The Bogota seedlings, raised from the seed-balls of the native potato, have exhibited indications of the disease. The same is true of the Chili seedlings.

Another fact, not only inconsistent with the theory of exhausted vitality, as the remote cause of the disease, but also of the sudden alterations of the weather at critical periods in the growth of the plant, as the proximate cause, is the appearance of the disease at Bogota, in New Grenada, in Peru, and other parts of South America, where the plant grows indigenously.

And another fact, wholly irreconcilable with the theory, is, that potatoes taken from the Atlantic States to California are restored to their accustomed vigor; while those brought from California here are equally affected with others.

Another important fact, demonstrable by experiment, is, that when you produce a family of seedlings, they not only resemble the parent variety in all their leading qualities, but actually exhibit less hardiness in proportion to the amount of tuberous elaboration than the original plants.

Still another fact, characteristic of these experiments, and shaking the foundations of the wearing-out hypothesis, is, that in all their efforts at reproduction *de novo*, the experimenters have realized no such thing as *invariability of result.* The prevailing dissimilarities are such as to be wholly irreconcilable with each other, and phenomena are constantly occurring which are inexplicable upon any theory yet started.

Another, and still more embarrassing fact, is, that many non-tuberous plants allied to the night-shade family have taken the disease; and even some not so allied have showed more or less indications of it.

Notwithstanding the difficulty of harmonizing these facts, the theory of *exhausted energy* still continues to be the favorite one adopted; and the prevailing remedy suggested, is, a restoration by new varieties. The main corollary drawn from the hypothesis is, that improvability must follow reproduction. In order to determine the probabilities of success in any given reproduction, we start with the algebraic method of assuming the unknown quantities, and after explaining the several facts by the very original process of supposing them to happen in obedience to some general law of development, we finally return to the identical proposition upon which we started, and record the important discovery that $x=x$. The sum of all our experiments is, that we shall succeed in 'proportion to the elevated point from which we start.' We must start with hardy varieties to get hardy varieties; for there is always 'a tendency in like to beget like.' And if we do not succeed in the first reproduction, we must try a second, and third, and so on; practically involving our identical propositions, till our algebraic process returns to the original formula of 'like equals like.' This is certainly a very innocent and harmless, not to say satisfactory, way of getitng at a result. As long as the productive equation is properly balanced there is no danger to be apprehended from the elimination of error. The unknown quantity will invariably return, 'smaller by degrees and beautifully less,' to the stenographic point from which it was ingeniously started.

The *fungal* theory of disease has, also, attracted the attention of a large number of scientific men, since the commencement of the 'rot;' but has failed to meet the general approbation of those who have carefully investigated it. It lacks the number of earnest advocates who support the 'wearing-out' hypothesis. One reason perhaps is, that it is less fanciful in theory, and approaches nearer in fact to the real cause of the disease.

Mildew, or parasitical diseases, is not a new discovery in agriculture. It was known by the ancients as an incurable malady: to avoid the approach of which the people often had recourse to spells and enchantments. The *mala rubigo,* or malignant mildew, is frequently referred to by the Roman poets; to prevent the recurrence of which the 'great Cato' seems to have suggested the efficacious effects of certain kinds of magic. It has long been a common malady on wheat, peas, hops, &c., and on the leaves of the peach, the nectarine, and other fruit trees. It has not been considered, however, as the *originating,* but rather as the *resulting* cause of disease. It arises, or is supposed to arise, either from the constitutional weakness of the plants affected, or from some predisposing causes in the atmosphere. But it is difficult to trace any connection between the disease and the hygrometrical, or other states of the atmosphere; for it has ravaged with equal intensity under every sensible condition of that element, whether of humidity or aridity.

In examining the parasitical theory, there is this very consolatory view of the matter: that, if it be correct, there is no danger to be apprehended as to the ultimate extinction of the potato as a species. The great compensatory system of nature, which holds all the elementary forces in due equilibrium, controlling one by the other, and prescribing to each its advancing and regressive limits, gives us assurance that no such disastrous results will ever follow. The parasite holds a subordinate, and not a subversive, rank in the order of nature. Its life, instead of being commensurate with, is wholly dependent upon that of the dominant vegetable or animal upon which it subsists. If then, that terrible scavenger, the *botrytis infestans*, be the true parasite of the potato, it is not only entirely subaltern in its character, but its very existence hangs upon the living tissue of the plant. It is so fleeting and evanescent that it can only seize and fix, in its mobile vitality, upon some extrinsic and superior law of life. The plant upon which it preys must forever precede it in the advancing scale; and when it has reached its ultimate point of development, its dynamical forces must give way to those of the superior life. It will then fall back to its retrograde point and await the restoration of the nutritive plant. Instead of being a power fully adequate to the destruction of the plant itself, it is wholly dependent upon it for its vitality. The plant is the only nidus for its seeds; the only source from which it can draw its life. The danger is not then from the loss of the plant, but from that of its parasite.

The prevailing opinion, in regard to the character of fungi, seems to be, that they are developed from the unhealthy conditions of the superior plants, and possibly from some slight chemical changes previously effected in their constitution. Their office seems to be to hasten decay after it is commenced, and not to produce it in the first instance. They result from decomposition and decay, and not in those conditions. They do not spring from the living tissue and destroy it, but wait till the vital principal ceases its action and a chemical change ensues. They are evidently, then, not the cause of disease, but the result of it. If the disease were propagated by the diffusion of seminal fungi in the atmosphere, it is evident that it would march in the direction of the wind, and particularly its stronger currents, and that the fields lying along the atmospheric belt would be almost simultaneously affected by it. There would be no occasion for such great irregularities and inequalities in the distribution of the fungal animalculæ, or for such apparent partiality of influence as is every where manifested through the infected stratum. The fungal virus, or whatever may be the producing cause, does not communicate itself through the medium of effluvia, or even the secretions of individual tubers; for tubers will remain perfectly sound, or at least without any traceable signs of decay, when completely enveloped in the matter of the diseased tubers. If there were any external epidemical cause resulting in disease, it would go on augmenting until it had either resulted in the destruction of every tuber in the hill, or become counteracted by some influence more powerful than itself. But the well known fact is, that the disease will commit its greatest ravages in one field, while it entirely neglects, or but slightly visits another, in the immediate vicinity. Nay, it will entirely destroy one variety of potatoes in the same hill without in the least affecting another.

The *atmospheric* theory is still more objectionable in some of its aspects. It assumes that there is something in the atmosphere which specifically causes the disease; some floating miasmata, or contagious influence, impregnating the currents of air, which are borne in fixed telluric directions; in some instances, without material contact or pollution; in others, acting as a most terrific vegetable plague. But however plausible this theory may be to those who have not examined the subject in reference to atmospheric influences, it is wholly irreconcilable with some of the known physical agents of the atmosphere. We cannot trace the morbific matter even from one field of potatoes to another; much less across seas, mountains, and deserts, upon any known principle of atmospheric movement. Like the ravages of the cholera, the disease spreads from remote districts in the very face of the strongest winds. It refuses to be governed by any known laws, or reconciled to any known conditions in meteorological science. No trace of the morbific condition can be determined by analysis, or the keenest microscopic research. It escapes the application of every chemical test, and eludes every resort of human wisdom.

It would certainly seem that, where the injury arises from sudden or extreme changes of weather, or from heavy rains, fogs, frosts, &c., the line or region of devastation ought to be more or less distinctly marked, if not strictly confined to the localities within which such meteorological changes, or causes, exist. The disease, to be induced by atmospheric influences, must manifest itself in the line of the existing or moving miasmata; or it would *seem*, at least, that it should so manifest itself. But the history of the disease shows that it does no such thing; that it is obedient to no such influences. It takes up its own line of march, and travels in obedience to its own hidden laws. It comes like some unpropitious destiny—some sudden stroke of fate—and smites down the best and most generous gift which nature ever dispensed with her liberal and benignant hand. It seizes upon its victim with the impetuosity of passion, strips him of his leafy honors, and sends its destructive virus to the very heart—the living tissue—of his life-giving tubers. It is at once as merciless as death, and implacable as the grave. We approach the stricken field, where the plant has labored with such generous activity, with feelings almost akin to sympathy. We arm ourselves with physiological facts, experimental proofs, hypothetical data, and propitious combinations of matter, in order to combat the hostily arrayed elements, or the innate and hereditary discord; but the subtle enemy everywhere eludes our grasp. With all our incontestible data—the fruit of years of *human* experience—we can find no stable point from which to start and carry on a work of restoration. That beneficent labor still remains to be performed, not by the speculative consciousness of man, but by an inscrutable law of a high-enthroned and ever-unerring nature.

In studying the habitudes of the disease, however, and marking its coincidences with those which have scourged the animal world, we must be satisfied that the 'end of the plant is not yet;' that the disease will ultimately pass away, and leave the plant to the domain of vitality.

The history of contagious epidemics shows most satisfactorily that no large volume of the atmosphere is ever at any one time seriously affected; that even the morbific exhalations of plague, small-pox, cholera, &c., are soon rendered innocuous by the disinfectant agents that are constantly abroad in the air. It is such a perfect self-regulating, self-restorative medium, that it is impossible to maintain any theory of disease upon strict atmospheric principles without combining some local causes. The yellow fever in its late ravages in the South West, proved quite as severe in high, airy and dry positions like those of Natches and Vicksburg; and on solid, sandy soils, exposed only to the purest sea breezes, like those at Mobile and Pensacola; as it did in the damp, low, swampy locality of New Orleans. For several days the deaths at Natches and Mobile exceeded, in proportion to the resident population of those places, the mortality of any one day in New Orleans during the epidemic. These facts, with hundreds of others that might be named, are not only inconsistent with the theory which locates the origin of the disease in certain conditions of the atmosphere; but, also, to the theory of local origin. The potato rot does not appear to be a sequence to any particular states of the weather, or changes in the conditions of the atmosphere. It is substantially a gangrene of the cellular system of the plant, or rather of its tuber; the starchy part being at first gnerally unaffected by the disease. Certain atmospheric conditions or states may be more or less favorable to the development and propagation of the disease where it already exists, as certain other of its conditions or states may tend to check the progress of it in its different stages of advancement. These conditions or states of the atmosphere may even predispose some plants and animals to certain forms of disease, but they cannot be said to cause the disease itself.

Meteorologists, in their investigations of the atmosphere, have confined themselves mainly to its mechanical properties, and to the various visible phenomena within its apparent limits. They have ascertained its weight, its height, its decrements of heat and pressure, its power over the solar rays, its evaporation, absorption, &c.; but its life-giving properties, its power over organic substances, its agency in supporting the animal and vegetable tissues, have as yet hardly attracted their notice. They have never looked upon it in the light of an immense life-giving continent, as it is, incessantly acting upon the substances of the enclosed *dead* continent with a view to vital development. They have ascertained the startling fact that a man of ordinary stature, sustains the enormous sum of thirty-two thousand pounds of atmospheric pressure; but its office in vitalizing the material world, and clothing it in its thousand diversified and beautifully variegated forms of life, has been a subject of comparatively little moment. Instead of being impregnated with the seeds of death, it is eternally vivifying the earth and fertilizing its particles of matter; observing an uniform course and apparently obeying an intrinsic law. It is not a principle of destruction, of elementary dissolution; but, under the Divine economy, *a principle of life.* It brings down from heaven the balmy spring, the dews, and the rain and the life-giving sunshine. It is thus beautifully described by the great poet and true meteorologist of antiquity:—

> "Tum pater omnipotens fœcundis imbribus aether
> Congugis in gremiinon laetae descendit, et omnes
> Magnus alit, magno commixtus corpore, fœtus."

Thus representing the 'almighty father Aether' (or the atmosphere) as descending into the bosom of his joyous spouse in fructifying showers, and great himself, mingling with her great body, and quickening all things into life. We can conceive of nothing more beautiful or significant than this, except it be that 'breath of life' by which the 'dust of the earth' became an *ensouled* vital substance—a marvel of creative power. There is a deep and most wonderful significance in the word 'breath,' as emanating from the great source of life. It was the same quickening power that moved upon the 'face of the waters' when the earth awoke from death into life. It was the body of this 'earthly tabernacle' which had fallen a prey to death, and not the cherubic element with its flaming sword. All the leaves of tradition and history are filled with the most beautiful images of poetry, not to say the profoundest truths of science, in regard to the perpetually renovating power of the atmosphere. Even mythology runs into scientific formularies of physiology when it approaches the ethereal element; for, as the earth contained alone the *principia* or germs of life, so also it contained exclusively those of death.

If this view of the atmosphere, as the great continent of life, the source of perpetual endeavor to produce uses to man, be fanciful, it is a fancy suggested by some of the profoundest truths of nature and the highest symbolical teachings of mankind. In speaking, however, of nature as a living entity; as a force adequate to the production of these uses in the material world, we wish to be understood as using the term in that high subordinate sense in which it may be considered as having a life *in* itself, but not *of* and *from* itself.

It is true that the atmosphere is constantly undergoing changes; not only great and various changes, but those which are productive of the most important, and at times the most violent results. But while there are innumerable causes which tend to disturb its equilibrium, there are powerful restorative forces, benign and salutary influences, which are active in sustaining its freshness, purity and vigor. If the earthquake and volcano upheave their sulphureous masses the broad-faced lightning cleaves them asunder with his far-reaching bolt, and the deadly and noxious vapors are at once dispersed. Thus, the restorative agents of the atmosphere are constantly exemplifying their power—demonstrating their superiority over its destructive elements. Every thing in nature is full of life, full of activity—bursting into spontaneous birth—under the balsamic breath of heaven. The atmosphere is not a sepulchre of death; but a most wonderful laboratory of life—a scene of manifold, diversified, unceasing reproduction. It is evident, then, that no long continued and specifically marked disease, like the potato rot, can be due alone to atmospheric influences.

Neither the *insectile* theory, nor that of *local origin*, nor of *chemically embalmed soils*, is, in our judgment, worthy of serious refutation. Although there are certain elements—component parts—of the soil which are more or less essential to the existence and growth of the potato, the restoration of those elements, of the alkalies, lime, and phosphates which enter so largely into their composition, does not necessarily restore the equilibrium of the soil so as to prevent a disturbance in the vitality of the plant itself. The *life* of the plant is as perfect in one condition of soil as in another; in fact, it would seem that an enfeebled condition of soil is more favorable to the perfect development of the plant *as such*—to the consummation of its life-principle in the production of seed—than even a rich or strong condition of soil. Besides, it is wholly improbable, not to say impossible, that the soil upon any considerable portion of earth's surface, should have become all at once chemically unbalanced so as to occasion a general disturbance as is manifested in the vitality of the potato.

We shall close our observations upon the different theories of disease by a reference to a somewhat novel theory which has been suggested by a learned and practical horticulturist in the State of New York. It is the relation between bearing seed-balls and the health and hardiness of varieties. The theory is based upon the supposition that seed-ball bearing is a test of hardiness. The author says, "a variety of potatoes cannot reasonably be expected to bear a heavy crop of balls and tubers at the same time. Both balls and tubers are the result of elaboration in the foliage. The material thus elaborated is derived from the air and earth. Now, if in a given position one variety bears a heavy crop of sound tubers, it is not to be expected that another variety should do the same, and also yield a heavy crop of balls—since, in the last case, the draught made upon the elaborating energy of the plant must have been at least double that of the other; and as the seeds of all plants always contain more mineral ingredients derived from the soil than simple wood, bulbs, or tubers, so, in the case of large crops of potato balls, there is proportionably larger quantities abstracted of important material from the soil than in the case of a simple variety of tubers. No one expects that, during the same year, a tree should make a stout growth of new wood and also of fruit. Unquestionably, the stripping off of the very young balls, or, better, of the flowers would add, in the case of varieties given to bearing heavy crops of balls, to the crop of tubers. But whether this labor would prove profitable in the end is a question not readily settled, depending on the price of labor, &c. May it not be suggested as probable, that, in the native land of the potato, where the season of vegetable growth never ceases, the seed-balls and tubers are matured successively ?"

There is no question but what there is a ratio of perfection—a reciprocal ratio of some kind—between the seed-balls and tubers of the potato. The fact is quite susceptible of demonstration. For, by carefully removing the earth from the roots of a hill of potatoes and separating the tuber-bearing fibres from the stems without molesting the roots of the plant, thus preventing the production of tubers, you will have a heavy and vigorous crop of seed-balls. And it is altogether probable, that by reversing the process, and preventing the production of seed-balls, you will enhance the crop of tubers. The same fact is demonstrable with a great variety of bulbous and tuberous plants. Take the case of the common onion, which is a biennial, and incapable of producing seed the first year. If it be allowed the second year to shoot up into a stock-flower, and ripen its seed, the bulb will almost entirely disappear ; whereas, if the flowering stem be cut down so as to prevent the plant from perfecting its seed, its productive energy will be directed entirely to the bulb, and the result will be a perfectly sound and healthy bottom for the second year. The same is true in regard to all bulbous and tuberous biennials. Eradicate their flower-stems the second year, so as to prevent a propagation by seed, and they will direct their elaborating energies to the bulbs and tubers.

This ratio of perfection between the roots and the seed is beautifully illustrated in the case of the *Orchis morio*, which very rarely ripens its seed. By destroying the new bulb, the plant will make a vigorous and successful effort at propagation by seed. So, also, with the *convellaria;* by crowding their roots into flower-pots, so as to prevent the production of bulbs, you will get an increased amount of seed. These are results experimentally known to all practical botanists.

The practice of *decortication*, or *ringing*, fruit trees, very clearly establishes the same fact. It impedes the progress of the descending sap through the decorticated space, and acts powerfully in accelerating the growth of fruit. The increased production of fruit is obtained, however, at the expense of the roots, or of the tree below the decorticated space.

From some experiments and observations made in the summer of 1851, we were led to adopt a theory of disease upon the hypothesis of a *too vigorous growth of the plant*, causing its sap or juices to be too rapidly diffused, and uninterruptedly expended, in the formation of the leaf-buds, to the exclusion of the fruit-buds, as in the case of young fruit trees pressed into excessive growth by artificial cultivation. There appeared to be too little compression—too little accumulation of the elaborated juices, to effect a perfect development of the fruit-buds, or seed-blossoms of the plant, *and hence the tendency to blight.* We were of the opinion, somewhat hastily formed, that the disease was the result of repletion, or a too excessive elaboration on the part of the plant; that instead of there being superannuation and want of energy, there was really superabundance and over exertion. That in pursuing the process of amelioration from the original and almost worthless condition of the plant in its native state, it had become, through successive generations of growth, not exhausted by age, but urged into prematurity and unnatural advancement, *and beyond its real powers of endurance.* There seemed to be not only a ratio of perfection between the tubers and seed-balls, but a point in their mutual progress of development *at which the one was forced to yield up its vitality to the other*, under circumstances and conditions, as to accumulation, maturity, &c., which seriously affected, if not fatally compromised, the life of the plant itself. We had noticed, and were strongly impressed with the belief, that although the potato had perfected a less number of seed-balls since the commencement of the rot than formerly, there was yet an equal, if not a greater, effort on the part of the plant to perfect them, as exhibited in its excessive and long-continued enflorescence, or unfolding of blossoms.

The facts upon which we labored to erect a theory of disease, although few, were yet more numerous than harmonizing. In 1850 and '51, our potatoes were seriously affected by the rot. No tubers, however, could have been more perfect than those raised by us a week before they were thus affected. The disease seized upon them at the very moment when the struggle for mastery over the elaborating forces of the plant seemed to be decided in favor of the tubers, and when the exhausted and vanquished flowers yielded their hold upon the superior stems. Had the tubers been taken from the ground a week previous to their being affected by the rot, they would all have been found, upon careful analysis, to contain the same, or very nearly the same, chemical ingredients. Nothing of the rot, at least, could have been predicated of one tuber more than another. The disease was unheralded by the approach of any external symptoms other than those affecting the vitality of the entire plant, and apparently springing from its inherent conditions. The tubers in the centre of the hills, attached to the main flower-bearing stems, were all, or nearly all, blasted; while the remote ones, those attached to the smaller stems, and such as did not exhaust themselves by excessive enflorescence, were sound and apparently healthy tubers.

It seems to be a well attested fact, that there is a strong tendency to precocious growth distinguishing the disease; that in the very act of consummating its life—in rallying its vital and material forces to the highest point of development—it sinks into putrefaction and death. This sudden collapse of the plant, in its powers of assimilation and structural development; this arrestation of life at the very threshold of vigor, is wholly inexplicable upon any theory of *gradual* exhaustion or *inherited* constitutional weakness, but shows rather an engorged state of the plant, a superabundant fullness in its unelaborated juices. The disease would appear to be occasioned, then, not by the want of assimilation, but by a too crude and imperfect one, arising from the engorged condition, or unnatural growth of the plant.

We are not prepared to say that our views in this respect are entirely unsatisfactory, in failing to meet all the difficulties in the case; but from repeated experiments and observations, and a fuller investigation of its various phenomena and characteristic features, we are strongly disposed to abandon all theories as yet founded upon mere experimental results and observations, and regard the disease as a sort of *vegetable plague*, which has already scourged the plant beyond its maximum point, and which is now gradually, if not rapidly, decreasing in the severity and frequency of its attacks. Plants, as well as animals, have their specific forms of disease, those assuming a fixed type and a marked and unmistakable character. It may be a part of the economy of nature that plants and animals should possess certain inherent conditions, or periodic tendencies to disease, as a check upon excessive propagation. It is but a few years ago that thousands of sycamore trees, in almost every part of the United States, were suddenly stricken with disease and perished within a very few days from the time they were first attacked. The wearing-out theorists were eagerly anticipating the entire extinction of this noble forest tree in confirmation of their hypothesis of disease, and were certain that it could 'only eke out a little longer the remnants of a woeful life.' But unfortunately for them, or rather for their hypothesis, the tree has entirely recovered from its withered aud blasted condition, and is now making as vigorous and successful a struggle for life as ever. And we may confidently anticipate the same result in the case of the potato. The disease will ultimately pass away, relinquishing its hold upon the plant, and yielding up the 'sustenance of millions' to the domain of life.

REMARKS ON VARIETIES OF THE DOMESTIC OX,

AND THE PRINCIPLES RELATING TO THEIR BREEDING, PREPARED WITH A BRIEF NOTICE OF SOME OF THE SPECIES COMPRISING THE OX TRIBE.

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The genus of animals known scientifically under the name of *Bos*, comprises several species, the most prominent of which are the the Aurocks, or European bison ; the American bison ; the common buffalo of Europe and Asia ; the African Cape buffalo ; the arnee ; the gour ; the gayal ; the yak ; the Musk ox ; the zebu ; and the domestic ox. All of these, with the exception of the American bison and the Musk ox, are natives of the Eastern Continent.

Some of the ox tribe have inhabited the earth from a remote period. Besides the species just mentioned, others which once existed have passed away—their bones being found in various localities. One of these extinct races, the Urus, within the period of history occupied the forests of central Europe, and was described by ancient writers as little less in size than the elephant, with enormous horns, and of a savage and ferocious nature. It is a singular fact, that though the Urus has been long since exterminated, the Aurocks (called also Bonassus and Zubr) which existed cotemporaneously with the former—the bones of both species being found in the same formation—has been continued to the present time. There is also a similar fact in regard to the hog, whose remains, resembling in every respect the present domestic race, are found intermingled with various extinct species of animals. It is an interesting, but unanswerable question—What could have destroyed some species of animals, while others which existed at the same time, have been preserved?

Other extinct species of the bovine genus, bore a nearer affinity to the modern domestic ox, though the identity of the latter with any of the former, has not been ascertained. The remains are found in England, France, and other parts of Europe, as well as in Asia. In America, also, one or more fossil species has been discovered, believed to be distinct from any now in existence.

The buffalo of Europe and Asia is sometimes domesticated, is made to perform labor in husbandry, and in some countries the female is kept for its milk. The flesh is also used for human food. It exists, likewise, in a wild state. In different localities it presents considerable diversity of character, and a question, not yet settled, has been raised in regard to the specific identity of the races. It is a highly useful animal in warm countries, subsisting where the domestic ox cannot live, and as it delights to wallow in mud and water, is well adapted to work in rice fields. It may properly be mentioned here, that Dr. J. B. Davis, of South Carolina, has imported what is called the water ox, or buffalo, for the purpose of employing the animal in the agricultural labors of that section.

The Gayal, or Jungly Gau, a native of Asia, is found both in a tame and wild state, in the former of which it is used for the same purposes as the buffalo.

The Yak, or grunting ox, a native of Thibet and other elevated parts of Asia, is also domesticated, is employed in labor, and its flesh is used as food by the inhabitants of those countries.

The Zebu, or humped ox, is found in India, China, the Indian islands, Madagascar, and on the eastern coast of Africa. In former times it existed in Egypt. Naturalists are not entirely agreed as to the question whether it is a distinct species from the ordinary domestic ox. Cuvier regarded them as identical. Martin, on the contrary, believes them distinct. As showing the great antiquity of the Zebu, the latter author cites the fact that both the humped and the ordinary straight-backed ox are delineated on the most ancient monuments of Egypt, which are traceable two thousand years before the Christian era, and that these representations exhibit precisely the same characters as are found in the two races at the present day. Other grounds for the conclusion that the two races had a distinct origin, are the striking differences in their shape, style of coloring, and voice. It is true that the two races will interbreed and produce a fertile offspring, but this affords no proof of specific identity. The same fact may be cited in reference to the American bison and the domestic ox. Not only do they differ widely in external appearance, but their osteological structure varies much. Without going into details in regard to these differences, it may be noticed that the bison has fourteen pairs of ribs, and the domestic ox only thirteen. Yet the two species freely interbreed, and their offspring is prolific. With common cows, impregnated by the male bison or buffalo, difficulty is frequently experienced in parturition, owing to the great breadth of forehead and depth at the shoulders in the fœtus; but the bison cow, impregnated by the bull of the domestic species, brings forth without difficulty.*

There are two classes of the humped ox, generally known as the large and dwarf Zebu. The former is as large as the smaller breeds of English cattle; the latter is only the size of an ordinary calf of six weeks old. A variety of the larger class, called the Nagore breed, is used in India as a substitute for the horse in carrying burdens, and for riding.

* The writer desires to be somewhat explicit in regard to the fertility of the hybrid offspring of the two species here mentioned, as he has on a former occasion expressed a different opinion. He had then heard of no instance of the hybrids having bred, but subsequently received a letter from Col. O'Fallon, of Missouri, who had made several experiments in regard to the question, by which the fertility of the stock was clearly shown. This letter was published in the Albany Cultivator for 1849, pp. 92, 93. Similar testimony has also been received from a gentleman, (Mr. Platt,) who resided for some time among the Pawnee Indians, and kept, as a family cow, a half-blood bison.

It is said "they will travel, with a soldier on their back, fifteen or sixteen hours in a day, at the rate of six miles an hour!" Dr. Davis, of South Carolina, whose name has been previously mentioned, has introduced this variety into that State. Crosses have been obtained with the cattle of that section, and experiments are going on to test the adaptation of the hybrid stock to the country. The Zebu, being a native of a warm climate, it is hoped that the cross-bred animals may retain some of the qualities of their Asiatic ancestor, especially activity, by which they may be rendered more valuable for labor under a southern sun, than the ordinary ox.

The late Gorham Parsons, Esq., of Brighton, near Boston, imported a bull and several cows of the large Zebu, about thirty years ago. He bred a small herd of the full-bloods, and reared several cross-bred animals, some of the males of which were castrated, and at a suitable age broken to the yoke. The latter were rather small, very active, quick walkers, but of an ungentle disposition, and on the whole were considered of no particular advantage. The full-bloods were kept merely as a curiosity. The dwarf Zebu was for a while kept by J. P. Cushing, Esq., at his place in Watertown, Mass., but the stock has been disposed of.

But it is more particularly of the domestic ox, (*Bos taurus,*) in its different varieties, that it is the purpose of this essay to speak. According to the census of 1850, there were, in the United States, 18,355,387 head of neat cattle.* It is computed that in a large portion of the country, one-half the labor of the farmer is devoted to the maintenance of cattle, sheep, and horses. And yet, notwithstanding the immense importance of this interest, it is probably more neglected than any other branch of husbandry. It is evident that in the breeding of domestic animals there is in general very little observance of system, or application of rules. The gross carelessness which prevails on this subject, can only be accounted for on the fact, that many farmers are ignorant of the principles in which it is involved.

Perhaps the first point which should be established in the mind of every breeder of animals, is, that there are certain constitutional quali-

* The census returns for 1850, give the live stock as follows:—horses, 4,325,652; asses and mules, 559,070; neat cattle, 18,355,387; sheep, 21,620,482; swine, 30,315,719. And their total value is put down at $543,822,711.

ties belonging to different families or breeds of the same species, and that the adaptedness of animals to particular localities or purposes, depends on these constitutional traits. A neglect of this principle has often led to serious mistakes. A breed which succeeds well under a mild climate, and on a soil producing abundance of nutritious grass, has proved wholly unprofitable when transferred to a different region—a result which might have been anticipated under a proper knowledge of the natural tendencies of the stock. Again, breeds of cattle whose distinguishing quality is the accumulation of fat, have failed to meet the expectations of some who, without understanding their characteristics, have adopted them for dairy purposes.

Another important principle is, that the characteristics of races or breeds, are in some degree under the control of man. For instance, a breed of sheep may produce a fleece of combined wool and hair, the proportions varying in different individuals. By selecting for propagation those which produced most wool and least hair, the growth of the latter may, in time, be wholly displaced by the former. So in reference to other qualities; any particular one may be increased by selecting and breeding from animals in which it is most strikingly manifested. But it should be borne in mind, that excellencies are more or less accompanied by defects, and critical judgment is required to obtain animals which possess the desired properties free from imperfections which lessen their value.

There is, therefore, not only a diversity in what may be called the original or natural qualities of animals, but there is also a great difference in the same race in a natural state and when subjected to artificial influences. It is true that in a strictly natural state—that is, a state of entire liberty—nature might be expected to inspire animals with such instincts as would perpetuate the race in the greatest perfection, having reference to the circumstances in which they are placed. But our domestic animals are not in this situation; they are more or less subject to man's will; he desires to develop in them such properties as will render them most subservient to his wants. It is obvious, that animals thus situated are deprived, to some extent, of the advantages of their natural instincts, and that hence, unless the art of man is properly exercised on them, they would be likely to degenerate from their primitive condition.

Now there are varieties or families of animals which have been particularly cultivated in reference to certain qualities; and it is obvious that whatever superiority these varieties possess over the general tribe to which they belong, is the result of what may be called *the art of breeding.* In a knowledge of this important art, many of our farmers, as before intimated, are essentially deficient. It is an art which cannot be perfectly taught by language; general principles may be laid down, but the details must be learned by observation and practice. That it is in general very imperfectly understood in this country, is shown from the fact that nearly all our domestic animals which are held in high estimation are derived from abroad. To England, where the art of breeding has been more extensively practised than in any other country, we are indebted for most of what is denominated *improved* stock. This remark has no reference to the fact that our original stocks of domestic animals were derived chiefly from the British Islands—it alludes to the constant *recurrence* to this source. We send to England and obtain the best specimens of her cattle and other animals of various breeds, and after the lapse of a few years we do precisely the same thing over again. The stock has degenerated, or perhaps, in the popular language, has 'run out.' That it gave satisfaction in the first instance, is shown by the circumstance of the same kind being re-ordered. The progeny became inferior to the parents and to the breed in general in the old country, simply because the breeders knew not how to keep them up to the required standard.

What the country requires is the prevalence of a knowledge of the principles and art of breeding, that will supercede the necessity of these constant importations—that will enable us, when a proper number of animals of such breeds as we require are obtained, to propagate the stock without deterioration. This would also produce various other important results. Complaints are frequently heard that animals of the most esteemed breeds are held at such high prices as to be beyond the reach of common farmers. It is not to be denied that exorbitant prices are sometimes demanded and obtained for those animals. But how is the evil to be remedied? Certainly not by denying the real merits of such animals, but by the dissemination of such information as will enable farmers to produce such stock, or that which will even better answer their purposes. If, as has been alleged, the breeding of fine stock is a monopoly in the hands of a few, it is one which can only be kept up by practical skill on the part of those who enjoy it, and the want of that skill in others. There is no insuperable barrier to competition in the business—no secrets but what may be learned by all, and the success of one only proves that the same skill and means would insure to others like results.

It has already been remarked that the domestic ox is not a native of America. Most readers are probably aware of the fact, that the first settlers of the United States came chiefly from Great Britain, and that their cattle, as well as most of their other domestic animals, were derived from that country. The Spanish, who settled South America and the region round the Gulf of Mexico, brought their stock from Spain, and in some of the Southern and South-western States, the descendants of that stock may have been introduced. The Dutch settlers of New York brought cattle from Holland, and the French of Canada brought them from France. Of course the term *native* as applied to our cattle is altogether a misnomer. It cannot be used with any definiteness, and no rules for its application can be given. Hence, in speaking of the cattle of the country which belong to no known breed, the word *common* will be used instead of native.

The term *breed* pre-supposes the possession of a certain class of characters by a family of animals, by which they are distinguished from all others. The common cattle of the country have not sufficient uniformity in this respect to justify their being considered a breed. They have no general standard of color, shape, size or quality; but on the contrary, vary greatly in all these points. Their origin was evidently quite diverse. This matter appears not to have been regarded, generally, in its true light. An impression prevails that the first cattle imported by the New England settlers were from Devonshire. The writer has seen nothing to justify the belief. It appears that the first importation was made by the Plymouth Colony; their agent, Edward Winslow, having brought by the ship *Charity*, in March, 1624, one bull and three heifers.* Shortly after, others arrived in the *Ann* and in the *Jacob*. By the kindness of Wm. S. Russell, Esq., clerk of the courts for the county of Plymouth, the writer had the opportunity, a few months since, of examining the an-

* These remarks apply to New England. The Jamestown (Va.) settlement imported cattle and other domestic animals in 1609.

cient records in reference to the importation of this stock, and its distribution among the settlers. From the description of the animals, it is evident they were very different from what is now recognized as the Devon breed. Thus the documents speak of "four black heyfers, came in the Jacob," of the "four black cows, came at first in the Ann," of the "great white-back cow brought over in the Ann," of "the white-bellied heyfer," "the red cow," &c. These colors show that the animals had a much closer affinity with the Cornwall cattle, or some of the Welsh breeds, than with those of Devon. According to the last census report, one hundred and fifteen cattle were imported into the plantations of Massachusetts Bay, in 1629. It is said "they were mostly ordered by Francis Higginson, formerly of Leicestershire, whence several of the animals were brought."

In addition to these, it is believed that animals of the Sussex breed were early introduced, and there was, probably, one importation from Devonshire. An intelligent Connecticut gentleman informed the writer, that the first settlers of that State imported cattle from the last named county, and that this stock was the foundation of what has been widely known and esteemed under the name of "Farmington reds." It appears to have been spread up the valley of Connecticut river from the neighborhood of Hartford, and having been adhered to by the farmers of that fine section, gave to their stock a more distinct character than is possessed by the common cattle in any other section of the country.

The foregoing remarks show that the original cattle of the country were of varied blood and qualities, not, probably selected with much regard to purity, or similarity of points; and under the careless and indiscriminate manner in which they have been bred, it is not singular that they have made no approach towards a standard of uniformity. The Connecticut importation alluded to was not, probably, from North Devon, as the stock are usually larger and somewhat coarser in form than the popular breed of that district. Some of the best of the New England cattle bear a considerable resemblance to the Sussex. B. P. Johnson, Esq., of Albany, N. Y., who attended the show of the Royal Agricultural Society, at Windsor, in 1851, observes in regard to the Sussex cattle: "When I first passed them I supposed they were Devons, and I can now account for a race of cattle in our country which pass for Devons, but which, I have no doubt, are descended from the Sussex. The cattle of New England, in many districts, have the characteristics of the Sussex."

Within the last sixty years, specimens of the Short-horn, Long-horn, Hereford, Devon, Ayrshire, and Alderney or Jersey breed, have been imported to this country, and their blood has been more or less disseminated and mingled in various degrees with the former stock, being possessed (remotely) by many animals, probably, without the knowledge of the breeder. But with few exceptions, the breeds just mentioned have not tended to produce uniformity in the common stock, but on the contrary, from the want of systematic breeding, have generally had an opposite effect.*

What has been said is not intended to deny that the common cattle are susceptible of improvement without further admixture with foreign stock. Nor is it intended to say that, by a proper course of breeding, a variety possessing peculiar and valuable properties may not be produced from them. It is to be regretted that a skillful and systematic attempt to do this has not been made. Animals are frequently found among the common cattle of the country, whose shape and qualities are by no means of an inferior order, having reference either to the yoke, the dairy, or the stall; and under the judicious management of a Bakewell, a Colling, or a Price, there can be no reasonable doubt that these qualities might have been in a good degree established in numerous descendants. But we have wanted the right men for the business. When shall we see the experiment properly carried through?

The few trials of this kind which have been made, so far as they have been made public, have not been conducted in a way to throw much light on the subject. The results from the celebrated Oaks cow may be cited. At eight years old, $484\frac{1}{4}$ lbs. of butter were made from her milk in eight and a half months; besides which she suckled her calf five weeks, and one quart of her milk, daily, was taken for other purposes. She was subsequently owned by Hon. Josiah Quincy and by Col. Jaques,

* Besides the breeds mentioned, the Hungarian has been introduced by R. L. Colt, Esq., of New Jersey, and J. P. Cushing, Esq., of Watertown, Mass., and a pair of Syrian cattle by Lieut. Lynch, on his return from the Dead Sea Exploring Expedition. The latter were presented to the State of Virginia.

both of whom endeavored to rear from her a stock of similar character to herself; but no calf of hers ever possessed more than ordinary merit in this respect. This need not, however, excite great surprise. She was, probably, altogether a *chance* animal. Nothing was known of her origin, as she was bought out of a drove. The result ought not to have discouraged further attempts of the same nature. Animals vary much in the power of transmitting their own qualities; hence trials should be made on an extensive scale. A number of animals which may be deemed most likely to produce the stock wanted should be chosen, and the trial should be continued through several generations.

In the Western States cattle are devoted chiefly to beef and the purposes of the dairy. They are less used for labor than on the rougher soils of New England. The remarks to be made in this connection will, therefore, have more special reference to the adaptation of animals to the first named purposes.

The points which denote a superior fattening tendency in cattle, together with constitution and a due degree of activity, are the following: the head small, wide across the eyes, tapering neatly to the muzzle, which should be rather small, with an open, spreading nostril; the eye full, lively, but mild in expression; the horns rather slender, and long or short according to the breed; the ears rather thin; the neck small at its junction with the head, clean at the throat, gradually enlarging to the body, and fitting to the shoulders without any depression at the top; the chest broad, deep, and capacious; the shoulders lying close at the top, slanting backwards, not protuberant of bone at the point, or uppermost joint, but the bone well overlaid with muscles; the crops full; the back straight from the shoulder to the setting on of the tail; the loin wide; the hips wide apart, large, and on a level with the back; the rump long from the hips backward; the twist full; the carcass cylindrical, from the circular spread of the ribs and the nearly parallel line of the belly with the back; the flanks full; the tail set nearly level with the rump bones, broad at its junction with the body, tapering finely downwards; the legs short, standing square and upright, the bone of the shank flat, appearing thin when viewed lengthwise of the body, and wide when viewed in the opposite direction; the fore-arm muscular; the hock wide, the leg above forming with it an oblique angle; the skin moderately thick, mellow, and elastic, moving readily from the points of the rump and the hips; the hair thick, soft, and for a cold climate, long in winter.

I am aware that some of the points here laid down conflict with certain hypothesis which have been lately assumed. For instance, Liebig, and others who have followed him, have taught that small chests and lungs are most favorable to the fattening tendency. It is scarcely necessary to argue a point on which there is almost an universal agreement among practical men. It might be shown that Liebig's notion is not only opposed to common observation, but also to sound reasoning, as given by various distinguished physiologists. It must suffice, however, to quote the language of the celebrated Cline on this subject, to which every person, who has carefully noticed the characteristics of animals, will readily assent.

"The lungs are of the first importance. It is on their size and soundness that the health of an animal principally depends. *The power of converting food into nourishment, is in proportion to their size.* An animal with large lungs is capable of converting a given quantity of food into more nourishment than one with smaller lungs, and therefore has a greater aptitude to fatten."

As to capacity of chest, which may be regarded as indicating the size of the lungs and heart, it does not depend, as many seem to suppose, on the appearance of the brisket, which is merely a fatty substance attached to the sternum, or breast-bone. It is sometimes very deep and prominent forward, but thin, and gives to persons who are not close judges, a fallacious idea in regard to the size of the chest, as well as the weight of the animal. This has been a *fashionable* point, and some animals have been favorites on account of possessing it, which were really very deficient in substance, and other essential requisites. The size of the chest depends more on its rotundity than on its depth, hence it is important that the carcass should be broad anteriorly. Here, again, cursory observers are frequently deceived. Some animals have very large and protuberant shoulder-points, which gives a false appearance of breadth of carcass; whereas this form, besides indicating a large proportion of offal, and a general coarse quality, is frequently accompanied by want of fullness of the first ribs, a narrow sternum, or base of chest, and a smallness of the waist or girth.

Another fashionable point has been the perfect straightness of the hind leg—the foot being on a perpendicular line from the point of the rump, without any angle at the hock. Such a leg has not the flexibility or mechanical power to enable the animal to move with facility. This structure of the hind leg is also generally accompanied by a similar structure of the fore leg, giving an upright shoulder. No man of judgment would choose a horse, even for farm purposes, with a straight hind leg and upright shoulder. It may be said the ox is wanted wholly for beef; but the animal is to gather a large portion of his food by the use of his legs, and has sometimes to travel long journeys to market. The defect here mentioned—although considered by some breeders an *excellence*—has sometimes been carried so far as to injure animals bred only for slaughter. The form alluded to has no advantage for any purpose. It is difficult to understand how any one should have supposed that it even constituted beauty, and it has no connection with any valuable property of the animal.

It has been supposed, and taught by some who have written on cattle, that thin skin and thin hair are desirable points in fatting stock. It is true they sometimes accompany a propensity to fatten; but a thin, flabby skin is generally accompanied by a loose texture of flesh—such as in butchers' phrase, "will not lie on the block"—and it denotes want of hardiness, which is also indicated in a still greater degree by thin hair. On the other hand, a proper substance of skin and fullness of coat, are indicative of a tendency to fatten, good quality of flesh, and sound constitution.

A convex, or circular form of the buttock, giving great width at this part, has sometimes been commended. It is a form which not only gives a large proportion of coarse meat in this part, but denotes a coarseness of quality throughout the carcass. The 'round' is composed of two parts or sets of muscles, usually called the 'outside' and the 'inside.' The inside is of much the best quality. The outside is never very good, and when it assumes the form just alluded to, it is hard, and ill-flavored. Hence, although full *twists* are desirable, large, thick buttocks should be avoided.

The milking property and the fattening property in cattle are somewhat opposed to each other. The same animal cannot unite the two and at the same time possess each in its greatest perfection. There is an advantage, therefore, in cultivating the two properties separately, as by that course each may be pushed to its greatest practicable extent. The same principle is recognized in regard to horses. Speed and power are opposed to each other, and hence to obtain both properties in such a degree as is required for certain purposes, different breeds are resorted to. A similar rule prevails in sheep. The finest fleece is not produced by the best mutton-sheep, and different breeds must be kept to fulfil all the purposes for which the species are required. It is true that an animal might possess in a low degree the different properties, but no one supposes any thing would thus be gained, and it is obvious that much would be lost by the amalgamation. It is so in cattle. If we would derive the highest profit from stock, it must be bred with reference to one primary object. Every breeder should decide what this object shall be, and select his stock accordingly. If the dairy-man wants animals for beef, or for the yoke, he will find it more to his advantage to procure them from persons who keep such stock, than to attempt to breed them, unless he has extraordinary facilities for keeping the several kinds. The grazier, on the other hand, will apply to the dairy-man for a superior milch cow. This course would be an approximation towards that system, which is acknowledged to be so essential to the successful prosecution of business in general.

In regard to points which denote the possession of dairy qualities, it may be observed in the outset, that flatness, rather than roundness, which is the leading characteristic of fatting stock, is the form of carcass to be preferred. The head should be small, with muzzle fine, the face rather dished, and the space between the eyes wide; a wedge-shaped head should be avoided as indicating weakness of constitution; the eye should be large, full, bright, and expressive of mildness and intelligence; the horns slender, and of a waxy appearance; the ears thin; the neck small at its junction with the head, long, rather thin than fleshy, but pretty deep and full at its junction with the body; the breast not so wide as in cattle designed chiefly for fattening, but not too narrow; the portion of the chest beneath the shoulders, deep; the shoulders not coarse and projecting, but well laid in at the top; the back straight; the loin and hips tolerably wide; the rump long from the hips backward, and the pelvis wide; the ribs less round than is preferred for grazing stock; the flanks deep and full; the hind quarters heavy in proportion to the fore ones, the preponderance arising from depth and length rather than width; the thighs thin; the tail slender, except at the upper end, where it should be large—it should not rise much above the level of the rump; the legs rather short, and small and flat below the knee and hock; the skin of middling thickness, mellow and elastic, and of a yellowish color as indicative of richness of milk; the hair thickly set and soft; the udder capacious, spreading wide on the body, but not hanging low, without fleshiness, but having plenty of loose skin when empty; the teats of medium size, regularly tapering from the upper end, widely separated from each other, and placed well on the forward part of the bag; the milk veins large, springing out near the fore legs, and well developed to their apparent junction with the udder. The points relating to the skin and udder, though mentioned last, are more than any others, perhaps, indicative of good milking qualities.

It may be thought that something should be said here in regard to a theory of foretelling the properties of cows by "escutcheons," or certain figures formed by the growth of the hair in different directions, as promulgated by Guenon. Whatever foundation there may be to the theory, the *exactness* that is claimed for it is evidently fallacious. So long as the quantity of milk which a cow is capable of yielding depends on the kind and quantity of food eaten, and various other contingencies, it is simply nonsense to lay down the precise number of quarts and fractions of a quart which one with any particular marks will give for a specified time. Again, many of the best cows (I speak from close personal observations) have none of the so-called "escutcheons" whatever. But granting the theory correct, which it is not, it only relates to the *quantity* of milk, which, except where the article is sold, is not a criterion of the comparative value of the animal. Every farmer knows that for butter, a cow giving twelve quarts of milk a day is frequently worth more than one giving twice the quantity. But the system is still further objectionable in having no reference to the proper shape and constitution of the animal. Admitting a cow to have the milking properties which the rule would allow, she may still be a very bad animal from which to propagate a stock. She may be ill-formed, large-boned, a great consumer of food in proportion to the profit yielded, and of poor constitution. The narrow views of many farmers on this subject have already been productive of much injury. They have regarded milking properties in the individual *alone*, without attending to that union of the proper shape and constitution necessary to make the most profitable dairy stock. A large-boned, coarse cow, though she may by chance give a large quantity of milk, may be expected to produce a progeny similar to herself, and if no attention is paid to correcting the defects of form and constitution, the stock, in a succession of generations, become monsters of deformity, and run themselves out. Finally, if a general indication of the milking qualities of cows is afforded by Guenon's rules, (in the minutia to which they are carried, it is impossible they can be true,) their use is superseded by other means of judging, which have long been acted on. That is, a cow which possessed the points alone laid down, might be safely taken for a good one, whatever might be the character of her "escutcheons," and in addition to the mere ability of giving milk, she would possess other qualities which would greatly increase her value.

It is proper to remark that the points given in this article, have special reference to *butter* properties. The cow most valuable for butter, may not afford the greatest quantity of cheese—richness of milk not being essential to the latter purpose. The oil or fat in milk, is the source of butter, and casein (a nitrogenous substance) the source of cheese. The oil in milk, however, increases the *richness* of cheese, and in this respect is deserving attention. The habit of giving rich milk, in a cow, also indicates that the animal has some tendency to fatten, a property which should by no means be overlooked, as it is for beef that all cows are ultimately wanted. But the fattening tendency should be kept in subserviency to that of giving milk; it should not be manifested to the extent which would lessen the value for the dairy, by converting the food of the animal into fat at the time it was wanted for butter, but should be possessed to the degree indicating the butyraceous quality of the milk, and a tendency to thrive when dry. This balance of the dairy and fattening properties, can readily be discovered by the eyes and fingers of a close, practical observer, but is difficult to describe in words.

The breeds of cattle most distinguished for fattening, are the improved Short-horn, Hereford, Devon, West Highland and Galloway. Those in which dairy properties predominate, are the Ayrshire, Yorkshire, Short-horn, Jersey or Alderney, and the Kerry. The limits of this article will only admit of brief notices of each breed. The former will pass first in review:

The *Improved Short-Horn* may be deemed an artificial variety. Its origin is not, perhaps, fully understood, but according to authorities it was derived from more or less intermixture of the blood of the old Short-horn, originally introduced into England from the continent, with other breeds. Space, however, will not permit a particular inquiry into this subject here. The stock is well established, and has a definite character. Its leading trait is a tendency to fatten at an early age. In this respect, if kept in a mild climate and provided with abundance of good food, it has probably the advantage over any other breed. In bulk of frame they are less than the old breed of Short-horns, but in weight of carcass they take the first rank. The best breeders have endeavored to produce great weight in proportion to the bone and offal, and their efforts have been attended with great success. The popularity of the breed in England is such that the best animals sometimes command enormous prices. At the sale of the late Lord Ducie's herd (1853,) Messrs. L. G. Morris and N. J. Becar, of New York, purchased the bull *Duke of Gloucester*, at 650 guineas, and the cow *Duchess* 66th, at 700 guineas; Gen. Cadwallader, of Philadelphia, and George Vail, Esq., of Troy, the bull *Fourth Duke of York*, at 500 guineas; and Mr. Thorne, of New York, the cow *Duchess* 59th, at 600 guineas.

The accompanying figure, taken from the English Herd Book, is said to be a good portrait of the Short-horn bull Duke of Gloucester, above-mentioned. He was bred by the late Earl Ducie; was calved Sept. 14, 1850; got by Grand Duke; dam Duchess 59th. His color is red.* He will be brought to this country in August (1854), when he will become

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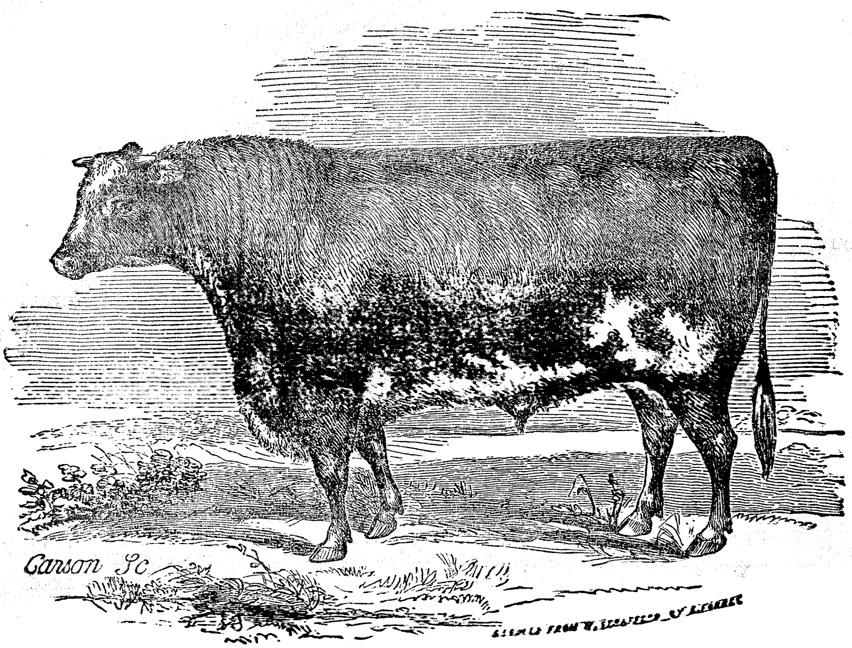
* Duke of Glo'ster (11382), red calved Sept. 14th, 1850; bred by and the property of Earl Ducie, Tortworth Court; got by Grand Duke (10284), dam Duchess 59th by second Duke of Oxford (9046), g. d. Duchess 56th by second Duke of Northumberland (3646), gr. g. d. Duchess 51st by Cleveland Lad (3407)—Duchess 41st by Belvidere (1706)—Duchess 32nd by second Hubback (1423)—Duchess 19th by second Hubback (1423)—Duchess 12th by the Earl (646)—Duchess 4th by Ketton 2nd (710)—Duchess 1st by Comet [155]—by Favorite [252]—by Daisy Bull [186]—by Favorite [252]—by Hubback [319]—by J. Brown's red Bull [97].—*English Herd Book of Short-horned Cattle, vol. x., p. 58.*

the exclusive property of Messrs. Morris & Becar, and will probably be kept at the farm of Mr. Morris, Mount Fordham, Westchester county, New York.



SHORT-HORN BULL "DUKE OF GLOUCESTER."

The *Hereford* is an aboriginal English breed, belonging to the class of Middle-horns. It has for many years been celebrated for its excellencies for beef, and has been held in great esteem for labor. In size the Herefords rank next to the Short-horns. They are more hardy than the latter, have more muscular energy and activity, and their beef is of better quality. At the shows of fat cattle, held by the Smithfield Club, London, where all breeds, till within two years, have competed against each other, the Herefords have taken more prizes on oxen and steers, than any other breed. They have not been as much known in the United States as the Short-horns and Devons, but have been introduced into New York and some other sections, and have given general satisfaction. They are eminently worthy a more extensive trial. There are two popular branches or families of the breed, derived from two noted cows, called *Mottle* and *Pigeon,* which lived about one hundred years ago. The former is red, with a white or mottled face, frequently with some white along the back and belly; the other a grey, approaching a strawberry-roan. Youatt, speaking of the Herefords, says: "They fatten to a much greater weight than the Devons, and run from 50 to 70 score [1000 to 1400 lbs.] the four quarters. A tolerable cow will average 35 to 50 score [700 to 1000]."

The *Devon* belongs to the Middle-horned class, and is regarded as indigenous to the section of country from which it takes its name. There are two varieties of the breed—the North and South Devon. It is of the former we particularly speak. From the earliest times to which accounts of them reach, they have maintained their principal characteristics unchanged. They have always been of a red color, varying somewhat in shade, the lighter having latterly the preference, as giving better quality of beef—the cows in some families having a little white about the udder. They have always been admired for beauty of form, sprightliness and intelligence, adaptedness for labor, and good tendency to fatten. The ordinary weight of fatted oxen of this breed, at four to five years old, is 800 to 900 lbs. Show animals in England have sometimes weighed as high as 1400 lbs., the four quarters. The size has, in latter years, been considerably increased, in a portion of the breed, by propagating from animals selected with reference to this result. At the same time a stock has been obtained which, in addition to increased size, is also improved in respect to shape, early maturity, tendency to fatten, and generally in quality of flesh. The North Devons have become considerably known in some parts of the United States. They are better adapted to soils of inferior quality than cattle of larger size. They succeed well on the hills of New England and similar parts of New York, and appear to have done better at the south than any other English breed.

The West Highland is an indigeneous breed of Scotland, belonging to the same general class as the Hereford and Devon. In originality of character, hardiness, vigor, and symmetry, the West Highlanders have no superior. They also fatten easily, and live on the roughest feed. The late John Price, a noted breeder of Hereford cattle, regarded them as approaching more nearly than any other breed, the standard of form which he considered the true one, and he therefore adopted them as his model. He observes that he was still more inclined to do this from a conviction that they "had remained longer than any other breed in the place where they were first located, and were more free from intermixture with others." C. Hilliard, in his *Practical Farming and Grazing*, says—"The West Highlanders are as perfect in their form as any cattle on the face of the earth." The size of the West Highlanders varies somewhat according to locality. The net weight of those from the Isle of Skye and Islay is said to be from 500 to 800 lbs., the four quarters, at four to five years old. Those of Argyle are considerably heavier. Martin says—"In Argyleshire they are larger than in the Hebrides, and many of them are models of beauty—pictures of a noble semi-wild race; descendants of the old mountain breed, which once roamed in the wilds of Caledonia, and came crushing the forest to meet the fierce hunter." The beef of the West Highlanders is superior in quality to that of any other breed, and commands a higher price. In every view, it appears that the characters of this breed are such as would eminently adapt them to some parts of this country—particularly the roughest parts of New England, New York, and Pennsylvania. Even on the western prairies, where cattle are allowed an extensive range with little attention to shelter, it can scarcely be doubted that they would have advantages over any other breed. Under these impressions the writer has frequently urged the importation of the West Highlanders. The only specimens of the breed we have known brought to America were introduced into Canada West a year or two since.

The Galloway is a polled or hornless breed, belonging originally to Scotland. There are several breeds which have no horns, but the Galloway is regarded as the most distinct and pure. It is for their superior grazing qualities, and for their hardihood and ability to stand exposure to severe weather, that the Galloways are most esteemed. They fatten very easily, and their beef commands a price in the English markets only exceeded by that of the West Highlanders. The form of their bodies is very cylindrical, and the flesh is laid chiefly along the back. The Galloway rib, is said to be well known in London. They are mostly slaughtered at three years old, and the average weight of those sent to the London market is put down at 770 to 840 pounds, the four quarters. The Galloways would doubtless be a very useful breed for fattening purposes in those parts of this country, where beef is the leading object—especially where hardiness of constitution and ability to withstand exposure are primary requisites. In these qualities they are only inferior to the best West Highlanders. It is doubtful whether any of the genuine Galloways have ever been introduced into this country.

Of the British breeds specially adapted to the dairy, the *Ayrshire* has of late years taken the lead. Their origin, like that of the improved Short-horns, was artificial. The foundation of the breed appears to have been laid seventy or eighty years ago, by a cross of the Short-horn and the Alderney with the original stock of Ayrshire, in Scotland. (It is remarked, however, by Professor Low in his *Illustrations*, (1841,) that the Ayrshires had "acquired such a community of characters as to form a distinct and well-defined breed.") The color varies from a light or yellow-red to a brown, mixed more or less with white. (Prof. Low says, "Healthy cows, on good pastures, give 800 to 900 gallons of milk in a year." Aiton says 600 gallons a year may be deemed about the average of this breed; and the author of *British Husbandry* says in reference to this yield, "If equalled, we believe it will not be found exceeded, by any other breed in the kingdom." Martin says, "the milk of a good Ayrshire cow will afford 250 lbs of butter, or 500 lbs of cheese, annually.") The breed has not yet had a thorough trial in the United States. (One of four Ayrshire cows imported by J. P. Cushing, Esq., of Massachusetts, gave 3,864 quarts of milk, beer measure, in a year. One imported by the Mass. Agr. Society, in 1837, afforded sixteen pounds of butter per week for several weeks in succession, fed on grass only. Instances are not rare of cows in this country of this breed having given twenty-four (beer) quarts of milk a day, which afforded twelve to fifteen pounds of butter a week.) From a fair consideration of their merits, it is believed that the adoption of the Ayrshires for the dairy, would secure the following advantages over the stock commonly kept for this purpose in this country: 1. A greater quantity of milk, butter and cheese for the food consumed. 2. Greater uniformity in the general character of the stock. 3. Better symmetry and constitution, and greater tendency to give flesh when not in milk.

The *Yorkshire Short-Horn*, as the term is commonly used, is quite a different animal from what is understood by the term *improved* short-horn. The latter, by attention in breeding has become specially a fattening animal, and is greatly improved over the old variety, or milking stock, in the quality of its flesh. The old variety, and what was long known as the Teeswater, were distinguished for yielding great quantities of milk. The infusion of the blood of the fattening variety, in certain degrees, with those, has frequently produced great milkers; but in general, the animals most celebrated either for the fattening or milking quality, present a considerable contrast in points. The milking kind is not only less disposed to fatten, but its beef is not so good; the fat and lean are formed separately, instead of being mixed or *marbled*, and the lean is apt to be dark-colored and not of good flavor. It is this description of short-horn which has been kept at the establishments which supply London and other English cities with their milk. The milk is not generally of rich quality; the cows which partake somewhat of the blood of the fattening sort, give richer milk, and some of them have been distinguished for large yields of butter. The stock is not hardy, and is only kept in England where there is always plenty of food. They have been introduced into the United States, and their success has been various, according to location and circumstances; but they have proved not adapted to short pasturage or a severe climate.

The *Jersey*, or *Alderney* breed takes its name from islands in the English Channel. It is supposed to have come originally from the French coast, as it bears a close resemblance to the cattle of Normandy. The cows are distinguished from the richness of their milk and the superior quality of the butter it affords. The quantity of butter is also large in proportion to the sire of the animal, which is considerably less than that of the Devon. They are rather delicate in constitution, and the form of the stock was formerly inclined to be ragged and uncouth. The true Jersey variety is claimed to be superior to the stock of Alderney and Guernsey. A society has existed in Jersey for many years, which was established for the improvement of the breed of these cattle. Accounts represent that by proper selections for many generations, the shape and constitution have been very much improved, while something has been gained in the quantity of butter afforded in proportion to the food consumed. The old stock of Alderney was introduced into this country thirty years ago. They were, about that time, considerably common in the vicinity of Boston, but they failed for want of sufficient hardiness. The improved stock of Jersey has been introduced into the same neighborhood within the last two or three years, and of course time enough has not yet elapsed to pronounce positively in regard to their success here. They are evidently superior to the old stock in having better constitutions; their hides are generally thicker, (though still, frequently, too thin,) and they have much better forms, and the fattening tendency is increased, though this is not generally possessed to that degree which causes the animal to carry much flesh when giving milk. So far as an opinion can at present be formed in regard to them, they appear to be just the cows for the city or town, where food enough and proper shelter and care are always bestowed; and in respect to general adaptation, are worthy a fair trial. Thomas Mottley, Jr., Esq. of West Roxbury, Mass., has a four year old Jersey cow, which afforded 407 lbs. of butter in eight months.

The *Kerry* breed is indigenous to the mountainous parts of Ireland. It belongs to the class of middle horns. Youatt says—"The cow of Kerry is truly a poor man's cow, living everywhere, hardy, yielding for her size abundance of milk of a good quality, and fattening rapidly when required." Mr. Colman states that he found in Ireland a dairy of five cows of this breed which had yielded an average of 320 lbs. each of butter, actually sold, in a season. Milburn says—"Crossing the Irish Channel there is a hardy small-sized cow, celebrated as a cottier's dairy cow—the neat pet-like cow of Kerry. Her placid countenance, patient, meek deportment, fine head and legs, her small tail, flat shoulders, breast and quarters, and her skinny udder and large milk-vein bespeak the characteristics of the milker, and well they may, for she is a treasure to the cottage farmer!—so hardy, that she will live where other cattle will starve; she will yield milk at the expense of her own muscles, nay, will yield it abundantly when they seem all but gone; and will give it also of quality so rich, that she is a perfect machine for converting the hardest and coarsest cattle-food into rich and nutritious milk and butter." We have no account of any of the Kerries having been brought to the United States. From descriptions, it appears that the breed would be one of the most useful we could have in this country for dairy purposes. The circumstances under which they are bred in their native land, and their natural characteristics, would adapt them to the climate of our principal dairy regions.

REMARKS ON THE HORSE,

ITS FORM, BREEDING, AND GENERAL MANAGEMENT.

BY C. LOFTUS MARTIN, BELOIT.

In considering this subject, as I intend my remarks to be strictly practical, I shall omit the early history of the horse, which has so often been brought before the public by pens more abler than mine, and commence at once by describing the form of a blood horse of the present day, not as he is too often found, but as he should be, and as he always is found more or less to be, if a good one, or intended to perform any thing more than ordinary service, for I never heard of a horse doing an extraordinary thing, but upon seeing him I found he had some extraordinary good points. To commence with the head, it matters not so much about the size, as the shape of it, for by nothing can you judge so well of the blood and temper of a horse, as by his head—it should be what in horse phraseology is called a lean and bony one, with large expanding nostrils—the eyes also large and placed wide apart to afford room for the nasal cavities, for it is a physiological fact, though little known, that the horse, owing to a peculiar formation of the *velum palati,* cannot breathe through his mouth, but only through his nostrils, consequently if the nasal cavities are naturally constricted, the slightest cold or inflammation will cause an impediment to his breathing, and, in all probability, cause him to make a whistling noise for the remainder of his life. The eyes should also be placed low down, thereby forming a large expanding forehead. The ears should be large, well split open, but thin, and when drawn through the hand should feel like a beautiful Paris kid glove; they should be placed well forward and wide apart, for their situation depends upon the size of the bones beneath, and if they are small, the cavity the bones form to contain the brain will be small also; and if this portion of the brain be wanting in size or power, the animal will be found proportionately wanting in intelligence. The branches of the lower jaw should be large, gradually tapering down to the mouth, which should be well split up to allow room for the bit, but formed by nice, thin-skinned and close-textured lips. The posterior angles of the jaw should be well rounded off, not carried too far backward, and spread wide enough apart to allow room for the larynx, or top of the windpipe with large glands, the parotid placed between them and the neck, without compression, when the head is curbed, and also to give that requisite of all requisites in the horse, a good mouth ; for with a contrary formation of those parts when the pull is made upon the mouth, through the bridle, the angles of the jaw will compress between them and the neck, the larynx and parotid glands, and instead of the head curving, it will become a fixed point with the neck, causing great pain to the animal and the most disagreeable of all feelings to his rider. The head should be connected with the neck by a large but clean and well defined throat. The neck itself should be long and light, but strong, gaining its strength more from the large size of the bones and its depth, than from its thickness, its length should be gained by passing well back between the shoulders, what is termed growing out of the back, or in other words passing imperceptibly into it, and from thenceforward the neck should form a straight line to the occiput or prominent bone between the ears. The shoulders should be large, long, deep and strong, they should rise well back on the withers, and pass obliquely down to the points, which should be placed well forward in front of the sternum or chest bone, so that if a line were stretched across from point to point in front of the chest, there would be a clear space between it, and the above named bone. The scapula, or blade bones, should rise well up, so as to cover the withers, and the shoulders at this part should measure as much through, as before they measure from point to point. The arms should be long, the elbows large, and standing perfectly straight with the chest, neither turning in or out. The knees large, prominent, straight and clean, and as near the ground as possible. The metacarpal, or shank bone, short; the tendons large, flat and well defined; the fetlock joints large; the pasterns moderately oblique, and of sufficient length to render a due amount of elasticity to prevent concussion, but not of so great a length as to make them weak, the two joints standing square with the rest of the limb, neither inclining inward or outward. The foot should be of moderate size, the crust or wall slightly oblique and of equal circumference from the coronary to the ground surface—the frog well developed, but not large—the sole slightly concave, so that it is just clear when the foot is upon the ground—the hoof should be tough and without fissures, cracks or rings. The foot and fore-limb should be placed well forward, so that a line dropped downward from the point of the shoulder would just touch the toe of the hoof. The chest should be deep, the ribs gradually swelling out from behind the shoulders until they reach the flanks. The bones of the spine should be slightly arched upward and of large size, which may be judged of by the size of the bones at the root of the tail. The hips must be large, spreading, and carried well forward, but not too high up. The tail should be tolerably high up, not too much so, but carried well back, to add length to the quarters, which should be large and muscular, the stifles also large and carried well forward, inclining outward. The thighs long, muscular and inclining inwards toward the hocks, which should be large, clean, straight, and placed well under the body, so that a line dropped from the most prominent part of the quarter behind would just clear the caps. The leg should also be perfectly straight from the cap of the hock behind down to the fetlock joint, and the pasterns the same as the fore ones already described.

The above points, all combined, I consider necessary to constitute a good horse; and, viewing him as a whole, he will present the following appearance: looking from behind forward, his body will represent a wedge, with the thick part toward you, and of great length; gaining it not from the length of his back—for a well made saddle should nearly cover it—but from his deep shoulders and long quarters; a fine and thin skin, thick tail, long, straight and silky mane, and standing firmly upon every limb, with head and neck erect, and a countenance expressive of a knowledge of power, yet beaming with intelligence, and having an object to attain with a willingness to accomplish it. This is a horse with the greatest possible amount of power and speed combined.

I doubt not some of your readers will say this is a race horse, or running horse, and such, in this country, we do not require. Granted; but at the same time I say, it is only necessary to widen his chest and bosom, and add more bulk to all the other parts, and in proportion to the width and quantity added, you will produce a perfect horse of any description, even to one over a ton weight; for what he gains in width he will lose in speed, but what he loses in speed he will gain in power, being thus enabled to oppose weight to weight. Having thus minutely described the horse, it is unnecessary to describe the mare, for she should possess one and all of his good points; but as nature has ordained the mare to mould and support the foal whilst a fœtus within her womb, it is particularly necessary that she should have wide and deep ribs, large and long hips and pelvis, that she may carry on the process of gestation and ultimate parturition without injury to herself or her progeny.

Breeding.—Here, also, I shall confine myself to a few practical remarks upon the horses best calculated for the present state of this country. They are these: first, a well blooded horse of from sixteen hands to sixteen hands two inches high, and weighing from twelve to fourteen hundred weight, with a view to improve the blood, and breed horses calculated for trotting and fast work. Secondly, a horse of from sixteen hands two inches to sixteen hands three inches high, and weighing from sixteen to eighteen hundred weight, with indications of as good and careful breeding as the first, though not of the same blood; for though some may doubt me, yet I have seen horses in England—even weighing from seventeen to twenty hundred weight—with the fine head, thin skin, and perfect form of the blood horse. This horse I would choose as likely to breed horses calculated for farm purposes, railroad carrying, and similar quick though heavy draught work. With reference to the mares for the first horse, I should select as well blooded ones, and as near his size and perfect form, as I could find; and there are many such in this country of sufficient quality, if carefully selected. For the other horse I should not be particular of what breed, providing they were of sufficient size, and had the large ribs and hind parts—the requisites of a brood mare; and were, in fact, what are called good roving mares.

In selecting animals to breed from, great care should be taken that they are free from disease of any kind, or if any exist, that it can clearly be traced to an accident, and not from congenital malformation, hereditary predisposition, or natural weakness of the part. Temper, also, should be considered, for it is an undoubted law of nature, that 'like begets like;' therefore breeders should be particularly careful not to breed from animals with qualifications they would not wish the animals to transmit to their progeny. The best time of the year at which to put the mare to the horse is early in June, so that the foal may be dropped in May; the weather by that time being sufficiently warm, and it allows time for the colt to become strong enough to resist the attack of the flies in summer, and the cold of the ensuing winter. I have been told, and have tried, many recipes and nostrums to insure a mare being stinted after taking the horse, but have never found any to succeed other than feeding, &c.

THE FEEDING AND GENERAL MANAGEMENT.—On this subject I think I cannot do better than to take a mare to the horse, breed a foal, and then follow it on to the full grown horse. The mare, then, should not be too fat, having been previously, for a week or two, prepared by a little spring grass; and, if a working mare, by a diminution in the quantity of grain fed; or, if in a city where grass cannot be easily obtained, by a bran mash given daily, which may be made by pouring boiling water on a quart or two of bran, with a handful of oats, and given when sufficiently cool; also the administration of a small dose of aloes, from one to four drachms, varying according to the size of the animal. She then being at use may be taken to the horse, and upon her return placed in a quiet paddock or loose box, for eight or nine days, and the cooling diet continued. She should then be again tried, and if not at use, we may fairly conclude she is stinted, and may be worked or not at pleasure; requiring no particular attention until the fifth monht, when she should receive a liberal allowance of grain and all her food be of the best quality—quality and quantity being what is required; for having to support both herself and fœtus, a stimulative and nutricious diet will materially assist the development of the latter; and if worked at all she should be used quietly up to the last month, when she should be turned loose in a paddock or placed in a loose box, with a succulent though nutricious diet—such as cut grass, chopped carrots, mashes, &c., and a diminution in the quantity of grain until after foaling, when it may be continued. The mare should be allowed to run with the colt for three or four weeks, when she may be worked lightly, but the colt must be shut up, and upon no consideration allowed to run by the side of its mother, for while the bones and sinews are soft the slightest concussion will cause ring-bones, strained tendons, curbs, and many other ailments, that the colts of this country are subject to; and which, I believe, arise chiefly from the foolish habit of allowing them to run on the hard road and plowed ground by the side of their dams, independently of the annoyance of running in people's way, and their liability to accident.

The colt will not require any other food than the dam's milk, and what grass it can eat, until the sixth month, when it should be weaned, for the mother's sake, if she is again in foal; and also on account of the colt itself; for by this time not only will the milk have deteriorated in quality, but the stomach and bowels of the colt will have undergone a change, so that they will not be adapted for a milk diet, which would disarrange their natural functions, causing acid secretions, the formation of worms and other parasites, leading to an attack of inflammation, and a train of other bad symptoms, ultimately terminating in death. The colt being weaned, will require a liberal supply of some kind of grain and other food—I prefer oats and good meadow hay. As with the mare, I leave the quantity to the judgment of the individual, so much depending upon the size and temperament of the animal, and other circumstances. It should also have a halter put upon it every day, and be lead about for a few minutes; and though the lesson be ever so short, it will make the colt tractable and accustomed to being handled. It will now be a year old, and if a colt foal, should be castrated; but as this is so like his sire, and as good stallions are so much needed in this country, I will keep him for a stock horse, and continue the treatment, increasing gradually the quantity of grain, except in the summer, when the quantity and quality of the grass is very good, at which time it may be discontinued altogether. He will now be between three and four years old, and having had the dumb jockey on one or two hours a day for the last three months, and been backed occasionally, he will ride tolerably well, and be admired by every body. He will now, perhaps, be off his feed, with a slight cough and discharge from the nostrils, and an enlargement of the sublingual glands between the jaws—it is the strangles, or horse distemper; but do not be alarmed, for a little judicious management will soon put all to rights again. He should be put on a cool diet, have administered to him from one to two drachms of aloes, his mouth washed out three our four times a day with the following gargle: Potassæ nitras, four drachms; water, one quart, and a hot linseed poultice applied daily to his throat until it suppurates, when it should be carefully opened with a lancet, washed with warm water, and a small piece of lint inserted daily, to keep the wound open for a few days. A few weeks having elapsed, he may be broken for harness or saddle, as required, and worked lightly until five years old; when, having attained his full growth, he might, if intended, go into regular work; but as he is for a stud horse, he may commence covering; but should not exceed forty mares this season, and never at any time exceed eighty in any one season. He should be placed in a warm, loose box, have his coat thoroughly dressed every day, and be liberally supplied with oats, hay, and a little corn or beans of the best quality, and have a bucket of water always by him. This plan should be adopted with all horses; they would then neither drink so much, nor ever have a stomach full of water; a matter of considerable importance to stage horses, and those travelling fast or far. He should also be exercised regularly every day, and in the winter time, when not at work, have his grain reduced, and a yard to run into attached to his box, and never be allowed—or any other horse—to stand on hard, dry boards, which will inevitably cause internal disease in the feet, with its attendant lameness and contraction. Should his legs swell from high feeding or any other trifling cause, a mash with a desert spoonful of flowers of sulphur and nitrate of potassa for a few days, would put all to rights.

The general management of a gelding or mare would be the same, up to five years old; and they would be worth from two to five hundred dollars; and this, as a stud-horse, from one to two thousand dollars. Now, I am sure these prices would pay a farmer better for his time and attention, than the brute raised from a bad two years old filly, and sired by a worse yearling colt; for such an one it costs as much to raise, with the exception of the attention, and when raised it is not worth forty dollars. My horse would have covered mares, and got colts too, much sooner; but I valued him too much to spoil him, which I trust I have not done; if I have, I must ask your forbearance, for it has not been done willingly, but from a want of ability to describe him.

AN ESSAY ON REARING SHEEP AND GROWING WOOL.

BY T. C. PETERS, DARIEN, N. Y.

I readily comply with a request, officially communicated to me from the Agricultural Society of Wisconsin, to prepare for its Annual Transactions an article on the above subject. My engagements have been such, that I could not devote as much time as was desirable to its preparation;

and while it contains nothing, perhaps, that is new to the experienced wool grower, yet to many there will be found information that is valuable.

I propose to consider the breeds of sheep; their management in summer and winter; and their diseases.

THE DIFFERENT BREEDS.

To those who wish to go into a history of the various breeds of sheep, so far as is known in the habitable globe, Youatt's valuable treatise on sheep can be studied to advantage, and much valuable information will be found in the "American Shepherd," and in "Sheep Husbandry for the South." But for all practical purposes it is not necessary to look out of our own country for a variety of breeds; and it is probable, that the general experience of the country has designated those breeds which are the most profitable in certain and peculiar locations. We have now the common sheep, originally of English origin; the Merino; the Saxon; the long-wooled English sheep, as the Cotswold, Leicestershire, or Bakewell; and the short-wooled, as the South Down. Then we have the French, and the Prussian—the latter of recent importation, but both to be classed with the fine-wooled species.

These different varieties are very naturally and properly divided into two classes. The first, fine-wooled where wool is the primary, and carcass the secondary object. The second, coarse-wooled, where carcass is the first and the wool the second object.

Natural causes seem to lead to this division, and the experience of the best breeders, running through a long number of years, has established the fact, that no breed has yet been found that would combine the desired characteristics of the two classes. The important requisites for excellence in each class are opposed to the profitable amalgamation of the kinds. A requisite, and an important one too, in a fine-wooled sheep is, that the wool be more or less oily, and it is one of the best evidences of the purity and excellence of the breed that the wool is filled with a fine oil, which hardens upon the outside of the fleece and becomes gum. This oil is found to be but another form of the feet of the animal. On the other hand, coarse-wooled sheep should not secrete any oil in the wool, and if coarse-wool be found oily it is an evidence against the purity of blood, and deteriorates from its value. The value of the coarse-wooled breeds consists in early maturity, and in the cheapness and facility whereby they may be fattened. It is obvious, then, that if a sheep secrete the feet-forming principle of its food within the body, rather than upon its covering, a serious waste is prevented. It is, then, more profitable to make mutton with coarse-wooled than with fine-wooled sheep—though, at maturity, fine-wooled sheep make excellent mutton, but always at a greater expense than the coarse. I am aware, that there are those who would palm off upon the inexperienced, sheep at high prices, which they claim possess all the valuable qualities of a mutton, and a fine-wooled sheep. No man should allow himself to be deceived by any such absurdity.

Fine-Wooled Sheep.—*The Merino.*—All fine-wooled sheep should properly be classed as Merino, for that breed is properly the origin of the several varieties before named. (It is the most remarkable of all the animals which a kind Providence has given to man for his necessities or his luxuries. Its origin is undoubtedly contemporaneous with the ox and horse, and most, if not all the animals which are now domesticated.) There is no reason to doubt that the Merino, as a distinct breed, existed and comprised the flocks of the patriarchs thousands of years ago. Until within a few years it was supposed it had been matured and perfected in Spain, but more recent investigations show conclusively that fine-wooled sheep existed in Greece long before Spain was settled other than by barbarians. (That fine-wooled sheep now exist in Persia and the interior of Asia, which are almost identical with the Merino of the present day in the shape and form of the carcass, and in the beautiful texture and softness of the fleece. The Merino is undoubtedly a distinct breed, possessing qualities peculiar to itself, which may be more or less transmitted to other breeds, but which, in its purity, will always characterize the breed in whatever country or climate found.) One of its peculiarities is the retention of its fineness of wool in all climates. Within the last fifty years it has been carried into all the various climates of the earth, and in the North as far as Sweden, in Germany, Northern and Southern Russia. In all the climates of the Union, in the tropical regions of South America, and in Australia, and yet the wool from all comes back the same. (So little attention has been paid to the subject, that it is only within a very short time that people would believe, fine wool could be grown in a warm climate, even in our country. But experience has clearly shown that the Merino will yield its treasures in any climate with proper care. Its introduction into this country some forty or fifty years ago was a blessing which we have not yet learned to properly appreciate, and we owe it in a great degree to Mr. Jarvis, Col. Humphries, and Chancellor Livingston. These gentlemen imbued with a spirit of patriotism in those days by no means rare, with much trouble and expense, set the example, which was afterwards followed to a considerable extent, and the Spanish Merino became an established breed in the country, and should henceforth be known as the *Merino*, or if there must be any distinction let it be called the *American* Merino. I, however, approve of no prefix, but merely the *Merino*.

The Merino is described as "long in the limbs, but the bone is small, the breast and back narrow, and the sides rather flat. The fore shoulders and bosoms are heavy, and the skin under the throat loose and flabby or indeed pendulous, the forehead and cheeks are covered with coarse, long hair, but the lower part of the face is smooth and velvety, the head is large, the forehead rather low." This is the general appearance of the sheep, but when in the hands of skilful and judicious breeders they are made to assume a form compact and graceful; and the same author (Martin) says that among their defects is the fact "that they consume a large quantity of food without assuming a proportionate degree of condition." If he had been better observant of the natural history of the sheep, he would have found that what the mutton growers considered a defect, the fine-wool grower considered the reverse; for to that very reason is traced the fineness and beauty of the wool.

The importations of Merinos embraced individuals from the best of the various noted flocks in Spain, and having been bred together indiscriminately in this country, there is no full or pure blood of any of them, and whoever asserts that he has pure Paulers, or Negrettes, or Montarces, or Escurials, does so only to deceive. From any high bred flock individuals having the characterestics of each of the above may be found, and by careful selection the flock may be bred towards the heavy dark-wooled and wrinkly Negrette, or to the lighter and clean throated Escurial. It is probable that the amalgamation of the breed of the different flocks has been productive of good, by giving a stronger constitution, and more wool.

The Saxon.—This congener of the Merino was undoubtedly derived from the flock of the Escurial, the finest in Spain, at the time of the German importation. It is described as less hardy than the other breeds, but of symmetrical form, and having a fleece of surpassing fineness. In the hands of the Germans it has been the beautiful Saxon, the paragon of fine-wooled sheep. Great injustice has been done the breed in former years by importations of grade animals. Experience has demonstrated that in the hands of careful and judicious breeders, this breed had been so improved in its constitution, as to become acclimated in the most rigorous portions of the Union. And did the price of its wool invite the extension of its growth the Saxon of the present day would be found to stand side by side with the Merino in any region. It is much to be regretted that the wool of the Saxony does not bear a price in proportion to its value as compared with other wool. And it is yet to be hoped that fashion will raise the fabric of the exquisite Saxon staple, from the oblivion which now envelopes it. Experience has shown that the fineness of the fleece may be retained, and at the same time the weight increased. And I believe that the time is not distant when four pounds will be found as common a yield for the Saxon as six is for the Merino.

There are innumerable grades of fine-wooled sheep, some being grades between the Saxon and Merino, some having more or less of the blood of one or the other breed preponderating. Perhaps the wool most sought for by the manufacturer is a grade ranging from half to three quarter blood between the Saxon and Merino.

French Sheep.—These sheep should be classed as fine-wool. There is much doubt and controversy as to the true qualities of these sheep. Many of them approximate the Merino, and bear a beautiful wool, but it is not to be disguised that very large numbers, especially of the large specimens of the breed, are only a grade sheep. Crosses have been made upon our fine-wooled sheep, but as yet not enough has been done to warrant classing them with the Merinos. If the judicious flock-master cross with them at all, he will do it with great caution.

Silesian Sheep.—It is but quite recently that the attention of breeders have been turned to this sheep, and but few have as yet been imported

They are a pure Merino, generally fine-wooled; but not as heavy shearers as the American Merino. The few that have been imported are in the hands of some of our best breeders, and it will not be long before their merits will be tested.

COARSE-WOOLED SHEEP.—There are many varieties of coarse-wooled sheep. But in this country they are principally known as the common, the long-wooled and short-wooled kinds.

The Long-wooled are principally of the Bakewell, or perhaps more properly the Cotswold and Leicester breeds. They are a large sheep, with coarse, long wool. Their great value is as a mutton sheep, and from their tendency to early maturity, and the ease of fattening them, they are among the most valuable breeds for the shambles. Their treatment is essentially different in many respects from that of the fine-wooled kinds.

The Short-wooled include the common and the South Down. Of the Common sheep little need be said, as they are fast disappearing in other kinds.

The South Down is also eminently a mutton sheep, and as such well worth the attention of those who find mutton more profitable than wool. The wool of this kind is not as valuable as that of the other variety.

These are all the distinct breeds which are found in our country, and they are mixed in every possible degree.

SUMMER MANAGEMENT.

The key to the successful management of sheep is found *in good keeping and care.* It matters little what breed a man has, if he be negligent in attention to them. No animal better repays care—none sooner becomes unprofitable by neglect. If you wish sheep to winter well, they must be well summered. If you wish for heavy fleeces, you must begin in the summer, even before the sheep are shorn. To have them healthy—and without health they are of little use—they must have dry land pasturage, not rank, but short and sweet. While cattle delight in a rank growth of grass, sheep want it fresh but not high; and on artificial pastures just enough should be kept to keep the grass from a strong and rank growth, but not so many as to keep the sward bare. The number to the acre can be best determined by the locality. They should have salt as often as once a week, and it will do them no hurt to feed about an ounce of sulphur to an hundred monthly. To ewes in lamb it is thought by many not advisable to feed it. Another thing very essential to the health and comfort of sheep, is to furnish them with high and dry places to sleep nights, and shelter in hot weather. No animal is so sensitive to the bad effects of a damp atmosphere as the sheep, and they particularly shun all low and damp places for their lairs or sleeping-grounds. Another precaution, which is equally important both in summer and winter, and that is, not to keep too many in a flock. If they have a wide range, and are Merinos and Saxons, from one hundred to three hundred may do for summer, provided they are of equal strength; but weak and strong ones should not be permitted to herd together. My own experience has been to keep the ages as separate as possible. Thus my lambs are weaned and wintered alone; my yearlings are kept separate summer and winter; my two years old the same. Older than two I let run together, only selecting out, from time to time, the weaker ones, and putting them by themselves, or with a younger flock. A little attention to the habits of the sheep will soon learn the farmer what they desire for their health in his location. But care, *care*, CARE! Look to them often. Take care of your sheep, and they will take care of you.

Coarse-wooled sheep should be kept in very small flocks. I refer to the long-wooled kinds. And above all, they should not be permitted to run with other kinds. They require a much larger amount of food than a fine-wooled sheep, and must therefore have a wider range of territory to gather it from.

If the grass fail in the autumn, before it is time to go into winter quarters, it will be important to have a supply of other food. A little grain then is worth more than at any other time in the year. Indeed, as soon as the nights begin to be frosty, it will pay well to begin with a light feed of corn or oats. A peck of shelled corn to one hundred daily would be of more real service than double that amount later. Where corn can be so easily raised as in the West, it is one of the best and cheapest kinds of grain that the wool-grower can have.

WINTER MANAGEMENT.

If the sheep have been well summered, they are half wintered. But if they come to the yard thin and weak, the careless owner may make up his mind that he will have pelts or pulled wool to sell in the spring. The flock should be well sorted if a large one, and all the weaker ones put out, so that they can be better cared for. Those ewes intended to breed should also be put out; and, unless in small flocks, no ewe should be permitted to drop her first lamb until her third year. When there are but few, and they are well attended to, it may do to stint them to the ram in their first year; but the practice is not a good one among fine-wooled sheep. With the large long-wooled breeds it is different; though even these I should prefer to give another year's growth.

Whatever may be the condition of the sheep, let no man flatter himself that he has got ready for winter unless he has provided ample sheds for their accommodation. Sheep cannot be profitably kept or wintered without them. And if the farmer is not prepared with sheds, he had better let sheep alone. The shed, however, need not be an expensive one. A bank of turf, four feet high, will form a good wall, and poles or rails, resting one end on the bank and the other on a pole some seven feet high from the ground, will form the foundation; cover this with straw or coarse grass, and your shed is complete. All the sheep asks from you is a *dry* place, not a warm one. It will stand any amount of cold, but it must be dry. If the farmer have any doubts on this subject, it would be well for him to get his clothes thoroughly wet, and then stand out of doors in a cold, driving wind. The experiment once tried, if he be a humane man, he will never after neglect to provide ample sheds for his stock. The sheds should be so arranged as to be able to fodder the sheep under them when wet. But while they should have shelter, they must not be crowded too closely. One hundred is as many as ever ought to be wintered in a flock, and they should have free access to fresh air and to water. No animal suffers sooner from a confined, bad air, or seems to relish the pure, fresh air so well as the sheep; and no animal, not even excepting man, is so naturally neat and cleanly in its habits, or so dainty in its tastes. The expense of providing sheds, even where lumber and timber is scarce, is so small in comparison to the advantage, that no man should think of wintering sheep without them. It is not necessary to have barns, for sheep like their hay quite as well from a stack as from the mow. Sheds and yards, however, must be kept dry with fresh litter, always bearing in mind that in every situation the sheep must be kept dry. Where economy is any object, racks and feeding-troughs are indispensable. The trough is best made by nailing two boards, one six and the other seven inches wide, forming a V, and making legs to it, or simply notching it into a block for each end. The racks are of an endless variety, governed in their construction more, perhaps, by the cheapness of lumber than any other consideration. Of all that I have thus far used, if under shelter, I prefer the Geddes rack. It is, however, expensive in the outset, as requiring considerable lumber and a good mechanic to construct them. Perhaps, for a new country, no rack is so good, under all circumstances, as the common box rack; a round pole, or square, four feet long, and equal to a 4 x 4 scantling, will answer for a post; four of these posts form the foundation of the rack; three feet is as wide as is necessary, and the length may be governed by your poles or boards. Build it in any way that will keep the sheep out, and yet give them access to the hay on each side. Sheep require salt in winter as well as in summer. It is a very bad plan to salt hay. Salt your grain, mows, or stacks freely, but keep it off your hay.

Having provided good shelter, convenient racks and troughs, see that the sheep are fed daily, and as near as possible at the same hour. They should have hay or straw twice a day, and a peck of corn to each hundred once a day; although a small feed, yet, if evenly distributed, it will be found of great service; more will not do harm, and, when plenty, a half bushel would be better for store sheep, but even so small a quantity as eight quarts a day will tell sensibly upon one hundred sheep. If grain be fed, it should be commenced early in the season, as by beginning to feed late the wool is apt to start and come out badly before shearing time.

As the tuping of the ewes comes in winter, it will be proper to treat of it under that head. Whatever your breed, you must have a good ram or you will not long have a good flock. Where there are not more than one or two hundred ewes it will pay well to use but one or two rams, unless it is desirable to get a variety of some choice breed. My practice is to bring my ewes into a yard daily, commencing about the first of December, so that the lambs may drop in May. The yard is subdivided so that each ram has a share of the ewes. The rams are then let out, and a man attends them; as soon as a ewe is once served, she is marked with the same mark as the ram and put out. I have found this an easier way than to use a teaser, and quite as effectual. If the sheep are in small yards, the ram does not get fatigued. I take them up about two o'clock, and turn the ewes out. Those that have been marked are turned away by themselves. I follow this till the first of January, when the rams are put away for the winter. I never allow my rams to run with the ewes at any time, summer or winter. I also take great care to keep my rams in good condition, and feed freely during the tuping season. I used three rams this season for two hundred and thirty ewes, but one, being a yearling and untried, I only allowed thirty ewes to be stinted to him, so that the two others served one hundred each, and were not sensibly affected in their flesh by their labor. In addition to serving my own flock they also served some fifteen each for my neighbors. It may be well to say that my flock is Merino. Let it be borne in mind, that much of the future value of a flock depends upon a generous supply of food to the ewe, not only during pregnancy, but also until the weaning of the lamb.

With the coarse-wooled sheep I should recommend a somewhat different mode of treatment. Where but a few are kept the ewe should be stinted to the ram early in August, if possible, so that the lamb might be dropped early in January. Good warm shelter should be prepared, and also a good supply of roots, or bran, or shorts, laid in. Roots and meal, however, would be the cheapest and best. As soon as the lamb has got strength enough to stand up well, usually the third or fourth day, let the ewe have a good supply of meal and roots, being guided by her size and condition. Patatoes, beets, carrots, or rutabagas, will be, any of them, useful, the object being to give a full flow of milk. By this means a lamb is raised for the early market, which by the first of June will command from three dollars to five dollars, according to size and condition. Early lambs near large towns will always command high prices. The ewes having their lambs taken away so early will get in high condition, and may be sold, if desirable, as fat sheep.

In fattening sheep during the winter, all that has been said relative to shelter and care, in relation to store sheep, is equally applicable. But in addition, to fatten sheep profitably, they ought not to be kept in larger flocks than twenty-five. And although it will require more labor to prepare the yards yet it will be amply compensated by the better condition of the sheep. I know that it is the custom to feed in large flocks, but I also know that it costs at least one-third more to bring all the sheep into good marketable condition than if fed in small lots, and were I to engage in fattening sheep I should divide them into flocks of ten rather than a larger number. The best age to fatten is, in coarse-wooled, at three years old, and fine-wooled at five.

More care is required in wintering lambs than any other part of the flock. As soon as weaned, which with me is done at four months old, they should be put into good pasture, and early learned to eat grain, oats, peas, barley, or even corn will do. But when bran can be obtained it is still better; a very little will suffice them, and will be of great service in preparing for winter. In winter they should be kept by themselves, and have a dry warm shed and plenty of hay besides their grain. If linseed oil-cake be at hand, it makes an excellent feed for the lambs as well as the fattening sheep.

If stinted to the ram in December, the lambs will begin to drop in May. Care should be taken that the ewes are well attended during the lambing season. And when it is an object to keep a register of the flock, and the pedigree of the stock, the lamb should be marked with the number of its dam, soon after it is dropped. It is a good plan to cut off their tails when not more than four weeks old. And if convenient all the lambs to be castrated, should have it done at as early a day as possible.

Before turning the sheep out to pasture in the spring they should be tagged. It takes but little time if properly performed, and but little wool need be wasted. It is then a good time to examine the sheep and mark such as have desirable peculiarities, or the reverse.

As soon as the weather and water get warm, it is well to wash the sheep. This may be done in a pool or running stream; but wherever done, the water should be clean, and great pains taken that the sheep are not injured in the handling. If the sheep be weak, the water should be sqeezed out of the fleece before they are let go. However, always having before him the word CARE, the prudent farmer will require no advice in the details of managing his flock.

Shearing should take place, if convenient, in about two weeks after washing. Sheep-shearing is always, and from time out of mind has always, been considered an important era. It is truly so to man and beast. Few directions are necessary at this day, and in the West. The sheep should be handled carefully, and the shearer should not be permitted to cut the sheep, rather than the wool. No good shearer will haggle up the sheep, and a poor one is a nuisance. The rolling and tying up of the fleece in any particular manner, is more a matter of taste and convenience than importance, so that it is tied up with the flesh side out, and sufficiently compact to keep together till in the rack, is almost all that is required.

But shearing-time, to the careful flock-master, who has set his mind upon the improvement of his flock, and is anxious to have a pure and valuable breed of sheep, is one of anxiety and care, and the most important of all the year. It is now, by the examination of the matured fleece, that he is to ascertain whether he has been successful in his attempts at improvement. Now is the time to carefully select and to thoroughly examine, so that if he have been successful he may follow up his success, and if at fault, he may detect the fault, and apply the remedy. Each ewe is carefully examined, both while in the hands of the shearer and when the fleece is off, and a mark put upon her to denote the quality and quantity. A register is kept, and all the defects, as well as the good qualities, registered; for it is from this point that he takes his departure for another year. As with the ewes, so with the rams. It is only by this care and attention that a flock can be improved or kept up. I am free to confess that there is no part of the year to me so mentally laborious as that of shearing-time. After shearing, sheep should have, if possible, the advantage of shelter, or shade, for a few days, and if cold rains set in, they should be sheltered.

DISEASES.

When sheep are well kept and cared for they are liable to few or no diseases. Two only require any notice—the scab and foot rot. The scab is to the sheep what itch is to humans, and may be cured in the same manner. It may be known by the sheep rubbing and biting its wool. The remedy is simple, and if thoroughly applied, entirely effective. Make a strong decoction of tobacco juice, open the wool, and with a stiff shoe brush apply the juice and rub it over all the affected parts, which may be easily detected by the appearance of the skin, with the brush. If well done, the first application will cure; but if not, the second will. After shearing, dip all your sheep in tobacco juice, and the scab will not trouble you any longer. The foot rot will always more or less affect flocks which are compelled to feed on moist land, or to pass often through wet swampy places. The cure is easy, if attended to in time. Take all the lame sheep into a dry yard, with a *sharp* knife pare off all the hoof where there is the least appearance of matter, and until you come to a healthy looking flesh or hoof. Take a pound of blue vitriol or sulphate of copper and put into a quart bottle, fill up with rain or river water, put a goose quill through the cork, and after it has stood for a few hours it is ready for use. After clearing the foot, apply this slowly and carefully so that every part is reached by the solution. Let your sheep go on to dry ground. Examine it the week after, and if the work has been well done, the sheep is cured. There is a great variety of quack medicines to cure foot rot, but they are humbugs all. Blue vitriol, or as it is known at the druggists, sulphate of copper, dissolved in pure water is the cheapest, safest and best remedy that experience has yet discovered for this disease. But without thoroughly paring off the hoof nothing will cure the disease; that done, and little else is necessary except dry ground. The best remedy for all other diseases is good keeping, salt freely, and sulphur occasionally.

I have endeavored to condense into as small a space as possible all that might be of real service to the wool grower. If I have done the cause any service I shall be gratified. Of the importance of wool growing I have said but little, but I am well satisfied that there is no locality where sheep in large or small flocks may not be profitably kept; and it will be many, very many years yet before it will not, as a general thing, equal any other branch of business adopted on the farm.

The annual consumption of wool in this country is equal to six pounds to every inhabitant, which would give at least one hundred and fifty millions of pounds, requiring at least fifty millions of grown sheep to produce it. The last census shows that we possess only about twenty millions. Of the wool consumed, we grow at home fifty millions; we import about twenty-five millions more in the unmanufactured state. This will make seventy-five millions of pounds which is manufactured here, while the other seventy-five millions is imported in the shape of manufactured goods. Taking the price at the average of our wool for the last two years it would give at least thirty millions of dollars as the amount the farmers would have saved to the country if they had a full supply of sheep. With the increase of population to the extent of at least a million annually, and a large and increasing consumption of mutton in all the cities and large towns—the city of New York alone averaging over twelve thousand sheep a week—there is no fear of a dull market for wool or mutton.

After nearly a quarter of a century's experience, I can safely say that no money has been made so easily or so cheaply on the farm as that by means of my sheep. In the spring when your barns are empty, your stacks gone, you see their value soon to come back from the golden fleeces which the quiet sheep has been maturing for you during all the long winter, and which is yielded up to you with pleasure. And in the autumn the increase of the flock comes again to replenish your pockets. I acknowledge a stronger attachment to the sheep than to any other animal. My flock is my pet, and, unlike many pets, it pays me bountifully for my care.

DARIEN, N. Y., February, 1854.

VEGETABLE PHYSIOLOGY CONSIDERED IN ITS APPLICATION TO THE CULTURE OF FARM PLANTS.

BY JOHN TOWNLEY, MOUNDVILLE.

"Nature is not to be conquered except by obeying her."—BACON.

A number of intelligent and enterprising farmers living in the several counties surrounding London, and who are in the habit of attending the London Market, formed themselves into a club. One chief object they had in view was mutual instruction, lectures are delivered, or papers read on farming matters by members or others at stated periods, and a discussion usually follows, in which the views advanced are criticised by members present, and some general conclusion arrived at. I learn by a recent number of the Agricultural Gazette, that at the monthly meeting of the London Farmer's Club, held on the 7th of November last, Mr. Baker, of Writtle, one of the most eminent practical farmers of Britain, delivered "a very admirable lecture" on the benefits which science had conferred on agriculture. The lecturer gave a rapid sketch of the relation in which the different sciences stand to the practice of the farmer, and recited the many instances in geology, chemistry, botany entomology, mechanics, architecture, &c., where farm management had been improved by the suggestions and discoveries of scientific men. At the close of the discussion which ensued, Mr. Fisher Hobbs, a name familiar to many farmers in the United States, proposed the following resolution, which was unanimously adopted by the club: "That the influence of science on agriculture has been to increase the produce of the soil, and that, as during the present century, great strides in agricultural improvement have taken place by the aid of chemistry, geology, and other departments of science, so by the happy union of practice with science, it is believed that still greater advances will be effected."

I apprehend that no one who is acquainted with the history of farming during the present century, can doubt for a moment the soundness of the conclusion arrived at by the London Farmers' Club. The advantages resulting from an union of practice with science are indeed so self-evident and indisputable that "it is now considered simply an impertinence in the eyes of every intelligent man to attempt a labored proof of the usefulness of science." If we call to mind, for instance, the state of the sister art of gardening only twenty years ago, and compare it with what is now effected, and if we consider further that the great improvements made in the culture of garden plants is owing chiefly to gardeners as a class, having acquired a knowledge of the laws of vegetable life—what plants feed upon—whence they obtain their food—how it is digested and assimilated—what are the functions of roots, leaves, flowers of fruit, and what the action of light, heat and moisture on the development of the growing plant, we must be led to conclude, that knowledge of this kind should be valuable to the farmer also. Under this impression I venture to send you a necessarily brief outline of vegetable physiology, considered more especially with reference to the culture of agricultural plants.

"The power of man over nature," says Sir John Herschell, "is limited by the one condition, it must be exercised in conformity with the laws of nature." Before we can exercise that power with certainty and effect, we should understand these laws. It is true, indeed, that by the accumulated experience of ages, farmers are able to produce successful results without knowing or being able to explain the cause on which the success of their operations depends. The early Egyptians, long before the sexual distinctions of plants were understood, had somehow discovered that in order to have perfect fruit on their Date Palms, which have the male and female flowers on separate plants, it was requisite to bring the male flowers to the fruit-bearing trees. Their knowledge was empirical; they knew nothing about the parts of the plant concerned in the process, or by what means the result was produced. They consequently, in like manner, brought wild Fig-trees in contact with those they cultivated, supposing the effect would be the same; but in the Fig the male and female organs are both present. The earlier ripening of their fruit resulting from this practice was caused by the puncture of an insect brought with the wild Fig from the woods, not to the fertilization of the seed as in the case of the Date Palm. But no sooner was the important fact discovered that all flowering plants have sexual organs, that most have the two sexes united in the same flower, and that a limited number have the two sexes, as in the Date Palm, on two separate plants, than men were able to take a comprehensive view of the whole subject, to understand why the barren flowers of the Date Palm were required to fertilize the seeds of the fruit-bearing plant, and that the same means were required to fertilize the seeds and to obtain perfect fruit of all other unisexual plants. A knowledge of general principles is not only useful as explaining successful practice and preventing us from making mistakes by endeavoring to accomplish certain objects by means opposed to the laws of nature, but it is especially valuable as suggestive of further improvement. A knowledge of the sexes of plants, for instance, led to the important inquiry whether by removing the stamens of a flower before they had reached maturity, its embryo seeds might not be fertilized by the stamens of another nearly allied plant; and if so, whether we might not, as in the animal kingdom, blend the good properties of the two parents in the offspring, and thus effect a more rapid improvement of useful and ornamental plants than by the ordinary method of selection through successive generations; when tested experimentally, this proved to be the case; and he, who I believe first turned this knowledge to a practical account, Andrew Knight, has been gathered to his fathers but a few years, yet how marvellous and how rapid has been the improvement already effected in some plants by this means! How great was the power of man acquired over nature by this simple interpretation of nature's laws!

I have considered it advisable, in the first place, to give a very brief outline of the structure of the organs of plants, considering that by this means their functions and uses may be better understood. In compiling this essay, I have consulted the works on general botany and physiology, of Knight, Lindley, Henfrey, Grey and Balfour; and Johnston, Liebig and Solly's works on agricultural chemistry. Much useful information has also been derived from Lindley's Gardeners' Chronicle, Downing's Horticulturist, and other periodicals and works on farming.

A plant in all its parts consists of minute cells or tubes, to which the general name of tissue is given. Tissue is divided into two kinds, cellular and vascular. Cellular tissue consists of small cavities or vesicles, whose length does not greatly exceed their breadth. Vascular tissue consists of similar cavities or tubes which are more or less elongated. These variously modified or combined constitute the elementary organs of plants, out of which the compound organs are formed. Cellular tissue is the only elementary organ universally found in plants. The simplest kinds of plants, as mushrooms and sea-weeds, are composed entirely of cellular tissue. The pulpy and succulent parts of the higher tribes of plants contain much cellular tissue. The pith of trees and the medullary rays proceeding from the pith to the bark, and commonly known as the silver grain are composed of cellular tissue. The green part between the veins of leaves (parenchyma) is cellular tissue. It is the tissue first generated when the bark or wood is wounded; it forms the callus at the base of a cutting before roots are emitted. The points or extremities of roots consist of it alone, and from the cellular tissue of the medullary system, leaf-buds are generated. It is also the tissue in which various secretions, as starch, sugar, oil, &c., are deposited.

Vascular tissue consists of tubes whose length greatly exceeds their breadth. Woody fibre or ligneous tissue consists of long cylindrical spindle-shaped tubes, which adhere closely together and overlap each other at the ends. This tissue is found in the wood, in the veins of leaves, and in the inner bark. Its functions are to give strength to the plant and transmit fluids from the roots to the leaves. If we macerate a leaf in water, the comparatively soft cellular parenchyma may be easily separated from the tough veins of woody fibre. Flax and hemp consist of woody fibre and are obtained in this manner: "The finest thread of flax when magnified 180 times is found to be composed of a great number of tubes."—(Lindley.) Cotton is considered to be a form of cellular tissue.

Fibro-vascular tissue also consists of cylindrical tubes tapering to each end. The sides of the tubes are very much thinner than those of ligneous tissue, and they have a spiral fibre or fibres coiled up in their inside, they are found in the medullary sheath, in the veins of leaves, and in the petals of flowers. The spiral fibres are very elastic, and may be unrolled when stretched. By pulling asunder the petal of a rose across the veins, these fibres may be seen by the naked eye. Spiral vessels are supposed to convey air; they have been found to contain 7 or 8 per cent. more oxygen than the atmosphere.

Laticiferous tissue consists of branched tubes somewhat resembling the veins of animals. They occur in the inner bark, and contain a fluid called latex, which is often white, yellow, or reddish. Lindley says the use of this tissue is unknown. It is said to carry the latex to all the newly formed organs which are supposed to be nourished by it.

COMPOUND ORGANS.—The elementary organs, now briefly described with some modifications not requiring to be noticed here, are variously combined to form the compound organs. These may be considered as nutritive and reproductive. The nutritive consist of the stem, roots and leaves, which are occupied in the nourishment of the plant. The reproductive, the flower and fruit which produce new individuals.

Flowering plants are covered externally by a thin membrane, the epidermis. It consists of one or more layers of cellular tissue and covers all parts exposed to the air, excepting the stigma of the pistil and the extremities of newly-formed roots. The epidermis is itself covered by a very thin membrane, the cuticle. Plants growing in a dry climate have generally a very thick epidermis. It is comparatively thin on those plants which prefer damp, shady situations, and is entirely absent from leaves and other parts which live constantly under water. Hence it has been concluded that the use of the epidermis and cuticle is to protect the tissue in the interior of plants from the immediate action of the air.

The epidermis is pierced with small openings or mouths called stomata. They occur on the green parts of plants, especially leaves. They are said to open or close according to the hygrometric state of the atmosphere, and are considered to regulate evaporation and respiration, especially the former. The number on a square inch of leaf has been counted on many plants, and is found to vary very much in different species, and in different parts of the same plant. Stomata are most abundant generally on the under surface of leaves; many plants have no stomata on the upper surface. The grape-vine and the lilac for instance have none on the upper side, while the former has 13.600, and the latter 160,000 on the lower surface. When leaves grow vertically, the number of stomata is often equal on both sides. The spider-wort of our woods (Tradescantia) is said to have 200 on a square inch of the surface of each side of the leaf. Stomata are formed on the upper surface only of floating leaves, and they do not usually exist on leaves which are always submerged.

When a seed is sown, and the embryo-plant within it grows, tissue is developed in three directions, upwards, downwards, and horizontally. The part which developes upwards, seeking the light, is the ascending axis or stem around which the leaves are arranged; that which descends downwards, avoiding the light, is the descending axis or root; that horizontally is the medullary system; the part from which the two axes start is the crown or collar, and was formerly erroneously considered by some to be the seat of vegetable vitality. Plants are divided into three classes, according to the internal structure of their stems: exogens, ondogens, and acrogens. Exogens, or outside growers, to which class all the forest trees of the northern United States belong, increase in an outward direction, a layer of wood being formed each year on the outside of that of the year preceding; hence a cross section of the wood of an exogen exhibits a number of zones or circles, each indicating a year's growth. Endogens, or inside growers, as Palms, Indian Corn, and the grasses, increase by additions made internally. There is no distinction in the stems of these plants of pith, medullary rays, wood, and bark, as in exogens. The structure of the seeds as well as of the stems of these two classes of plants is different. The seed of an oxogen has two cotyledons or seed-lobes, hence they are called dicotyledons. Endogens have only one cotyledon, and are called monocotyledons. In a dicotyledonous plant the pith, composed of cellular tissue, occupies a great portion of the young stem. It is full of fluid, which is employed in the nourishment of the young shoot. After serving this temporary purpose, it dries up. Immediately surrounding the pith is the medullary sheath, a fibro-vascular layer of vessels, which extend into the leaves; beyond are bundles of porous and ligneous vessels, inserted like wedges between the medullary rays. In succeeding layers or circles of wood the medullary sheath is not repeated. Surrounding the wood is the bark, which consists of several layers. The liber, or inner bark, or bast layer, as it is sometimes called, from the use made of it, consists of elongated vessels chiefly; it increases by very thin layers on its inside, which may be separated from each other like the leaves of a book, hence the name liber. Next to the liber is the cellular envelope, consisting of cellular tissue. It is sometimes called the green bark, as the cells generally contain green coloring matter, called chlorophyle. It is not so extensively developed as the outer or suberous layer of bark, which forms the substance known as cork; outside of these layers is the epidermis, which serves a temporary purpose, and in time dries up and peels off.

The heart-wood, or duramen, of an exogenous tree is well known to be harder, more durable, and generally of a darker color than a few of the outside layers—the alburnum, or sap-wood. The difference is owing to the deposition of matter (sclerogen) in the tissue of the heart-wood; by digesting a piece of heart-wood in hot nitric acid, the coloring matter may be discharged. When the heart-wood is filled with secretions, it no longer performs any useful function; hence trees live many years after the centre of the trunk has decayed.

The structure of the root of an exogen is similar to that of the stem, but there is a difference in several important points. The stem has a distinct pith, but the root has none; it has, however, a distinct medullary system. In some instances, as in the Horse-chesnut, the pith does extend some distance into the root. Stems have a provision for a symmetrical arrangement of leaves and branches; leaf-buds being placed at regular intervals. No such provision occurs in roots; they ramify irregularly, partly according to the nature of the plant, and partly according to the nature of the soil. The fibrous roots of plants being so constructed as to grow most in that direction wherein they meet with most food. Stems in their young state are green, and are provided with stomata; subterranean roots are never green, and have no stomata. Aerial roots, as those of the highly interesting tribe of epiphytal orchids, which grow on the stems of trees in tropical countries, are green and possess stomata. Young stems increase or grow throughout their whole length. Roots have to make their way through substances which offer resistance to their progress, it is therefore wisely ordained that they shall lengthen exclusively by additions to their points. A plant absorbs nourishment from the soil exclusively, by the extremities of the young roots, called spongelets, or spongioles. Besides fixing the plant in the soil and absorbing fluids, roots are often reservoirs of nutriment stored up for the future wants of the plant; the roots of the carrot and turnip, for instance, contain a fund of organizable matter destined chiefly to feed the blossoms and seeds of the following summer.

Buds are of two kinds, leaf-buds and flower-buds. Leaf-buds contain the rudiments of branches, and are formed in the axils of leaves, in the angle formed between the stem and leaf. Many leaf-buds remain dormant; they do not, under ordinary circumstances, grow into branches. If we cut off the branches of a young tree, buds will be irregularly developed on the stem; these are called latent or adventitious buds; they are generated by the horizontal or medullary system. In temperate climates buds remain dormant during winter, and are protected by scales, which are modified leaves. Some-buds, as those of the horse chesnut, are coated with a resinous varnish; others, as the buds of the willow, are protected with a thick, downy covering. In tropical climates, where the temperature is not hurtful to the young bud, no such elaborate protection is needed, and in most cases none is provided.

Leaves are most important organs, and their structure and functions should be clearly understood by all cultivators of plants. A leaf is a continuation of the bark; the veins consist of vascular tissue; the spaces between the veins being filled up with cellular parenchyma. There are at least two setts of veins, as may be seen in skeleton leaves obtained by macerating leaves in water. The upper strata communicate with the medullary sheath of the wood, and contain spiral vessels and woody fibres. The lower strata is in connection with the bark, and consists of laticiferous and other vessels resembling those of the liber or inner bark. Leaves are commonly arranged on the stem in a spiral manner which enables them adequately to perform their functions, by exposing all alike to the action of light. The leaves of exogens are commonly arranged in cycles of five. If we take a freely developed branch of the apple or cherry, for instance, and pass a thread round the stem from leaf to leaf; when we reach the sixth we shall have made two spirals, and find that the sixth leaf is directly over the first, the seventh over the second, and the eleventh over the first and sixth.

The reproductive organs—the flower and fruit—are now considered to be leaf formations, variously modified to serve special purposes. A flower usually consists of four parts—1. the calyx; 2. the corolla; 3. the stamens; and 4. the pistil. The floral envelopes, calyx and corolla, are generally easily distinguished from each other in exogens. The calyx is on the outside, and usually green, while the corolla is mostly highly colored. In some plants there is only one whorl developed, and it is then considered to be the calyx, although it may be colored. The essential organs are the stamens and pistil. The stamens usually consist of two parts, the filament and the anther. These constitute the male apparatus of plants. The anther is a cellular case, which, when perfect, opens and discharges the pollen, a dust-like substance, by means of which the fertilization of the embryo seeds is accomplished. The pistil occupies the centre of the flower, and consists of one or more carpels or seed-vessels. The pistil may be divided into three parts, the ovary, the style, and the stigma. The ovary is the case containing the embryo seeds or ovules. The style is the part which connects the ovary with the stigma; it is not essential, and is sometimes absent The stigma is generally the summit of the pistil. It is the part which receives the influence of the pollen, and at the time of fertilization exudes a viscous fluid.

Most flowering plants have the stamens and pistils in the same flower, and are said to be perfect or hermaphrodite; others, as the hazel, melon, and corn, have the stamens and pistils in different flowers on the same plant; others, again, as hemp and the hop, have male flowers on one plant and female flowers on another. In some species, these three kinds of flowers are found on the same plant.

The conditions required for the germination of seeds are moisture, heat and access to air. Light appears to be injurious; darkness may therefore be considered necessary also. Seeds absorb a large quantity of water; the office of water, in the first place, is to soften the nutritive matters of the seed. The amount of heat required to excite the vitality of the seeds of different species of plants, varies considerably. Seeds of tropical plants require a high temperature to induce them to germinate. Air, or rather the oxygen of the air, is essential to germination. If seeds are buried deep, they do not vegetate. Some kinds retain their vitality for years when buried deep in the soil; hence it is no uncommon occurrence, when land has been subsoil-ploughed or deep-drained, for species of plants to appear, differing from those which had been observed in the same locality previously.

Seeds have been made to vegetate in a certain quantity of air by Saussure and others, who, by determining the composition of the air before and after germination, proved that germinating seeds absorb oxygen and give off carbonic acid. This gas is formed by oxygen combining with a portion of the carbon contained in the seed. By this chemical action heat is produced, and the comparatively insoluble starch of the seed is converted into soluble gum or sugar, upon which the embryo can feed. The process of converting barley into malt affords a familiar illustration of the chemicial changes induced by germination. When a seed begins to germinate, the radicle or primary root of the embryo first lengthens; in whatever position a seed may be placed the radicle invariably avoids the light and descends into the soil, and the plumule to which light is essential, as certainly ascends through the soil to the light. During germination a certain degree of heat and moisture and access to air, are the conditions required; when the cotyledons appear above ground, carbonic acid and light are essential to the further progress of the young plant.

Farmers generally know the importance of having what is commonly called a good seed bed, which is obtained when the soil is moderately moist, and can be well pulverized—made as mellow as an ash heap. If a soil is too wet either from heavy or continued rain, or want of draining, the temperature is reduced, the particles of soil pack or adhere closely together, and the quantity of air in the soil is thus diminished: The germination of seeds under these circumstances is retarded, and many perish without vegetating. In a moist soil well pulverized, the particles do not adhere so closely together, the spaces between are filled with air, and the temperature is higher, the germination of the seed is consequently more certain, and the vigor of the young plants greater than in the former case.

The depth at which seed should be sown varies to some extent with the kind of seed, and the character of the soil. If wheat is sown more than about one inch deep, it is found to have two setts of roots; which have been called the seminal and coronal roots. The former originate where the seed germinates, the latter from just below the surface of the soil, whether grain is sown deep or superficial. A hasty conclusion was formerly arrived at that the lower tier of roots served to provide the plant with nourishment during winter, when the surface soil was frozen. Col. Le Conteur, the author of a very useful treatise on the wheat plant, considering this notion to be plausible and consonant to common sense, ploughed in some fine Dantzic wheat about 7 or 8 inches deep. The consequence was that "a vast quantity of the seed rotted instead of germinating, and proved a very losing crop, much to his regret and mortification." Col. Le Conteur very justly remarks that 'nature has in some measure pointed out that wheat may be sown quite superficial, as self-sown wheat is frequently seen very rich and fine.' I suspect that the formation of these roots immediately below the surface is a well-directed effort of the plant to improve its position, and indicates the depth which it is most advisable to sow the seed. The bulbs of different species of plants are formed naturally at different depths in the soil, some resting on the surface, others being several inches below. A tulip forms its offsets or young bulbs usually at the base of the stem, but I have met with an instance where a tulip bulb had been planted too deep, and the fresh bulb, instead of being formed at the base of the stem, was situated two or three inches above. Some species of orchids have tuberous roots, usually two, one light and shrivelled, which has given existence to the growing plant; the other solid and forming, destined for the support of a plant in the following year. I once met with an orchid which had been buried too deep by drift, and whose young tuber, as in the case of the tulip, was formed at the side of the stem instead of at its base.

The effects of different depths of sowing on the germination of seeds was tested experimentally by Petri, who obtained the following results:

Seeds sown to the depth of	Came above ground in	No. of plants that came up.
½ inch.	11 days.	7-8ths.
1 inch.	12 days.	All.
2 inches.	18 days.	7-8ths.
3 inches.	20 days.	6-8ths.
4 inches.	21 days.	4-8ths.
5 inches.	22 days.	3-8ths.
6 inches.	23 days.	1-8th.

When germination has proceeded so far that the cotyledons or the seminal leaves appear above ground the young plants are nourished by food obtained from the soil and from the air. A moderate quantity of the various materials required may enable a plant to grow in a healthy condition, to build up its structure, and to propagate the species by perfecting seeds. But the object of the farmer is not to grow plants in a normal condition merely; his object is, or ought to be, to obtain the greatest amount of vegetable produce in the shape of leaves, roots, seeds, or fruit, at the least expense of land and labor, and without exhausting or impoverishing his soil. In order to accomplish this, he must feed his plants; to economise his food, it is desirable he should know what substances are required by them, whether all require the same substances, in the same or in different proportions; whether one substance is essential to the healthy and vigorous development of one plant which is not required by another.

He should know something of the origin of soils, what substances they naturally contain, and whence they are derived; he should be acquainted with the composition of manures and the means employed to increase their quantity and add to their value; he should know something of the physical or mechanical character, as well as of the chemical composition of soils, and what are the effects of texture, color and moisture on the temperature of soils and on the growth of plants. He should also know the form in which various substances are absorbed by plants, and which are the organs, and what the power by which the crude sap is digested and made fit to enter into the various forms of beauty and usefulness which exist in the vegetable kingdom.

Plants consist of water; of organic matters, certain gases, derived chiefly from the decomposition of animal and vegetable substances; and of inorganic or mineral matter. By drying in a bath or oven heated by boiling water, the per-centage of water in plants is ascertained. Potatoes contain about 4-5ths and the turnips about 9-10ths of their weight of water. By burning the dried plant in the open air, the organic constituents are burned away. The ash which remains is the inorganic matter, and consists chiefly of alkaline salts.

The organic elements of plants consists of carbon, oxygen, hydrogen, and nitrogen. Carbon constitutes from forty to fifty per cent. of plants in the dry state, commonly grown for food. It is found in plants in a much greater proportion than the other organic elements, and it was formerly considered to be the chief substance concerned in the nutrition of plants and the main cause of the difference in the fertility of different soils; latterly, however, it has been concluded that plants may obtain their carbon from the air, providing all other constituents required by them exist in the soil in an available condition. Charcoal, as is generally known, is an impure state of carbon; it is insoluble in water, and cannot therefore enter the plant in that state. Carbon is obtained by plants chiefly in combination with oxygen, as carbonic acid gas. It is absorbed by leaves in the gaseous state from the atmosphere, and along with water by the roots. Liebig, in his chemistry of agriculture and physiology, stated, that "when a plant is quite mature, and when the organs by which it obtains food from the atmosphere are formed, the carbonic acid of the soil is no longer required. During the heat of summer a plant derives its carbon exclusively from the atmosphere." On the first appearance of Liebig's work this statement gave rise to much controversy, and many doubted the accuracy of his views on this point. He mentions one fact which is somewhat difficult to reconcile with this conclusion. When stating that the products of a plant may vary according to the nature of the substances given it as food, he says, "a superabundance of carbon in the state of carbonic acid conveyed through the roots of plants, without being accompanied by nitrogen, cannot be converted into gluten, albumen, wood, or any other component part of an organ; but either it will be separated in the form of excrements, such as sugar, starch, oil, wax, resin or gum, or these substances will be deposited in greater or less quantity in cells. We know that the starch or potatoes increases when the soil contains much hamus, but decreases when the soil is manured with strong animal manure, although then the number of cells increases, the potatoes acquiring in the first place a mealy, in the second a soapy consistence." Late varieties of potatoes do not usually commence the formation of tubers till the growth of their stems is nearly complete and their leaves matured. The tubers are formed during the heat of summer chiefly; it is therefore clear, if the carbonic acid generated by the decaying humus or vegetable matter in the soil, is absorbed by the roots and the carbon deposited in the tubers as starch, that plants do not obtain their carbon during summer exclusively from the atmosphere; and we may also infer, that providing a soil was rich in carbonic acid, and that substances were also present affording nitrogen to the growing plants, then the carbonic acid of the soil, instead of being stored up as starch, &c., might be employed in the formation of wood, or gluten, or other substances in which nitrogen is an essential constituent.

Oxygen exists in the air as a gas; it forms about 21 per cent. of the atmosphere—eight out of nine lbs. of water consist of oxygen. It enters largely into the composition of rocks, and forms numerous combinations with many alimentary substances. It is the gas which supports animal life, combustion, &c. It is said to be appropriated by plants chiefly in combination with hydrogen as in water. Hydrogen forms one-ninth of the weight of water; it exists in the atmosphere, in small quantities, combined with nitrogen. Sulphuretted hydrogen and hydro-carbonates may afford hydrogen to plants. Nitrogen forms seventy-nine per cent. of the atmosphere; it is doubted whether plants can obtain nitrogen directly from the air, it is found in the soil and the air in combination with hydrogen forming ammonia. Ammonia is produced by the decomposition of animal and vegetable bodies, especially the former; it is considered to be the chief source whence plants derive their nitrogen, a most important element in the food of plants. These four substances constitute the organic part of vegetable and animal bodies. In vegetables used as food for man and cattle, they exist in the following different proportions in the plants in the dry state:

> Carbon forms nearly one half by weight.
> Oxygen rather more than one third.
> Hydrogen little more than five per cent.
> Nitrogen from two to four per cent.—JOHNSTON.

Many vegetable products, as starch, gum, and sugar, do not contain any nitrogen, and their use in the animal economy is to supply carbon for respiration, and to be stored up in the animal tissue, as fat. The muscles and blood of animals, the albumen or white of egg, and the caseine of milk, contain a certain proportion of nitrogen. The gluten of wheat and other products of plants, known as vegetable albumen and caseine, are similar in composition to animal fibrine, albumen and caseine; hence it is concluded that vegetable substances containing these nitrogenous, or azotized products, as they are usually called, are most essential food, especially for young growing animals. The composition of starch is 12 equivalents of carbon (C_{12}.) 10 equivalents of hydrogen (H_{10}.) and 10 equivalents of oxygen (O_{10}.) Cane sugar consists of $C_{12}\ H_9\ O_9$ plus 2 of water ($\bowtie$ 2 HO.) Gluten or fibrine, albumen and caseine have been found to contain the same proportions of carbon, hydrogen, oxygen and nitrogen, combined with different proportions of sulphur and phosphorus. The name of protein compounds has, in consequence, been given to them. Protein consists of $C_{48}\ H_{36}\ N_6\ O_{14}$. Gluten or fibrine is protein, plus sulphur ($\bowtie$ S) plus phosphorus ($\bowtie$ Ph.) Albumen is protein $\bowtie$ S_2 $\bowtie$ Ph. Caseine is protein $\bowtie$ S. As these azotized substances contain the same amount of nitrogen, chemists, instead of in all cases making a complete analysis of vegetable substances to determine their value as articles of food, simply burn a quantity of the perfectly dry plant and determine the per-centage of nitrogen which it contains, they thus obtain the per-centage of protein compounds.

The inorganic constituents of plants form a very small proportion of their whole weight, they are nevertheless of great importance. Different species growing in the same soil afford ashes which differ in quantity and composition; the difference being the greatest between plants which are not nearly related to each other. When a plant grows in a healthy condition and matures seeds, it has been found that the nature and proportions of its mineral matters are nearly alike, whatever may be the character of the soil on which it was grown. If, then, two plants of different genera are grown in a soil of known composition, and the analysis of their ashes proves that one had taken from the soil some substance in much greater proportion than the other, and that this difference in the composition of the ash invariably occurs; the conclusion to be arrived at is, that these substances in these relative proportions exercise some important function in the economy of the plant, and that they are essential to its healthy development.

It is evident, that plants must have the power of selecting from the inorganic matter of the soil those materials which they specially require; if, therefore, one plant, the same kind of crop is frequently repeated on the same soil without any thing being added to it in the shape of manure, that the soil must sooner or later, according to circumstances, become exhausted of one or more substances required by that particular crop, and the plants will, in consequence, gradually decline in vigor and their produce diminish. The effects of growing plants in the same soil a number of years in succession, and of changing the soil each year, has been put to the test of experiment by Professor Daubeny, who obtained the following results:

		Average of five years.
Potatoes	In the same plot	72.9 lbs. of tubers.
	In different plots	92.8 lbs. of tubers.
Flax	Same	15.0 lbs.
	Different	19.9 lbs.
Beans	Same	32.8 lbs.
	Different	34.8 lbs.
Barley	Same	30.0 lbs.
	Different	46.5 lbs.
Turnips	Same	104.0 lbs.
	Different	173.0 lbs.
Oats	Same	28.0
	Different	32.0

It has been contended, that the benefits derived by a rotation of crops was owing to root excretions, that plants exuded from their roots certain matters which were injurious to plants of the same kind, but beneficial or useful to others ; this notion is now considered to be untenable. All our crops are liable to be attacked by animal or vegetable parasites, each crop having its peculiar parasites ; and it is probable that the growth and increase of these pests will be favored to some extent by frequently growing the same kind of crop on the same soil ; and a given crop, when frequently repeated, may be more liable to disease and less productive in consequence.

But the chief benefit derived from a judicious rotation of crops is owing to the plants which succeed each other requiring different kinds or proportions of mineral matters for their growth. The following table of Prof. Solly, contains a list of the inorganic substances usually found in plants, and exhibits the relative proportion of each contained in the ashes of several kinds of plants commonly cultivated by the farmer :

	Wheat.	Barley.	Maize.	Buckwheat.	Flax.	Beans.	Potato.	Cabbage.
Potash	20	180	189	332	510	1656	138	2370
Soda	29	48	4	62		50	0?	1154
Lime	240	554	652	704	230	624	2928	1747
Magnesia	32	76	236	1292	480	209	488	22
Alumina	90	146	6	26	2	10	52	17
Silica	2870	3856	2708	140	20	220	801	210
Oxide of Iron	--	14	4	15	10	7	58	8
Oxide of Manganese	--	20	20	32	--	--	44	--
Sulphuric Acid	37	118	106	217	66	34	245	959
Phosphoric Acid	170	160	54	288	118	226	32	785
Chlorine	30	70	6	95	20	80	0?	274
100,000 parts dry yield of Ashes	3518	5242	3985	3203	1456	3116	4786	7546

By this table we learn that silica is an important constituent of wheat, barley and corn ; that buckwheat requires large quantities of magnesia ; the potato lime ; the cabbage pot-ash, besides sulphuric and phosphoric acids and chlorine. Now none of these substances exist in the generality of soils in any considerable quantity excepting alumina, silica and oxide of iron. If this be so, it is easy to understand, by studying this table, how a soil may be exhausted of some essential material by raising the same crop on it year after year, and how even if a rotation is observed and none of these substances taken from the soil by the crops are returned to it in the shape of manure, it must in the course of time become comparatively barren, by being unable to afford certain mineral matters in quantities sufficient to enable the plants to grow in a healthy and vigorous condition.

The chemical composition of most farm plants has now been determined; various kinds of matter used as manure, have also been analyzed. It is therefore possible to ascertain what different plants require and what different manures are capable of affording. But before extraneous or special manures can be applied with certainty and advantage, we should know what the soil contains: whether it is really deficient in some one or two mineral matters required by plants. The chemical composition of a soil, however, can only be satisfactorily ascertained by an expert analytical chemist, and as we are not likely to receive any aid from this source soon, we shall have to trust to accumulated experience to guide us in this inquiry. I hope to see in future volumes of the Transactions of our Society the results of experience as to the best and most profitable rotations of crops; whether some soils seem better adapted than others to the growth of certain crops, and whether any substance has been used as manure other than that made on the farm, and with what results. If a certain rotation, or a certain manure had been proved to be advantageous in one soil or district, it might prove equally efficient in a like soil in other parts. At all events, a simple statement of the results obtained, beneficial or otherwise, might lead to further experiment and inquiry which could not fail ultimately to add to our store of useful knowledge. Soils are originally derived from the disintegration or decay of rocks; and as rocks differ in their composition, providing a soil is derived from the rock immediately below it, on which it rests, or from the rock on a hill above it, and is not composed of drifted materials, as frequently happens, the composition and physical character of the soil will be influenced by the nature of the rock.

In the first Vol. of the Journal of the Agricultural Society of England, there is an interesting and useful paper on the application of geology to agriculture, which I may refer to in illustration. A gentleman possessing an extensive estate, observed great variations in the soils, not only on the sides of the hills which might have been expected, but also in the fields upon the table land forming the summits of these hills. Being at a loss to account for these variations, he mentioned the subject to a geologist, who was making a geological survey of the district at the time. They went over the estate with a map in hand, "and marked in different colors the ranges of different strata of rock, as they appeared in succession upon the surface, forming themselves into zones or breadths of one, two, or more fields together." "The result thus obtained clearly demonstrated that the value of each field, and the mode of cultivation already adopted (with the exception of the use of lime, which had been too frequently and too indiscriminately applied to the entire estate) corresponded to the variations of the strata, and were limited by the areas which these occupied on the surface; thus showing that (though the results had been arrived at by the farmers through a different process, viz: trial and error) the geological character of a country, when accurately understood, pointed out at once the natural value of the land, and the system of cultivation best adapted to it. For instance, on the highest range of my hills, a few fields, without any apparent reason, have been universally productive in all seasons, more so than the fields adjoining them on a lower level, and which appeared nearly of the same quality. The fossils and other marks well understood by the geologist, proved them to consist of an insulated portion of the upper calcareous grit formation, which also produces an excellent tract of land in another part of this country. Again, when, on descending the hill sides, it was found that there were certain fields which, whether toward the south or north, whatever the aspect, whatever the local circumstances, (so long as not too steep to be ploughed), invariably produced good wheat. It was a triumph for agricultural geology to discover that these fields were invariably upon the Oxford clay, or rather where the lower beds of the calcareous grit become mixed up with that formation; and, comparing the comparative value and growth of timber produced upon different portions of the slopes where too steep for ploughing, it was satisfactorily established that oaks flourished the best upon this identical stratum or zone wherever appearing."

Prof. Johnston, when speaking of the lower silurian rocks, remarks: "In this formation, as in every other we have yet studied, the soil changes immediately on the appearance of a new rock on the surface. The soil of the Wenlock shale is sometimes more sandy as it approaches the Caradoc beds, and on favorable slopes forms good arable land, and sustains luxuriant woods; but where the Caradoc sand-stones reach the surface, a wild heath or poor woodland stretches over the country, until passing over their edges, we reach the line containing soils of the Llandillo flags, when fertile arable lands and lofty trees again appear."

Bordering the chalk on the north and west in two or three of the southern counties of England, is the green-sand formation. The soil of the upper green-sand is said to be remarkable for its fertility in the United States as well as in England. An extensive farmer in the county of Kent, who had used quantities of bones as manure, found that on some parts of his farm they exercised a very beneficial influence on the growth of his crops, while on other parts they produced no visible effect. Being unable himself to account for this difference, he sought the aid of geology and chemistry, and the mystery was thus explained: The land on which a dressing of bones was useless, rested on the green-sand, which contains numerous fossils. These fossils were found, on analysis, to yield a considerable proportion of phosphate of lime, the chief mineral matter supplied by bones. Phosphate of lime, sufficient for the wants of the plants, already existed in the soil; a further application of this substance was not therefore required. The Lias clay, a belt of sand running east and west through some of the midland counties of England is the richest grazing land in Britain. Bones of Ichthyosori and other extinct animals are found in the Lias. Cheshire is celebrated for the excellence of its cheese. Much of the land of that county is kept in permanent pasture, which seldom received any other manure than the droppings of the cows which grazed upon it. Now, milk contains phosphates; every day's milking, therefore, robbed the land of a certain quantity of its phosphate, and the quantity in the soil had apparently become so far exhausted as to retard the growth of the herbage; for when a dressing of crushed bones was applied to these pastures they had a very decided and permanent effect, very much increasing their produce.

A knowledge of what milk contains, what plants require, and what the soil affords, had clearly a money value to the Cheshire farmers. If they had sooner known that they were gradually exhausting their soil of an important constituent, they might have sooner applied the remedy, and prevented the loss consequent on the diminished produce of their pastures. So with the farmer in the green sand district; if he had previously known that some of his land was already rich in phosphates, he would have saved the money, time, and material expended in applying bones to a soil in which they were not wanted. Sir John Johnstone, whose remarks on the geological survey of his estate I have previously quoted, states, that besides obtaining clearer views of the true conditions of vegetable life, he derived the following positive practical results from the survey :—1. the knowledge of applying lime to advantage over the property—2. laying down fields to advantage to grass, and where and how to plant wheat—3. what sort of trees to plant on each stratum.

Before taking leave of this subject we may consider for a moment what useful results flowed from the farmer on the green sands possessing an inquiring mind. He was not content to know that bones were of no use on some of his fields, he desired to know why they were useless, and he wisely applied for information to the geologist and chemist; men who had made the arrangement and the composition of rocks their especial study, and who, of all men, were best qualified to give him a satisfactory answer. The results obtained by the farmer through trial and error, and the explanation of these results afforded by the investigations of the geologist and chemist, became the common property of all the farmers located on the green sand. They were all, from that time, saved from making the important mistake of purchasing and applying a costly material to their soil in the vain hope of adding to its fertility; and the knowledge thus acquired may prove useful, not only to the farmers of that locality, but to farmers in other parts of the world, wherever the green sand is known to exist. There is a great similarity in the same kind of rock wherever found; it is, indeed, by their family chiefly that many rocks are distinguished. The benefits resulting from this investigation did not end here; it suggested the further inquiry, if these fossils are so rich in phosphates that they anticipate the action of bones on this soil, may they not prove beneficial, and be used as a substitute for bones on other soils requiring phosphates? Experiment was again resorted to, and the question being answered in the affirmative, these fossils are now extensively collected, and their phosphates extracted. The whole farming community of Britain has thus been benefitted by this mineral phosphate, as it is called, coming into competition with, and keeping down, the price of bones, now so extensively used as a manure in that country.

Many instances might be cited of the benefits which have been derived by the application of a special manure; that is, a manure consisting either of two or a very few of the different materials required by plants, as the nitrates of potash and soda, common salt, gypsum, and various compounds of ammonia, all of which have been extensively experimented with. But the application of a manure containing such a limited number of the substances essential to plants, is hap-hazard work unless the composition of the soil is known; and they ought never to be extensively applied by practical farmers before first making a small comparative experiment, counting the cost and carefully observing the results produced. I apprehend, however, that there is not much need to fear that many farmers, in a new State like this, are likely to lose any serious amount of capital in the purchase of special or other manures; the probability rather is, that sufficient time and labor will not be expended with a view to economize, increase the amount, and add to the value of the manure which may be made on the farm. This, however, is a most important matter, and will sooner or later force itself on the attention of every one who settles down on a piece of land with a view to make it his home, and to live by farming. We know the results produced in the older Eastern States by the skinning system, as it is not inaptly called, and ought to be warned in time that we must feed our plants as we would our animals, if we wish them to grow in a healthy, vigorous, and profitable condition. No man of ordinary observation, acquainted with the subject, can travel through the country without seeing on all hands that a vast amount of manure is annually wasted; spread abroad in yards exposed to the weather, much of the soluble and most valuable of its fertilizing substances are wasted away, and others lost by evaporation. The liquid which drained from heaps of cows' dung exposed to rain, has been analyzed in the laboratory of the Agricultural Chemistry Association of Scotland, and a statement of the results obtained may serve to show how much valuable matter, required by plants, is thus lost. A gallon of these drainings, when evaporated to dryness, left about 480 grains of dry matter; this consisted of

Ammonia	9.6 grains.
Organic matter	200.8 grains.
Mineral matter (ash)	268.8 grains.

The inorganic portion consisted of

Alkaline Salts	207.8 grains.
Phosphates of Lime and Magnesia, with a little Phosphate of Iron	25.1 grains.
Carbonate of Lime	18.2 grains.
Carbonate of Magnesia and loss	4.3 grains.
Silica and a little Alumina	13.4 grains,

A second gallon of liquid, consisting of the drainings of farm-yard dung, when watered with cows' urine, was also analyzed; this, when evaporated, left 617½ grains of dry matter, which consisted of

Ammonia	21.5 grains.
Organic matter	77.6 grains.
Inorganic matter (ash)	518.4 grains.

The mineral matter contained in this liquid consisted of

Alkaline Salts	420.4 grains.
Phosphates of Lime and Magnesia	44.5 grains.
Carbonate of Lime	31.1 grains.
Carbonate of Magnesia and loss	3.4 grains.
Silica and a little Alumina	19.0 grains.

Proceedings of Ag. Chem. Ass. of Scotland, p. 61.

There are no phosphates in the urine of the cow, but it contains alkaline salts, besides most of the substances voided by the cow which are capable of producing ammonia. By referring to the table previously given, of the mineral matters found in different plants, we may understand how desirable it is that the liquid, as well as the solid portion of our manure, should be preserved. Various expedients have been resorted to with a view to effect this object. In older countries liquid manure is collected in tanks in some instances, and applied to the land in the liquid state, or else thrown back on to the solid manure; some have filtered it through charcoal, and the sulphates of lime, magnesia, zinc, or iron, have been added to the liquid to throw down the phosphates and some other matters; the precipitate was then collected and dried, and so used. The manure sold as urate is said to be manufactured in this manner. Considerable fertilizing matters, however, remain in the liquid when these precipitates are used, besides they are not easily procured here, and their use would be attended with too much expense. What, then, is the cheapest and most efficient mode of preserving manure, adapted to our circumstances? This point should be considered when erecting farm buildings. Barns may be so constructed as to have cellars underneath, in which the manure may be deposited, and thus preserved from the damaging influence of the sun and rain. Where cellars cannot be conveniently had, stables and sheds may be so arranged as to afford considerable protection to the manure. On a small farm, for instance, where few cattle are kept, the horse-stable may run north and south, having a trap-door at the north end to throw out the litter; the cattle yard may be on the east side, and the shed or stable may join up to the north-east corner of the horse-stable, and have a small door at the west end, to throw out the manure. The manure from the two stables would be thus mixed together, and the buildings would protect it to a considerable extent from the morning and mid-day sun. To protect it from the rain, a crotch might be fixed in the corner of the north-west angle, a pole to rest on this and on the north-west corner of the cattle-shed, a few rough slabs or boards of lumber, or two or three loads of straw or damaged hay, would suffice to keep the rain from falling on the manure in quantities sufficient to wash it. A few logs should be raised on the two open sides of the space where the manure is deposited, to prevent hogs from spreading it abroad. To preserve the urine of our animals some absorbent material should be provided; for this purpose there is nothing to be had in this section of the State comparable to the black vegetable matter found at the edges of our marshes and swamps, commonly known as muck. This may be dug in the dry time, which usually occurs in the fall, after harvest and seed-time, and should be allowed to dry before it is handled, to save labor and to add to its usefulness; for the dryer it is, the more urine it will be capable of absorbing. At the very dawn of the improvement of British agriculture, a Scotch farmer, Lord Meadowbank, insisted on the importance of increasing the amount and value of the manure raised on a farm, by mixing farm-yard dung in alternate layers with peat, or bog-earth. Vegetable matter, in an active state of fermentation, has the power of inducing other vegetable matter to ferment likewise, if placed in contact with it, and this speedily, providing the fresh matter has been previously deprived of life. Thus the tough and fibrous peat, besides absorbing gases and fluids which would otherwise have been lost, became itself so reduced, by the action of the fermenting manure, as to be capable of affording food to plants.

In these parts peat, properly so called, is unknown. In its natural state it produces a poor, stunted herbage and heather; but the black muck which it is proposed to use as an absorbent here, from the luxuriant vegetation which it naturally produces, is evidently rich in the food of plants, and would of itself, if applied to the lighter sandy soils of our oak openings, prove beneficial. If muck is not used after the Scotch fashion by mixing it in alternate layers with manure, it should form the base of our dung-heaps, and be spread thickly in our cattle-yards and hog-pens. Muck may be turned to account in other ways. Animals which may die on the farm, or the offal of animals which are slaughtered, may be made to afford a quantity of powerful manure by being mixed with muck.

Bones are a most valuable fertilizer, and should be carefully preserved. They have been applied to land in a variety of ways. Formerly they were simply crushed, and so spread on the land. Sometimes finely crushed bones were laid on heaps, moistened, and covered with earth for about a week or ten days before they were applied; they heated, became more or less soft, and afforded in consequence a greater immediate supply of food than if they had been used in the raw state. This was a point of considerable importance in the culture of the turnip. The young plants were more speedily pushed into the rough leaf, and had a better chance of escaping the ravages of the fly in consequence. Crushed bones may be more effectually reduced by mixing them with fermenting manure. Fresh wood-ashes, moistened, have also the power of reducing bones. But the mode of decomposing bones now most extensively practised is to dissolve them by means of sulphuric acid, (oil of vitriol). The substance obtained by this process is that known as super-phosphate of lime. Bones treated in this way have a more powerful immediate action than crushed bones; but the latter produce a more permanent effect.

Fresh bones of the cow have been analyzed, and were found to consist of

Organic animal matter, (gelatine)	$33\frac{1}{4}$
Phosphate of lime	$55\frac{1}{3}$
Phosphate of magnesia	3
Carbonate of lime	$3\frac{3}{4}$
Soda and common salt	$3\frac{1}{2}$
Chloride of Calcium	1
	100—*Johnston.*

"By the action of sulphuric acid the gelatine of bones is decomposed and converted into new compounds capable of affording nitrogen to plants. The carbonate of lime is decomposed, sulphuric taking the place of carbonic acid, thus forming sulphate of lime, (plaster). A part of the lime contained in the insoluble phosphates is also converted into sulphate of lime, while the remainder of the lime and the whole of the magnesia forms soluble phosphates with the whole of the phosphoric acid. The salts of soda are also converted into sulphates, or form a mixture of sulphates and phosphates of soda.

All these compounds are soluble in water, the phosphates of which the plant requires at certain seasons of its growth a ready supply, are especially so; and thus all the inorganic matters which the bones contain are brought into a condition in which they can readily, and without waste, be made available for the nourishment of the plant."—*Johnston.*

Bones seem to be a peculiarly grateful food to fruit trees. Barry, in the Horticulturist of December last, remarks that "in taking up trees from soil where bones have been used as manure, we find every particle within reach of the roots completely enveloped in masses of fibre. Clement Hoare, in his excellent Treatise on the Culture of the Grape Vine, states that a large bone, which was dug out of a vine border, was covered with a net-work of fibres inside and out, and the roots instead of passing into the soil beyond when they reached the end of the bone, had turned over the edge and passed inside. Superphosphate of lime is said by Lindley to facilitate the emission of roots by newly-transplanted trees.

Ashes are also a most valuable manure, and every man's experience must convince him that a great loss is annually incurred by farmers, owing to the want of a little thought and care in the management of this one material. Some have ventured to predict that the time will arrive when barn yard manure will be reduced to ashes, and the ashes alone applied to the land, the inorganic matter of the manure being considered by them to be the most valuable, or only essential part of it required from the soil for the nourishment of plants. It may reasonably be doubted whether this prediction will ever be fulfilled; nevertheless it serves to show how highly ashes derived from plants are valued by some men—agricultural chemists of no mean fame—and consequently how desirable and necessary it is to preserve and apply them understandingly. Ashes will vary much in their composition according to the kind of plant; they, however, all contain certain substances which are useful and essential to all plants alike. Many of these substances, especially the alkaline salts, are readily soluble in water as every housewife knows; it is therefore requisite that ashes intended for manure should invariably be kept dry till they are to be used. The most economical mode of applying ashes is to scatter them on the land, in the same manner as plaster or lime is applied. They may be mixed with muck, if used soon after mixing; but they should never in their fresh state be added to farm-yard manure, because they would drive off the ammonia it contains.

Chamber-lye is another valuable fertilizer, causing too frequently a perfect nuisance round farm-houses during the hot months of summer. This, too, should be cared for. A heap of dry muck, or muck mixed with charcoal, or charcoal dust put into a barrel in some out-of-the-way place near the house, and saturated with urine, would make no trifling addition to our annual supply of manure. This I know will be considered by some a small matter for a farmer to attend to. A cell also is a very small matter, requiring a microscope of high powers to distinguish it, but an aggregate of cells build up a plant; so attention to what may be considered trifles in farming, may ultimately produce no trifling result. Human urine is rich in substances producing ammonia, it also contains phosphates and alkaline salts.

I entertain a very high opinion of charcoal as a manure, and I have generally contrived when clearing land to burn up the brush when snow was upon the ground, in order that I might be able to shovel snow on fires and preseve as much of the brush as possible in the state of charcoal; soon after the fires were extinguished, the ashes and charcoal were scattered over the land. This requires but little time and labor, and I consider my crops have derived immediate and permanent advantage from the practice. If wheat is the first crop taken on a piece of newly broke land, patches may be seen here and there, where the fires have been, without any plant, these bare spaces are surrounded by a belt of tall-growing luxuriant wheat, which remains comparatively green when the rest of the field is ripe, and is almost invariably so much infested with rust as to produce a worthless grain; this loss might be easily avoided; the ashes which in quantity act as a poison, diminishing the produce to some extent, and injuring its quality, might, if spread abroad, have contributed to the health and vigor and increased the produce of the entire crop. Many experiments have been made with charcoal of late years, more especially by gardeners, and with very beneficial results. Peat is now extensively charred in Ireland for the purpose of mixing with and de-odorising offensive animal manures. The chief value of charcoal is probably owing to the remarkable power it possesses of absorbing and condensing gases within its pores. "Light porous charcoals, such as those obtained from the horns and hoofs of animals, and from certain kinds of wood, as the willow and pine, absorb of ammonia 95 times their own bulk, of sulphuretted hydrogen 55 times, of oxygen 9 times, of hydrogen nearly twice their bulk, and of watery vapor so much as to increase their weight from 10 to 20 per cent. They also separate from water any decayed animal matters, coloring substances, &c. This action is so powerful that port wine is rendered perfectly colorless, and a decoction of hops becomes tasteless when filtered through a well prepared charcoal. In or upon the soil, charcoal will act in the same manner. From the air it will absorb moisture and gaseous substances, and from rain and flowing waters organized matters. All of which it will yield up to plants that grow around it, when they are such as are likely to contribute to their growth."—JOHNSTON.

The black vegetable matter of a soil possesses similar properties, but in a less degree, it has the power of retaining the volatile ammonia carried down from the atmosphere by rain, and partly in consequence of this property, I consider that if it were applied alone on sandy soils, it would exercise a beneficial influence on the growth of plants.

Recent experiments of Professor Way have also shown that clay also has the property of abstracting a certain quantity of ammonia from water. The power of clay to absorb ammonia was made manifest some years ago by Rivers, the celebrated nurseryman of Sawbridgeworth, England. An account of his experiment is on record in the Agricultural Gazettee of February 8th, 1845. He took a cubic yard of earth from the headland of a field having a subsoil of tender white clay. The earth was spread about a foot thick on a lattice door, and so placed in the centre of a fermenting dung-hill; the earth laying upon about three feet of the dung, and the whole was covered with sticks and straw to retain the heat. The earth was twice burned over during the month, then taken out and exposed to the action of frost to pulverize it. It was finally put upon a solid bottom of clay, and spread out into a bed 18 feet by 3 feet. Along side of this bed, another precisely similar was formed of earth taken from the same locality, which, however, had not been put into the dung heap. The two beds were then dibbled in February with an equal number of grains of the Tartarian oat placed at equal distances apart. The result was, that the oats upon the bed which had been put on the fermenting dung appeared above ground some days previous to the other bed, and kept the lead through the season, growing a foot and a half higher than the other, and upon being threshed and dressed, the produce was from the earth immersed in the dung heap three quarts half a pint; from the maiden earth, one quart one and one-half pint.

By using muck as the base of composts, with bones, ashes, &c., we may possibly derive other advantages; besides adding merely to the quantity of our manure, we should be enabled to some extent to vary the kind applied to a given piece of land. Barry, who is high authority in these matters, states, in the Horticulturist, that a change of manure is advantageous; that lime, marl, seaweed, &c., though they may prove very useful at first, ultimately cease to produce any good effect. The same results were frequently observed in the experiments with special manures in England. Our crops may not only be directly benefitted by the variety of food supplied by different manures, but they may indirectly contribute to their health and well-doing, by destroying or otherwise checking the increase of insects injurious to vegetation. The frequent application of strong animal manures is said to favor the increase of grubs, while a dressing of ashes or soot diminishes their numbers.

By using muck as the basis of composts, we may also compound manures so as to adapt them to the special wants of certain crops. If we take the cabbage, for instance, which is a profitable crop to raise in the neighborhood of towns, by referring to Prof. Solly's table it will be seen that this plant requires large quantities of potash and soda, with phosphoric and sulphuric acids, and chlorine, and a considerable proportion of lime. If, therefore, we take a quantity of muck mixed with charcoal and saturated with urine, and add to this superphosphate of lime and common salt, we shall have a manure specially well adapted to the growth of the cabbage. The muck and charcoal, by their gradual decay, would supply carbonic acid and other matters; by their power of condensing gases they would retain the ammonia of the urine and the gelatine of the bones, and thus supply the plants with nitrogen to form their protein compounds; the superphosphate of lime would yield sulphuric and phosphoric acids and lime, and common salt—which consists of the nauseous yellow gas chlorine in combination with sodium, the base of soda—would furnish chlorine and soda, while a dressing of fresh wood ashes applied to the land the previous fall, might serve the double purpose of destroying grubs, or other injurious insects, and supply potash largely, as well as other inorganic constituents.

The cabbage and asparagus, in their wild state, are found growing by the sea shores of Europe. Salt may be applied with benefit to asparagus in quantities sufficient to kill weeds, and it is probable that a moderate application of salt to the cabbage tribe may prove useful in a State so far inland as Wisconsin.

Ploughing under various green crops is another mode of enriching the land commonly practised. The roots of clover—the crop generally grown for this purpose—are said to go deeper into the soil in search of nutriment than those of wheat; consequently, when a crop of clover is ploughed under, it supplies, by its decay, a greater store of mineral matters to the wheat than it would otherwise have been able to obtain. The large amount of water contained in the fresh clover plants will be useful to the succeeding crop. The decomposition of the clover will also produce a considerable quantity of carbonic acid, as well as mineral matters; this gas may be absorbed by the roots, and directly contribute to the growth of the succeeding grain crop. But from what is known of the power of carbonic acid in decomposing mineral substances, as feldspar, lime, &c., I consider it is highly probable that one of the chief advantages of ploughing under green crops will be owing to the action of carbonic acid on mineral substances in the soil, gradually decomposing them, and setting free their potash, lime, &c.

"Two chemists, Wiegmann and Polstorff, subjected white sand to the action of a boiling mixture of hydrochloric and nitric acid, and having washed away all traces of the acid liquid, they digested the purified sand in distilled water, saturated with carbonic acid gas. At the expiration of thirty days, the water was filtered and evaporated to dryness, when a residue was obtained consisting of silica and carbonate of potash, with some lime and magnesia." The experiment, as Prof. Way remarks, is highly significant, as showing us that the prolonged action of the natural agricultural solvent (carbonic acid water,) is capable of effecting decompositions which, in a shorter period of time, the strongest mineral acids are unable to bring about.

More precise information than any we yet possess on the subject of green manuring is desirable; in this section at least it would be interesting and useful to know whether clover generally succeeds in the soils and climate of this State? What has been found to be the best mode of securing a full plant? What is the effect of plaster on the growth of clover in different soils, and in what stage of the plant's growth, or under what circumstances, does it exercise the greatest influence? What is the relative cost of clover as compared with green rye, buckwheat, &c., and what are the effects of such on the following crop? Is there any green crop which may be profitably substituted for clover? I have been led to dwell at greater length on the subject of manures than I at first intended, or than is required in a brief essay like this, intended chiefly to illustrate some of the more important points of the physiology of plants. But situated as we are so far from the sea board, and having as yet few large towns or manufactories in our midst, affording cheap extraneous supplies of manure, I am strongly convinced of the paramount importance of economizing and increasing the quantity which may be made on a farm. The great attention paid to improving and enriching the soil is the main cause of the rapid improvement of farming in Britain of late years. The chief object of the extensive culture of the rutabaga and other green crops in that country is not so much to raise food for cattle as to raise manure. The more green crops they grow, the more cattle they can keep, the more cattle they can feed, the more manure they can make, and the more manure they can apply to the soil, the heavier grain crops they can raise.* Thus it may be seen that by a judicious use of extraneous manures as guano, bones, or superphosphate of lime, not only may the immediate crop to which they are applied be benefitted, but by skill and economy they may be made to effect a permanent improvement in a farm. If, as is the case in England, a certain proportion of the arable land of a farm is devoted each year to the growth of roots, and a quantity of guano in addition to the manure made on the farm is applied to the root crops through one rotation, and if the produce is increased one-third by the aid of this additional manure, and it has been often increased much more than this, then the farmer by this increased produce is enabled to feed one-third more cattle and to make one-third more manure, to apply to the same extent of land. I may conclude my remarks on this subject in the words of one of the most enterprising and enlightened farmers of the present day, Mr. Mechi:—"The great secret of profitable farming is this: to be able to grow a very large increase on a small piece of ground. The great friend of the farmer is manure; and if he doubles his manure, he will then have some hopes of doubling his crops."

The food of plants absorbed from the soil can only enter the extremities of the roots in a state of solution; a knowledge of this fact and of the great per-centage of water which plants contain, has induced Mechi, and other farmers, to dissolve their manure and convey it by means of pipes and a stationary steam-engine to their growing crops. Andrew Knight had a reservoir in his garden, so situated that he could turn the water on to different parts of his garden as required; and so decided were the advantages derived that he considered a market-gardener could well afford to pay double the amount of rent for a piece of land where he could have the same command of water as he possessed. If the use of simple water in the cloudy and moist climate of England proves so beneficial, what will be the effect of liquid manure when applied in quantities to

* Let me not be misunderstood here.—The manure is applied to the preceding green crop, and not directly to the grain crop.

most garden vegetables exposed to the high temperature and brilliant sunshine of the United States. We may reasonably expect that a copious supply of liquid manure would enable us to rival the marvellous productions of California, mentioned in the last Patent Office Report; and I venture to predict that considerable fortunes ere long will be made by this means by market-gardeners residing in the vicinity of large cities, where early and superior vegetables command a ready sale at high prices.

The fluids absorbed by the roots ascend through the woody tissue of the stem. It was formerly considered, that the crude sap rises in trees exclusively through the alburnum or sap-wood; later observations prove that it flows partly through the heart-wood when the tissue is not so filled up with secretions as to prevent its passage. As the sap rises in the stem it becomes sensibly sweet in many trees, and the specific gravity increases. It dissolves in its progress various organizable matters previously stored up in the tissue, and destined for the nourishment of new growths. From the stem the sap flows into the branches, thence into the leaves through the veins of the upper surface which are in connectien with the wood. In the leaves the sap is exposed to the action of light, undergoes certain chemical changes, then passes over the eges of the leaf down to the lower set of veins into the bark. The descending, true, or elaborated sap, as it has been variously called, descends through the vessels of the inner bark to the extremities of the roots, depositing in its progress various secretions. A certain portion passes off horizontally by means of the medullary rays, which communicate with the centre of the wood.

The direction taken by the radicle or primary root of a germinating seed, is considered to be influenced by gravitation ; but the fibrous roots appear to be so constituted as to grow most in that direction wherein they meet with most food. If we dig a trench, say eighteen inches or two feet deep, place in the bottom a layer six inches thick of rich compost, then fill up with poor light soil, and sow on the surface, seeds of spindle-rooted plants, as carrots or parsnips, the main root will be found to go straight down to the rich soil below, which, when the plants are taken up in the fall, will be found full of fibrous roots, while very few natural fibres will be found in the poor soil above. If the experiment is reversed, and the six inch layer of compost is placed on the top of poor soil, then the plants, as though they knew when they were well off, instead of forming long, tapering, cylindrical roots, as in the former case, either branch out into two or more ramifications, or taper rapidly to a point at the surface of the poor soil. Andrew Knight, who tried these experiments with the carrot and parsnip, also placed seeds of almost all the common esculent plants of a garden, so that the young plants had an opportunity of selecting either rich or poor soil, which was disposed in almost every possible way within their reach, and he always found abundant fibrous roots in the rich soil, and comparatively few in the poor. If two distinct species of trees, one requiring much moisture, the other naturally preferring a dry soil, are so placed that they can have the choice of either, the roots of the tree requiring much moisture will grow most in the direction of the wet soil, while the roots of the tree requiring a dry soil seem, from their direction, to avoid the water.

The seeds of trees sometimes vegetate on the walls of old ruins and on ledges of rock, and in such situations they have been observed to act so wisely that some have concluded that plants must be endowed with a kind of instinct analagous to that of animals. The plants make very little progress at first, the soil on the rock or wall affording them but a scanty subsistence; to make the best of their position and get out of the difficulty, they are seen to direct their energies to the formation of a single root down the side of the rock to the soil below, which is no sooner reached than the hitherto dwarfed plant begins to extend its branches and assume its true character. In the neighborhood of Tunbridge Wells, in England, there are several remarkable groups of rocks. At the show place, called the High Rocks, I noticed several trees which had sprung from seeds in the ledges and in the crevices of the rocks, some of which had sent one straight root, many feet long, down the side of the rock to the soil; and in one instance a seed had vegetated in the lowest corner of an inclined ledge of rock, the main root of this, instead of growing perpendicularly down the side of the rock, had proceeded up the ledge and turned sharply over the top of the rock into the soil above. When a root proceeds down the side of a rock in this manner, it will in the first instance be as a delicate fibre, following either a crevice or a water-furrow, covered probably with mosses and lichens, and affording, by the particles of decaying vegetable matter adhering to them, a small supply of food, besides protecting the tender root from the action of the sun. The roots less favorably situated on the top of the wall, are affected by drought early in summer, and cease to lengthen; and the conditions are not favorable to the emission of lateral fibres from the roots proceeding down the side of the rock. The plant thus becomes dependent on that one root chiefly for its subsistence, and its growth is rapid compared with others.

Roots must have access to atmospheric air. "Under natural circumstances," Lindley observes, "the tendency of the roots to keep near the surface is invincible." An acquaintance brought to him a Lucerne root eighteen feet long, in proof of the common opinion that they go deeply into the soil, and may be buried deeply with impunity. On investigation it was found that the root had proceeded down the side of a gravel pit, and was never more than six inches from the surface. "The celebrated Duhamel," says Col. Greenwood, "wishing to protect his field from robbery from the roots of a row of elms, cut a deep ditch between the elms and his fields. The roots however were not to be done. They of course followed the surface of the ground, whether down, horizontal, or up hill, and took the ditch in and out clever into the philosopher's field. Duhamel thinks they were cunning roots, and that they had an instinctive notion of the treat they were to have on the other side of the ditch, and grew at it. Had the philosopher built a wall in the ditch and then filled it in, he would have beaten the roots, on account of their inability to leave the surface and get under the wall." By studying these facts we may understand some of the reasons why deep plowing, enriching and pulverizing the soil, and relieving it of stagnant water by means of draining prove so beneficial.

Leaves are most important organs, and their use in the economy of vegetation should be well understood by all who cultivate plants. Every part of the plant is considered to be composed of matter which has been previously elaborated or prepared by mature leaves; hence, it has become an axiom with the more intelligent gardeners of the present day that the product of a plant will, all other circumstances being similar, be in direct proportion to the extent of healthy foliage which it can expose to the light. Some plants, as the curious tribe of cacti, have no leaves; the green stems of leafless plants perform the functions of leaves.

When the crude sap reaches leaves exposed to the action of light, water is thrown off. The quantity lost by various plants was determined by Hales, one of the earliest inquirers into the physiology of plants, and he estimated the average rate of perspiration of plants to be equal to 17 times that of a man. The amount of perspiration depends mainly on the intensity of the light, most water being thrown off during bright sunshine, and none in total darkness. It is in the leaves that water and the carbonic acid absorbed by the roots from the soil and by the leaves from the air are decomposed, the hydrogen of water, and the carbon of the carbonic acid being retained or assimilated by the plant, and the oxygen which was combined with the carbon and hydrogen is set free. The decomposition of water and carbonic acid depends also on the action of light on leaves. Priestly, towards the close of the last century, discovered that if plants were placed in air in which an animal, as a mouse, had died, and the plant was exposed to light, that the air in the vessel was again rendered fit for breathing. By the breathing of animals oxygen is taken from the air and carbonic acid added to it. If an animal is placed in an atmosphere of carbonic acid it instantly dies, so if it is confined to a limited quantity of atmospheric air in an air-tight vessel the oxygen of the air is speedily consumed, a quantity of carbonic acid produced, and the death of the animal is the consequence. Carbonic acid is produced by the decay of animal and vegetable bodies, by combustion, fermentation, &c., as well as by the respiration of animals; yet this gas constitutes only about the one-thousandth part of the atmosphere. It has been wisely ordered that plants should take from the air carbonic acid which in excess is injurious to animal life, and that they should give back the oxygen which is essential to animal existence.

It has been proved by many and variously combined experiments, that the leaves of plants when exposed to light have the power of decomposing carbonic acid. One of the neatest and most conclusive is that of the distinguished botanist, De Candolle. He placed two inverted glass receivers in a cistern, filled with distilled water, the water being protected from the air by a layer of oil, which floated about its surface. One glass was filled with distilled water and had a plant of water mint floating in it, the other was filled with carbonic acid. When the apparatus was exposed to the sun the quantity of carbonic acid gradually diminished, which was evident by the water rising in the glass, at the same time a quantity of oxygen gradually collected and replaced the water in the upper part of the glass containing the mint plant. Another mint plant was placed in a glass containing distilled water, without having access to carbonic acid. A third plant was placed in a glass filled with distilled water, and a second glass containing oxygen was placed in the cistern as in the first experiment, but these two plants when exposed to light produced no oxygen.

Many experiments have also been made with a view to prove that growth depends upon the action of leaves. If we separate two rings of bark with spaces without bark, and let a leaf be developed on one ring and not on the other, the ring having the leaf will be found to live the longest. An attack of the turnip-fly or pumpkin-bug affords familiar examples of the injurious effects of destroying leaves; if these insects attack the seminal or primary leaves, the death of the plant is generally the consequence, or its growth is feeble and considerably retarded. If we strip a plant of its leaves in summer, and prevent the growth of others, the branch either dies or does not sensibly increase in size. If the leaves of a tree with half-grown fruit are attacked by animal or vegetable parasites and destroyed, the fruit will either fall off or not ripen.

The active vitality of leaves, and their power of forming organizable matter when detached and planted under suitable circumstances, has frequently been put to the test of late years. Andrew Knight, the late President of the Horticultural Society of London, planted leaves of the potato, which continued to live until winter. They formed at their base conic bodies more than two inches in circumference, which consisted of matter similar to that of the tuber of the potato plant. Leaves of mint thus treated assumed the character of the thick fleshy leaves of evergreen trees, and produced numerous roots. Not only have leaves the power of uniting roots, and of adding to their substance, but those of many kinds of plants produce buds; and propagation by means of leaves is now commonly practised by nurserymen.

The leaves of monocotyledonous plants seem to have this reproductive power in an eminent degree. The Rev. W. Herbert, Dean of Manchester, who is highly distinguished for his experiments in cross-breeding and hybridizing plants, made numerous experiments with the leaves and scales of plants of the lily tribe. He planted leaves cut off just below the surface of the soil, and they produced bulbs; and by this means he was able to multiply some kinds of bulbs which did not willingly produce offsetts. In other experiments without cutting off the leaves, he made an incision in the midrib just below the soil, in others just above, and so layered them. Young bulbs were formed on the edge of the cut above ground as well as below. He made cuttings of the stems of species of Lillium, which formed bulbs in the axils of the leaves; he also obtained bulbs from scales.

Neumann, a French gardener, the author of an excellent treatise on the propagation of plants, republished in the Gardener's Chronicle of 1845, also made numerous experiments with leaves, and he found that if the midrib of some leaves was lightly broken, and the leaf placed on the earth, a callus was formed at each fracture, which gave rise to roots. He cut a leaf of Theophrasta into two pieces, both of which emitted roots, formed buds, and produced plants. There is a great difference in the power of the detached leaves of different species of plants to form buds; some will live two or three years without forming a bud.

"Can we possibly conceive," says Lindley, "anything better calculated to impress upon the mind the prodigious importance of these wonderful organs than a knowledge that they possess a vital energy of such force as to be able to produce young plants. Physiologists tell us that leaves breathe and perspire, but most people can see nothing of that, and possibly disbelieve it. The regenerating power which a leaf possesses is one, however, palpable to the senses, and which all men can see; it, therefore, serves better than any other demonstration to impress upon the mind a conviction that it is an organ of the highest importance in the vegetable economy."

If buds and young plants can be produced by simple leaves, we might infer that there would be no great difficulty in propagating plants by single mature leaves having buds already formed at their base. Many plants, difficult to propagate otherwise, are readily increased in this manner. This mode of propagating plants formed the subject of Andrew Knight's last communication to the London Horticultural Society. He had raised in this manner the Camellia, Rhododendron, Magnolia, &c.

They resembled more, plants raised from seed than those raised from cuttings, as usually practised; and they were so perfect, yet so small, that Mr. Knight, in a letter I received from him within a month of his lamented death, expressed a hope that by his newly discovered mode of propagation he would be able to send me many fruit and forest trees at once in an envelope. The success of these cuttings is owing chiefly to the action of their mature leaves. Mr. Knight considered that no cutting ever possesses the power of adding to itself vitally a single particle of matter till it has acquired mature and efficient foliage. Gardeners formerly used cuttings having some mature and efficient foliage, and other foliage which was young and growing; consequently "two distinct processes were going on at the same time within them, which operate in opposition to each other. The young and immature leaves expend, in adding to their own bulk, that which ought to be expended in the creation of shoots."

The peach-tree, in this latitude, seldom matures all its young wood; by pinching off the ends of the shoots early in the fall, the sap, which would otherwise have been expended in perfecting and adding to the number of immature leaves, is stored up in the tissue of the wood that remains, which becomes harder or riper in consequence of these secretions. So pinching the weak lateral shoots of the apple and pear, back to two or three mature leaves, favors the development of blossom-buds and fruit-bearing spurs. "When the branches of the vine," Lindley remarks, "are, in the autumn, beginning to slacken in their power of lengthening, theory says it is then right to stop the shoots by pinching off their ends; because after that season newly-formed leaves have little time to do more than organize themselves, which must take place at the expense of matter forming in other leaves. Autumn-stopping of the vine shoots should, therefore, be not only unobjectionable but advantageous, for the leaves which remain, after that operation, will then direct all their energies to the perfection of the grapes."

Every plant contains within itself, during winter, or its season of rest, a fund of elaborated sap, by which its first emitted leaves and roots are supported. The production of blossoms and fruit depends upon the quantity of disposable organizable matter previously prepared by mature leaves. And the quantity of organizable matter which a given plant can elaborate depends on the breadth of healthy foliage it can expose to the light, and the suitableness of the food with which it is supplied. Annual plants, as the melon, prepare, in one season, the organizable matter required to perfect their blossoms and fruit. It has been proved in England, where the melon is cultivated in hot-beds under glass, that the fruit may prove worthless or of excellent quality according to the care bestowed in the management of the foliage of the plant. Andrew Knight's melons were so deficient in richness and flavor that he requested his gardener not to plant melons again; but afterwards, attending more closely to his mode of culture, and that of other gardeners in the neighborhood, he thought he saw sufficient cause for the want of flavor in the fruit in the want of efficient foliage. To remedy this defect he placed his plants at greater distances apart than his gardener had done; the branches were conducted in every direction, so as to expose the greatest breadth of foliage to the light, and they were secured in their first position by small hooked pegs pressed into the soil; and water, instead of being poured on the leaves, as usual, and which by its weight displaced the foliage, was poured on the tiles covering the soil of the melon bed. Thus managed "he had the pleasure to see that the foliage remained erect and healthy. The fruit also grew with very extraordinary rapidity, ripened in an unusually short time, and acquired a degree of perfection which he had never previously seen." We may, doubtless, imitate with advantage this improved method of managing our melon plants. The branches may easily be arranged and fixed so that the leaves of one branch will not crowd or overshadow those of another; and with a view to improve the size and quality of the fruit, I would suggest that the fruit first set should be destroyed, unless the plant has attained a considerable size. When a fruit is set, much of the sap prepared by the mature leaves will be devoted to its nourishment; whereas, if the first formed fruit is destroyed, the same sap would contribute to the more rapid development of other leaves, and the result would be that, in the branches and roots of the plant, there would be stored up a greater supply of organizable matter for the young fruit to feed upon; and the plant, in consequence of its greater breadth of mature foliage, would be in a position to afford a greater continuous supply of organizable matter to the young fruit. The quantity of fruit which the melon

—and indeed all other fruit-bearing plants—is allowed to produce, should be limited, if superior size and quality are desired.

The roots of the carrot and turnip and the bulb of the onion are stores of organizable matter, formed one season and destined for the support of blossoms and seed in the season following. Here we have again familiar instances of the use and functions of leaves. If we sow carrots or turnips in drills and allow the plants to remain crowded, we have small and worthless roots, compared with those produced by plants which stand at such a distance apart as that the foliage of one plant does not interfere with that of another.

Varieties of the potato differ in the height of their stems, and the distance between the rows or hills in which they are planted should correspond with the average height of the variety cultivated. The whole of the ground would then be covered with foliage during the heat of summer, without one plant interfering with the functions of another. Layer tubers may be obtained by allowing more room, but it has been proved experimentally, in the garden of the Horticultural Society of London, that the greatest average weight of tubers per acre is obtained when the distance between the rows corresponds with the average length of the stem. The greatest length of the stems of the variety cultivated was two feet, the principal part attained this height; the shortest stems measured eighteen inches. The following are the results of the experiment:

Distance between rows.			Weight of Seed required per Acre.	Estimated Produce per Acre, deducting the weight planted.		
Ft.	In.		lbs.	Tons.	Cwts.	lbs.
2	6	setts planted with single eyes,	1,470	15	19	82
2	0	,,	1,794	24	0	87
1	6	,,	2,055	22	16	102
0	6	,,	5,008	16	17	10

"The most uniform size was obtained from the division where the rows were two feet apart. Where the rows were only six inches apart, a number of new potatoes were partially decayed, and a very large proportion was too small to be fit for use."

Some writers on farming have hastily concluded that the carrot having such light feathery foliage, derives its nourishment chiefly from the soil, while the turnip, with its broad leaves, depends more upon the air for its food. Even in such a comparatively recent work as British Husbandry, it is said the haulm of the carrot is not unfrequently mowed for cows, and that it is hazardous to draw any general conclusion for or against the practice. The leaves of the carrot are quite as essential to the growth of the roots as are those of the turnip. The foliage of asparagus is much more delicate than that of the carrot, yet Lindley very justly considers that when asparagus of large size is desired, it is a matter of great importance to retain the foliage entire and uninjured. In the Gardener's Chronicle of October last, he observes, "no exuberance of growth in the asparagus stems can be considered as excessive, nothing should be done to check it, every branch that a plant is able to form should be anxiously preserved; and if any means can be used to prevent the formation of berries, which, we must remember, is a process of exhaustion, these means should be adopted, provided always the little thread-like green leaves are in no way injured. Small as they are, they conduce to the strength of the asparagus, as much as its broad leaves to a forest tree."

A member of a farmers' club in Scotland transplanted some rutabagas, many were running to seed, and the tops of some were accidentally cut off, the roots of these were observed to put forth fresh leaves and to increase in size; the foliage of other plants was consequently mowed two or three times during summer and the leaves used as fodder, yet the roots, notwithstanding this treatment, attained a considerable size. A great discovery seemed to be made, farmers might eat their cake and have it; they might have tons of green fodder per acre, and the weight of their roots undiminished. Two turnips, whose leaves had been mowed three times, were sent to Professor Johnston to be analyzed, and in the state in which they reached the laboratory they were found to contain nearly 91 per cent. of water, leaving only 9 per cent. of dry matter. The proportion of water usually ranges between 88 and 90 per cent. leaving 10 or 12 of dry matter. Experiments in the field should go hand in hand with the experiments in the laboratory to be perfectly satisfactory. Roots, like the carrots and turnip, lose water rapidly if exposed to a dry atmosphere; and I consider it is probable when careful comparative experiments are made, there will be constantly found a much greater per-centage of water than usual in roots whose foliage has been removed three times during the summer; and I also anticipate, that if two plots of turnips are grown under precisely the same circumstances, excepting that the leaves of one plot are mowed three times, and the plants of the other are allowed to retain their foliage entire throughout the growing season, that the latter, when weighed, will be found to yield a greater weight of roots per acre. If the positions are true, that mature leaves, and of those such only as are not shaded by others are efficient; that young leaves are formed of matter previously prepared by mature leaves, and that the extent of the roots of a plant is commensurate with the extent of its foliage; then the first effort of the turnip plant, when deprived of leaves, will be to make good the loss it has sustained, to restore the balance between roots and leaves; to make good this loss, a quantity of organizable matter which had already been stored up in the roots, will have to be used in the formation of fresh leaves, and as immature leaves are less sufficient organs than mature leaves, the roots must sustain a farther loss—there must be a less amount of work done, according to the time required by the plant to mature efficient foliage.

The effect of mowing the leaves of plants grown specially for the sake of their roots, may be yet better understood if we consider the most efficient mode of destroying deep-rooted perennial seeds. Some land which I broke up here was overrun with a quantity of the common fern, the root stock of this plant lies deeper than it is usual to plough, and the fern in consequence is a somewhat difficult weed to eradicate by the usual method of destroying weeds; but if we consider the functions of leaves and how they are first formed or nourished, it must be apparent that there should be no difficulty in destroying the fern or any other deep rooted weed; all that is required is to persist in not allowing the weeds to perfect their leaves, not to be satisfied with hoeing them down two or three times in early summer, but to persevere in cutting them off as long as they continue to be produced, never allowing them to reach maturity before they are destroyed. The issue may appear somewhat doubtful at first; but no plant, whatever may be the kind, or however favorably it may be situated, can withstand the constant loss of foliage. By this process the root is gradually exhausted of its organizable matter, the leaves produced become weaker and weaker, and finally the root perishes.

The humid climate and murky atmosphere of England are favorable to the growth of grasses, and any one who has been in England and visited the trimly kept pleasure grounds of some of the more wealthy landed proprietors cannot but have remarked the beauty of their smooth green velvet-like lawns. The closeness and delicacy of the herbage of these lawns are chiefly the results of repeated mowings. The grass is never allowed to seed, scarcely allowed to obtain mature leaves before they are removed; organizable matter does not, therefore, acccumulate in the roots in sufficient quantity to produce rank, luxuriant foliage, hence the delicacy and softness of the leaves produced.

It is considered doubtful economy to pasture meadows early in spring which are intended to be mown for hay in the following summer. The quantity of hay produced is less in consequence, the reason is obvious. The first formed leaves produced in spring are employed in generating sap to feed other leaves, and to be stored in the roots for the support of the blossoms and seeds. If the first leaves are eaten off by cattle, instead of the roots becoming richer in organizable matter by their action, and being in a position to produce yet more vigorous foliage as they would have been if the first leaves had remained, they have to furnish matter to replace the leaves destroyed, and, as in the case of the turnip plant, deprived of foliage, sustain a double loss in consequence.

A practice which proves injurious with plants grown for the sake of their leaves and stems, may, under certain circumstances, prove beneficial with plants grown chiefly for their seeds. On rich soils in Britain, if wheat is sown thick and early, and the winter should prove mild, it will continue to grow throughout the winter months, and may prove too thick and luxuriant early in spring—the wheat is commonly called by farmers "winter proud." If the leaves are suffered to remain, the stems are too numerous, weak, and drawn up, and the crop, in consequence, is liable to lodge and to be attacked by mildew—hence the yield of grain of a crop, in this state, proves inferior in quality and produce. To remedy this evil some turn sheep on the wheat early in spring and pasture it down—others mow the leaves off. The result of either practice is, that the luxuriance of the plants is checked, and instead of throwing out fresh tillers, producing a crowd of stems which interfere with each other's functions, a considerable proportion of the organizable matter of the roots is expended in the formation of other leaves in the room of those destroyed, the number of stems is less numerous in consequence, the leaves are not so crowded and can better perform their functions, the straw is shorter and stouter, not so liable to be laid, and the grain is better fed or ripened. The utility of removing the leaves of over-luxuriant wheat appears to have been known to cultivators in the time of Virgil, who thus alludes to the practice in his Georgics:

> Him shall I praise, who lest the o'erloaded ear,
> Shed with prone stem the promise of the year,
> Feeds down its rank luxuriance when the blade
> Waves level with the ridge its rising shade.

Perennial herbaceous plants lay up in the fall a fund of nutriment destined for the support of the first emitted leaves and roots in the following spring. The vigor of the first growths will, all other circumstances being similar, be in proportion to the quantity of organizable matter contained in the roots; and the amount of organizable matter will depend chiefly on the action of efficient foliage; we may thus, by close stocking meadows immediately after the hay is gathered, diminish the crop of hay in the following summer as effectually as if we had pastured them in spring. In a paper by Andrew Knight, on the state of the sap of trees during winter, he states that "he had constantly found in his practice, as a farmer, that the produce of his meadows had been immensely increased, when the herbage of the preceding year had remained to perform its proper office till the end of the autumn, on ground which had been mowed early in the summer—whence he had been led to imagine that the leaves, both of trees and herbaceous plants, are alike employed during the latter part of summer in the preparation of matter calculated to afford food to the expanding buds and blossoms of the succeeding spring, and to enter into the composition of new organs of assimilation."

If we break up new land early in the spring or in the fall, we know that the sod does not rot so well—we do not so certainly destroy the grassses and other natural herbage as if we ploughed in June. In early summer, the sap which had been deposited in the roots the previous fall has, in a great measure, been expended in the production of foliage, the quantity of succulent green leaves ploughed under and deprived of light speedily decay. Early in spring, when active vegetation has scarcely commenced, and late in the fall, when it has almost ceased, the sap is concentrated in the roots, and if the sod is then turned over, many of the roots of grasses and other plants retain their vitality, and shoots from the curve upwards and make their way through the sod to the light; just as the plumule of a seed would do, if a seed were placed in the soil wrong side upwards. As the luxuriant growth of a plant in spring depends in a great measure upon the quantity of organizable matter it can command, means may be adopted to increase the quantity and with various objects in view, such, for instance, as to increase the size of bulbs the produce of roots, flowers, or seeds, or to hasten the period of the blossoming and fruiting of trees.

Andrew Knight adopted a novel plan of cultivating the onion. In the long and warm summers of the south of Europe, the onion attains a much larger size in a single season than in the colder climate of England. But by the following mode of culture which Mr. Knight had long practised, he found two summers in England produced nearly the effect of one in Spain or Portugal. "Seeds of the Spanish or Portugal onion were sown at the usual period of the spring, very thickly and in poor soil, generally under the shade of a fruit tree; and, in such situations, the bulbs are rarely found much to exceed the size of a large pea. These are then taken from the ground and preserved till the succeeding spring, when they are planted at equal distances from each other, and they afford plants which differ from those raised immediately from the seed only in possessing much greater strength and vigor, owing to the quantity of previously generated sap being much greater in the bulb than in the seed."

Andrew Knight, in raising very early varieties of potatoes in the open ground, was in the habit of selecting, in the fall, the largest tubers, and those nearly of an uniform size, for planting in the spring; and he found that these always afforded very strong plants, which readily recovered when injured by frosts, owing to the large store of organizable matter they contained. It would seem, at first sight, most advantageous in all cases to plant large tubers rather than small ones, or than sets. The greater the amount of organizable matter the tuber can supply to the young plant, the more vigorous should be its growth, the greater the breadth of its foliage; and in proportion to the extent of its foliage, so should be the weight of tubers produced. This is theoretically true, and the results would be as stated, providing nothing interfered to prevent the foliage from duly performing its functions. It was found, however, by a series of experiments, made in the London Horticultural Society's garden, under the direction of Prof. Lindley, that the weight of potatoes per acre is greater under equal circumstances from sets than from whole tubers, by upwards of from 7 cwt. to 3 tons per acre. How, then, is this to be accounted for? The reader may remember what was said of the injurious effects of displacing the leaves of the melon by pouring water upon them, and what beneficial results followed when means were adopted to keep the foliage in an erect position. The smaller produce of the potato plant raised from the large tubers, was owing to their excessive luxuriance; the stems were more brittle than those of moderate growth, and the weight of the foliage they had to support was much greater; they were consequently blown about, laid and broken by the wind; much of the foliage was thus shaded or destroyed, and the reproductive powers of the plant were diminished in consequence.

It is possible that Knight's method may prove useful if adopted with very early varieties only, or at all events with early varieties if planted in situations where they will not be exposed to strong winds. Plants of late varieties do not generally begin to form tubers till they have attained a considerable age; a quantity of the first formed leaves are employed in generating sap for the support and production of other leaves, hence the comparatively large development of stems and leaves of like varieties; but plants of early varieties commence the formation of tubers at a very early period of their growth, consequently the sap generated by the first developed leaves has soon to contribute to the growth of tubers as well as leaves, and the growth of the plants is checked in consequence.

It is common with some to cut off the leaves of lillies and other bulbs soon after they have flowered, and some gardeners mow off the leaves of their strawberry plants soon after the fruit is gathered,—the object in both cases being to make the garden look trim and neat. The question was raised in the Gardener's Chronicle, for 1843, whether the practice was beneficial or otherwise. Lindley objected to the practice on general principles, which he truly said cannot be neglected with impunity. Some who mowed the leaves off their strawberry plants contended that they raised good fruit, and that the beds were again covered with leaves before winter. "Rightly considered," Lindley said, "the reproduction of leaves was one of the worst consequences of the mowing, for if we inquire into the history of the formation of these new leaves, we shall find that they are produced at the expense of organizable matter, previously lodged in the roots of the strawberry plants, that matter was lodged there by the leaves which the mower destroyed, and was intended by nature for the food of the leaves, and fruit of the succeeding year. Being expended in the production of autumn leaves, the store of food of the leaves of next spring is by so much diminished. The leaves in August, when they are commonly mowed, are dark green, healthy, and vigourous, they are then collecting the organizable matter, which is wanted for the crop of next year, and that matter they are slowly depositing in the roots. Up to this time (August) they have not done much in this way, for at first they were occupied with their own organization, and then were called upon to feed the fruit. It was only after the fruit was gathered that they began to collect and seed down into the roots in any considerable quantity the organizable matter, or true sap wanted for another season. By mowing them off, the gardener stops this essential operation, and it is physically impossible for him to do so without detriment to the future crop."

It has been said that the elaboration of the crude sap of plants depends upon the action of light or leaves; all plants, however, do not require the same amount of light and heat to enable them to grow in a healthy condition. Some flourish beneath the sun of the tropics, others thrive only in temperate climates, while some seem most at home near the regions of perpetual snow. And in the same climate some plants seem better adapted than others for particular situations; the mountain tops, woods, valleys, and rivers having each their peculiar flora. It is a common remark that European gardeners do not at first sufficiently consider the difference between the climate of the United States, and that which they have been used to, and are thus liable to make serious mistakes by placing their plant houses, and by fixing upon sites for gardens as they would do in England, for instance, exposed to the sunny south. The light is brighter, and the heat of our summers greater than seems to be required by many plants, cultivated in the garden at least. The currant, gooseberry, raspberry, and strawberry, thrive better if so situated as not to be fully exposed to the sun throughout the day. A man who really deserved to be considered a gardener, who possessed a knowledge of the general principles of his art, which gardeners now-a-days have great facilities for acquiring, ought to know that in commencing operations in a country new to him, one of the first things demanding his attention and study is the character of the climate, and what modifications in culture and management are required to enable him to produce his flowers, fruit and vegetables in the highest state of perfection. Even in the limited range of the climate of England, modifications in practice are required to obtain a certain result. In one of my visits to the London Horticultural Society's garden, when conversing on climatal influences with Robert Thompson, the intelligent superintendent of the fruit department, and of the meteorological observations, which for many years have been made in the garden, he stated as an instance that the same mode of training by which the artizans of Lancashire produce gooseberries of an enormous size was proved, when tried in the garden of the Society, to be hurtful to the trees rather than otherwise. A high range of hills runs through Lancashire, and owing to this cause and to its proximity to the sea on the west, from which quarter most rain usually comes in that country, it is somewhat remarkable among the counties of England, for the amount of rain which falls annually. The horizontal mode of training the gooseberry bushes so as to expose the greatest amount of foliage to the light, succeeded admirably in the moist and cloudy climate of Lancashire, while in the drier and sunnier climate of London, the best results were obtained when the branches were allowed to grow in their naturally erect or slightly spreading position. This also is a most important subject of inquiry; and it is to be hoped that the useful observations of Mr. Phœnix, in the first volume of the Transactions, will be followed by others from farmers and nurserymen in different parts of the State. We may be assured that we have much to learn yet respecting the suitableness of different varieties of fruit, grain, and vegetables, to our soil and climate, and of the modifications in practice which the peculiar conditions of climate require.

Much difference of opinion prevails respecting the most suitable time for transplanting fruit trees, some preferring the spring, and others the fall. Fall planting seems to be gaining ground, Hovey, Barry and Thomas, great authorities in this matter, I find prefer to plant in the fall. Lindley in his Theory of Horticulture, considered that the most favorable time to transplant is immediately after the leaves have fallen, or between the fall of the leaf and the earliest part of spring, and for these reasons, because the roots are more or less injured in the process, and in the winter when the leaves have fallen they are comparatively unimportant; but most essential in summer, owing to the demands made upon them by the perspiration of the foliage. I have found in the climate of England that the best time for transplanting was soon after the leaves began to fall, but while a quantity yet remained on the plants in a mature and efficient state. I was led to plant at this time by considering the state of the true sap of trees during winter, the change the sap must necessarily undergo before the buds unfold in spring, and the necessity of efficient roots to effect this change. It has been previously stated that every plant contains within itself during winter, or its season of rest, a fund of elaborated sap, by which its first emitted leaves, &c., are supported; it is not however stored up in a fluid, but in an inspissated or concrete state, and before it can be made available for the support of leaves, &c., it must be dissolved by aqueous sap absorbed by the roots, previously to the unfolding of the buds; and in proportion to the quantity of sap thus prepared, which a plant contains previously to the renewal of its growth in spring, so will be, in a great measure, the size and vigor of the first emitted leaves and shoots. The roots of plants then are of great importance to them during winter, as well as summer, and that season must therefore be the best for transplanting which, with little risk of loss or injury from atmospheric influences, insures the speediest renovation of the roots. When the leaves of a tree begin to fall, the young wood is nearly ripe, and in consequence of the diminished number of leaves there must be a corresponding diminution in the supply of sap required from the roots. By the action of the mature leaves which remain the injury which the roots had sustained are speedily repaired, the plants take hold of the ground and become established before winter, and are prepared to grow with nearly if not quite their usual vigor in the following spring. Very much, however depends upon the weather at the time and immediately after the trees are removed; if bright sunny weather should be experienced, and the trees retained much of their foliage, the fluids contained in the wood might be exhausted and the foliage destroyed, before new roots were formed. In the last fall we had much dry, bright weather, no rain of any consequence throughout October, so that I did not consider it advisable to remove some trees while any leaves were on them, merely from one part of my land to another; nor do I consider it safe or advisable to remove trees with leaves on them if the distance from the nursery is much more than a day's journey. Mild, cloudy moist weather should always be selected for planting, if possible. Leaves perform their functions by the aid of diffused light, or in cloudy weather, as well as in bright sunshine; they are not, indeed, capable of doing the same amount of work, but in cloudy weather, and with a damp atmosphere there is less evaporation from the leaves, and roots do not dry so quickly when exposed to the air. The surface of roots should never be suffered to become dry. When removing from one part of a garden to another, no more plants should be lifted at once than can be planted while the roots continue moist; and when transplanting from a distant nursery, they should be coated with puddle and further protected with moss and matting.

Success in planting depends also in a great measure on the care observed in performing the operation. The roots should be mutilated as little as possible. A space should be dug wide enough to allow them to be spread horizontally. This is seldom attended to as it ought; many seem never to consider that a plant is a living being, requiring food, or if such thought occurs to them, they must conclude that it is a matter of little amount how the roots are disposed of, so that they are buried in the soil. The quantity and quality of the fruit produced in after years, will be influenced to some extent by the position of the roots, by the mode in which they are distributed through the soil. During the growing season, there is more or less constant motion of the fluids in a soil; downwards when much rain falls, and upwards when dry weather prevails, to supply evaporation. By this means food is presented to the roots, and it is obvious that a plant must work at greater advantage whose roots extend horizontally six feet, as compared with one whose roots do not extend over more than half that distance. If we tether an animal, as a calf, to a stake in a pasture, the food can only be available within the length of its tether; but extend the tether a little, and by the increased circumference of the circle, the supply of food is considerably increased. Not only should the main roots be spread horizontally, but the lateral fibres should be so arranged as to cover as great a surface as possible.

We have now to consider the reproductive organs—the flower and fruit. The floral envelopes, the calyx and corolla, are not always present in the same flower. The calyx is the outside whorl of leaves; sometimes it consists of a number of leaves more or less united together. The calyx when green, with the small, leaf-like appendages called bracts, perform similar functions to those of leaves; they decompose carbonic acid, and give off oxygen under the influence of light. The corolla, which is situated between the calyx and stamens, does not throw off oxygen.

The bodies immediately within the corolla are the stamens, or male organs, which produce a dust-like powder, usually yellow, and called pollen. In the centre of the flower is the pistil, sometimes more than one, seated immediately on the miniature seed-vessel. When the flower is perfect, or attained its full growth, a viscid fluid exudes from the summit or stigma of the pistil. About this time the outer cases open, and set free their pollen. When grains of pollen fall on the viscid stigma, tubes are said to pass down the style, when present, into the ovary, and are supposed to come in contact with the ovules, which by some means, apparently not well understood, are fertilized.

A knowledge of the effects of seed-bearing on plants has a practical value, and should be clearly understood. The organized matter which is expended in the formation of leaves, is returned again to the plant many times over when they reach maturity. 'The first effect of the production of leaves is weakness—the final effect of their production is strength.' Flowers and fruit, on the contrary, require to be fed by leaves throughout their entire growth; they are formed at the expense of all other parts of a plant; they check or diminish, instead of adding to, the growth or development of plants, as leaves do. Annual plants are so exhausted when they perfect their seeds that they die, but persist in nipping off the flowers; and these plants may be made to live two or more years. In this way the tree mignonette is obtained. The sap, which otherwise would have been expended in flowers and seed, accumulates in the plant, and the stem acquires a shrubby character. The production of flowers and fruit depends chiefly upon the amount of organizable matter previously prepared and stored up in the plant. If a fruit should set in the axil of the third or fourth leaf of a melon plant, it rarely grows or reaches maturity, because a sufficient quantity of sap was not then prepared for its support; but if the same plant had not been allowed to set a fruit before the twentieth leaf, then—owing to the amount of sap accumulated, and to the efficient foliage the plant would possess—the fruit would grow rapidly, and attain a high state of perfection. The common onion forms a bulb one year, blossoms and seeds the next, and so dies; but persist in not allowing the plants to blossom, and the formation of other bulbs will be the result, as I have proved.

If a tulip-grower has a bulb growing too luxuriant, producing seven or eight petals instead of six, in order to reduce the vigor of his plant, he allows it to ripen its seed. If a Dutch florist has a bulb, as a hyacinth, new to him, and which he desires to propagate, he adopts means to prevent its flowering, and a progeny of young bulbs is the consequence. We grow the potato for its tubers, and not for the sake of its blossoms and seeds; but the flowers as well as the tubers are formed of the organizable matter generated by the leaves; and, as a plant can only elaborate under given circumstances a certain amount of organizable matter, it follows that the more flowers and fruit there are formed, so much the less must be the quantity of sap which can be used in the formation of tubers. By plucking off the blossoms of late varieties, which formerly bore seeds abundantly, the weight of tubers was found to be considerably increased.

In the last spring I planted three carrots of equal size; one plant was deprived of its leaves as soon as the flowers were produced, and no other leaves were suffered to grow. No. 2 was allowed to grow naturally, to retain its foliage, produce flowers, and ripen seeds. The flowers of No. 3 were destroyed as soon and as often as they appeared; the foliage remained entire. No. 1 seemed to ripen the seed of two or three of the first formed umbels of flowers; the plant dried up, root and branch, early in summer. No. 2 ripened a full crop of seed, then died. No. 3 made repeated efforts to produce flowers; the plant continued green till destroyed by frost; the root was disorganized, but, as I anticipated, a considerable quantity of fresh matter was deposited in the root, and if the plant could have survived the winter, this was stored up with a view to enable it to make another effort to produce flowers and seed in the following year.

A plant of the apple or pear raised immediately from seed is generally many years before it bears fruit; by grafting a scion on the branch of another tree in full bearing, fruit is much sooner obtained, because the old tree contains within itself a greater store of elaborated sap than the seedling.

If trees, when arrived at maturity, are from some cause, such as the destruction of their blossoms by a late spring frost, prevented from bearing fruit, in the next year the crop is generally fine and abundant, owing to the quantity of sap which has accumulated in the tree during the previous summer. By supporting a heavy crop of fruit one season some apple trees become so exhausted as not to bear a crop the succeeding year, hence some trees acquire a habit of bearing every other year. It is an easy matter, as Downing and Thomas remark, to alter the bearing year of these trees, all that is required is to destroy the blossoms produced in the bearing year, and an abundant crop will be the probable result the year following.

A tree may be able to ripen all the fruit it sets, but the size and quality of the fruit may be considerably improved by early and judicious thinning. If a tree under given circumstances can only elaborate a certain amount of organizable matter, and this has to be divided between one hundred fruits instead of fifty, then the fruit in the former case could only receive half as much nourishment as in the latter. But if fruit was thinned to this extent the probability is, that the sap which would have been expended in producing 100 plants, would not be wholly employed in supporting half that number. In the latter case the fruit might attain the highest state of perfection it was capable of under the conditions of soil and climate, and yet a surplus of organizable matter might remain to contribute to the growth of branches and leaves, which by their action would prepare matter to be stored in the wood for the support of blossoms and fruit in the following year. Large, handsome, well-flavored specimens of a popular variety will always command a ready sale at good prices. An extensive fruit grower recently stated in the Horticulturist, that by selecting the finest specimens of his fruit he was able to obtain as much money for them, as he could for the whole of his crop if it had not been assorted. It would be interesting and useful to know what is the probable difference in the weight or bulk of fruit produced by a tree when it is allowed to bear a heavy or a moderate crop? What is the difference in the market value of the produce; whether the smaller quantity of superior fruit will not sell for more money than a larger quantity indifferently grown? And there is a further important question, whether by thus economizing the resources of a tree, it might not be able to bear a profitable crop of handsome specimens every year, instead of a large crop of inferior quality, every other as is commonly the case. I am much inclined to agree with Clement Hoare in his observations on the injurious effects of over-bearing on the growth of the grape vine and on the quality of the fruit, that it is not so much the production of pulp, or the substance of the fruit, as the perfecting of seeds, which has such a peculiarly exhausting effect on the resources or vitality of a tree. By reducing a heavy crop one half, immediately after the fruit is set, the tree will have only one half the number of seeds to ripen, while the weight of fruit produced may be very little less than if the whole had remained.

It is a matter of importance to prevent the formation of seeds by plants grown for the sake of their roots, stems, leaves, or flowers. If a timothy meadow is allowed to ripen seed, it is well known that not only is the quality of the hay inferior compared with what it would have been if cut soon after blossoming or when the seeds are about half ripe, but the quantity of the aftermath; the grass produced in the fall is not so great in the former as in the latter case, because of the greater exhaustion of the nutritious matters which had been stored up in the roots. If we mow oats for fodder as the plants come into flower, the roots produce fresh leaves and stems. It is a remark commonly met with in farming works, that certain crops exhaust the soil if allowed to ripen their seed, but if removed before seeding, the land may be benefitted rather than otherwise. In annual and perennial herbaceous plants the roots are the chief depositories of the secretions. In annual plants there will be a greater amount of matter stored in the roots just previous to flowering than at any other time; as the seeds ripen this store is gradually diminished; when the seeds are perfected, the roots are exhausted and the plant dies. The reason why ploughing under roots before the plants have blossomed may benefit, and why taking a crop of seed and ploughing under the stubble tends to impoverish the land must be sufficiently apparent.

Plants grown for the sake of their flowers should never be permitted to ripen their seeds. The rhododendron and the kalmia of the United States are extensively cultivated in the gardens of England ; their beautiful foliage and splendid masses of flowers produced in early spring rendering them general favorites. Not long since it was the practice to let them have their own sweet way and ripen their seeds at will, now the blossoms no sooner fade than they are removed. By this practice the quantity and beauty of the flowers, and the vigor of the plants have been considerably increased.

We cultivate the apple tree for the sake of its fruit, not for the sake of its wood. Very early varieties of potatoes do not naturally blossom and seed ; prevent the formation of tubers or underground stems, and the production of numerous blossoms and seeds will be the result. May the quantity or quality of the fruit of our apple and other orchard trees be influenced by the length of the stem between the roots and branches, by the quantity of wood required to be formed each year ? What are the uses or functions of stems ? They support the branches so that the foliage may be exposed to light—they convey fluids and serve as depositories of organized matter. A stem of two or three feet high is as equal to the task of supporting the branches and conveying fluids as one of six feet. May we not then so manage, or rather mis-manage, our fruit trees, as to impose upon them a considerable amount of useless labor by unnaturally increasing the distance between the raw material and the manufactured product ; and may we not further impose upon them the task of building up or maintaining a greater amount of storage room than the necessities of the tree absolutely require, and so far diminish, or limit, as it were, their trading or reproductive capital.

Tall stems are objectionable for several reasons, when the object of the cultivator is to obtain flowers or fruit. An apple tree five or six feet high, with a tuft of branches on the top, is much more liable to be injured by boisterous winds than one whose main branches originate two or three feet from the ground. The action of the sun in this climate is also found to exercise an injurious effect on tall naked stems exposed to its influence. The greater the distance between the roots and leaves, the greater the distance the sap will have to travel, and the greater will be the time required for its ascent and descent. In an exogenous tree, as the apple, a layer of wood has to be formed each year on the outside of that of the year preceding; sap-wood has also to be converted into heart-wood; and as a tree can in one season, under given circumstances, only elaborate a given quantity of sap, it follows, the more that is required for the formation and perfecting of wood, so much the less must remain for the extension of roots and branches, and the production of fruit. I have long had my eye on this subject, and I am convinced by practical observations, aside from theory, that the prevailing method of training up fruit trees to long stems has a tendency to check the vigor of a tree, and the production of fruit, and is altogether decidedly injurious and unprofitable.

Having now reviewed the life of a plant from its first germination as a seed to the ultimate object of its existence, the reproductive perpetuation of the species, I propose, in conclusion, to consider by what means improved varieties of useful plants may be obtained. This, I look upon as a question of the highest importance, hitherto strangely neglected by Societies established for the improvement of agriculture. This is the case in older countries where Agricultural Societies have long been in operation. The chief encouragement hitherto has been bestowed on the breeders or improvers of animals, and great results have unquestionably followed. But, as the editor of the Agricultural Gazette observed, "perfect farming will prevail when land shall have been made to yield profitably the maximum of produce; and this is to be effected:

1. By the proper cultivation of the soil.
2. By a selection of the best plants.
3. By a selection of the best animals, as a means of converting some of these plants into human food.

These are the fields on one or other of which all agricultural improvers are at work; and this, we contend, is the order of their relative importance. An influence exerted in the first of them is felt through all the others; one acting in the last is felt nowhere else."

Plants are capable of being progressively improved by the skill of man, or, in other words, they can be made to assume, by improved culture and judicious selection through successive generations, various modified forms and qualities which better enable them to minister to man's wants, than the species from which they were originally derived. Until recent times—for it is but lately, as I stated at the outset, that the nature of the sexes of plants was clearly understood—men had to take advantage of any deviation which appeared in their crops naturally, or as the result of improved culture; and if the cultivator wished to perpetuate an improved variety, or obtain others better, he grew and seeded the plants alone; and if any seedling was better than the parent, that only was saved; seed from it was sown, the first plant again selected, and so on through successive generations. This is even now found a useful mode of proceeding, and is practiced with some plants by men who are adepts at cross-breeding. Andrew Knight in this way obtained a very early and hardy variety of the cabbage, which in his hands continued yearly to improve in these useful properties, but greatly degenerated in the hands of the seedsmen owing to their want of care or skill in selecting seed-bearing plants. Skirving's Swede turnip has obtained a wide celebrity, he is understood to have raised the variety to its present excellence by a careful selection of roots to produce his annual supply of seed. The importance of attending to the improvement of agricultural plants by this means might seem from the following passage in Virgil to have been better understood or practiced by the Romans 2000 years ago, than at the present day:

> Oft have I seen the chosen seed deceive,
> And o'er degenerate crops the peasant grieve:
> Save where slow patience o'er and o'er again,
> Culled yearly one by one the largest grain.

The method of improving plants now most generally and successfully practised, is that of cross-breeding and hybridizing. By cross-breeding is understood crossing between two varieties of one species, as between two kinds of the apple; by hybridizing breeding between two distinct species of one genus, as between the apple and the pear—plants, like animals, will only breed within certain limits. Varieties cross readily with each other; hybridizing is a much more difficult matter to accomplish. No one has been able to cross the apple with the pear, nor the currant with the gooseberry. The morello was made by Andrew Knight to breed with the common cherry—two distinct species—the offspring proved to be true mules, producing abundance of blossoms but no fruit. Some hybrids breed if crossed again with one of the parent plants, some become barren in the third or fourth generation, others afford seeds as abundantly as cross-bred plants.

The principal objects of cross-breeding are, to add vigor and hardiness to the constitution; to modify or get rid of defects, and to combine many good properties in one individual, in the shortest time. A most important point in selecting plants to breed from is, that they be hardy, adapted to the climate and free from disease. The certainty of the produce and consequently the profit to be derived from our crops, depends much on their hardiness; and there are many facts on record which seem to indicate that disease is hereditary in the vegetable as it is in the animal kingdom.

Varieties of plants which culture has much altered from the normal condition of the species, are not alike in all particulars. Owing to some peculiarity of constitution, some are better adapted to one soil or climate than to another, and those suited to a given location are found to possess different degress of excellence. These, then, constitute the materials with which the cross-breeder or improver has to work; and it is highly desirable, if not requisite, that he be well acquainted with his materials; he should know what has already been done, and be able to determine what remains to be accomplished; and what varieties of the plant he wishes to improve, are best calculated to further his views. It is advisable to consider well at the outset what constitutes perfection; the improver should study his subject point by point, put his thoughts on paper, and to this ideal standard of perfection constantly aim.

The practiced experimenter having thus a distinct object in view, a certain standard of excellence to aim at, will carefully examine his plants, not with a view to select one, but several; he notes their power to withstand adverse weather; their habit of growth; the character of their foliage; the abundance, form, substance, color, size and fragrance of their flowers; or the quantity, quality, size and beauty of their fruit, and the time it arrives at maturity. If he finds a plant having one good point in perfection, and not remarkably defective otherwise, it is suited to his purpose; he may cross this with another plant having a second good point, and tolerably good in other respects, and may thus combine the two good properties in one individual. But if he could only meet with plants possessing these two good points, which had also marked defects, providing the defects of one were opposed to the defects of the other, so that if he could blend the two together a more perfect plant would be obtained than either, these too might be suited to his purpose; he might cross them in the hope that the defects of one parent would counteract the defects of the other, and enable him to unite their two good properties in one individual, without the plant being otherwise objectionable.

To understand the mode of cross-breeding plants, and the precautions required to be observed by the experimenter, the parts concerned in the operation should be readily distinguished, and their functions understood. Take flowers of the currant—one of the earliest plants in blossom, and found in almost every garden—with a penknife slit carefully down one side of a full blown flower, so as to spread it out for examination; there will be found an outer covering, or envelope, the calyx, divided at the edge into five small parts; next are five small leaflets, the petals, situated alternately with the segments of the calyx; then we have five small bodies alternating with the petals, and situated, like them, on the throat of the calyx; these are the stamens, or male organs, which produce the yellow fertilizing dust called pollen; in the centre of the flower is the pistil, a small, greenish, thread-like point, more or less two-cleft at the summit, and which is situated directly on the miniature berry containing the embryo seeds, and not on the calyx, as the stamens. Having well examined these flowers, there will be no difficulty in distinguishing similar parts in the flowers of the other plants. In the blossom of the pear there is the green calyx outside, divided at the edge into five small segments; and then there are five large distinct petals, constituting the corolla; next numerous stamens, each tipped with a little head or anther, producing the yellow pollen grains; and lastly, two to five pistils in the centre. Now all that requires to be done to cross between two plants is this: the flowers to produce seed must be carefully opened before they naturally expand—before any pollen is visible, and the stamens must be removed with a pair of small pointed scissors, taking great care to leave the pistil in the centre of the flower uninjured; then when these flowers have expanded, perfect flowers of the variety intended for the male parent must be collected, and the pollen from them gently applied to the summit of the pistil, with a camel's hair pencil. The best time to apply the pollen is in the middle of a dry sunny day, and for fear of failure it should be applied three or four days in succession. Besides removing the stamens from the flowers operated on, all other flowers produced no the same plant should be early destroyed, some experimenters remove the petals as well as the stamens of their flowers; there is then less danger of pollen being conveyed by insects. Not only should much care be observed in selecting varieties to cross-breed, but the plants should be so managed as to ensure a healthy and vigorous growth, and the most perfect seeds which the variety cultivated is capable of producing. These objects may be attained by superior general culture, and by special expedients.

Very few attempts have hitherto been made to improve agricultural plants by cross-breeding, but I believe in the prediction that the time will arrive when our grain and root crops, and even our forest trees, will be improved by this process. In the mean time, it is desirable, for the sake of immediate benefit, as well as with a view to future improvement, to ascertain as speedily as we can what are the relative merits of the different varieties of the various kinds of crops commonly cultivated in the State. I suspect well-conducted experiments would afford results little expected by many. In the last season I grew several varieties of potatoes under precisely the same circumstances, and weighed the produce, and the difference in the weight of tubers produced by some of the varieties was as three to one—there was a great difference also in the quality of the tubers of different varieties. A man may pull up the stumps, clear away the stones, eradicate the weeds, manure well, plow deep, and sow and plant in the very nick of time, yet unless he sows and plants varieties of thrifty and productive habits, adapted to the soil and climate, he cannot reap the full reward of his labor and enterprise.

Most of our orchard fruits, the apple perhaps excepted, are yet capable of great improvement. There are few varieties of the pear of hardy and productive habits, affording fruit of first-rate excellence. Many excellent varieties of the plum have been raised of late years, but there is doubtless ample room for improvement in this fruit. Most of the finer varieties of the cherry appear to be entirely unsuited to this climate. The success of Dr. Kirtland, of Ohio, affords great encouragement to attempt the improvement of the cherry. I would suggest that the very hardy but comparatively sour morello seems likely to afford a race of plants better adapted to this climate than any other. Andrew Knight considered that the morello cherry offered a wide field for improvement, that there might be raised from it in a few generations of seedlings with suitable culture, varieties yielding large and sweet fruit. There is little doubt that the red currant may be made much sweeter and larger. Attempts should also be made to improve one or two of the native gooseberries, say Ribes hirtellum and R. robundifolium; it appears to me useless to experiment with varieties of English origin; the climate is evidently too bright and dry for the English gooseberry, as it is for the English hawthorn, rendering them both sickly and a prey to parasitic fungi. We have few hardy varieties of the raspberry, it would be well to improve the native raspberry by crossing it in the first instance with the more tender but superior cultivated varieties.

Gardening has ever been considered to be one of the most delightful amusements which can occupy the leisure hours of man; but pleasant as the ordinary cultivation of plants may be, it is a tame and monotonous pursuit, compared with the pleasure to be derived by raising new kinds of perennial flowers or fruit from seed. The comparative uncertainty of the results of our experiments has its charms. In ordinary gardening, we know that the flowers and fruit of next summer will be like those of the summer that is past—differing it may be a little as the season is propitious or otherwise; but from the moment a seedling springs from the soil to the time it produces its flowers or fruit, it is an object of great interest, and a source of much speculation to the experimenter; more mind is in the work than in ordinary gardening, greater skill is required, more correct habits of observation, and a more intimate and extensive knowledge of cause and effect. There is doubtless ample room for improvement yet; more valuable varieties of grain, fruit and vegetables than any we now possess, will yet be obtained.

A very short time would be required to disseminate widely, seeds of improved varieties of grain, or of our chief root crops, turnips, parsnips and carrots. Within twelve years from the time of proving the fruit an improved variety might be introduced into every garden of the United States, and in a country where fruit growing is a matter of so much importance, it must be a source of gratification to the successful experimentalist to be conscious that, even by his amusement, he may have contributed to some extent, to the welfare of his country and fellow men.

INDIAN WOMEN GATHERING WILD RICE.

THE GRASSES OF WISCONSIN,

AND THE ADJACENT STATES OF IOWA, ILLINOIS, INDIANA, OHIO AND MICHIGAN, THE TERRITORY OF MINNESOTA, AND THE REGIONS ABOUT LAKE SUPERIOR.

BY I. A. LAPHAM, MILWAUKEE.

The word grass conveys two very distinct and different ideas; and when used should be explained in such manner as to leave no doubt in the mind of the reader as to which is intended. In common usage the word includes herbage, or plants which constitute the food of cattle and other beasts, without regard to any particular species or family of the vegetable kingdom. This is obviously very indefinite, and would include (besides the true grasses) the branches of trees, and a host of nutritious plants, as well as clover and lucerne. A much more precise definition is given to the word grass (Gramineæ) in botany where it includes only such plants as possess certain characters in common, constituting a natural group or family. In this sense it includes corn, wheat, oats, rice, the cane, &c., while it excludes clover and many other plants usually called grass, but which belong to very different groups or families. It is in the latter sense or meaning of the word that it is used, and must be understood in the following pages.

In attempting to make up a list of the native and naturalized grasses of Wisconsin, we are embarrassed by the paucity of observers. There are but few botanists in our new state, and only a very small portion of its surface has been explored by persons qualified to discriminate the different species that may fall in their way. Doubtless there are many grasses growing within our limits, not yet detected, especially in the northern and central counties. I have not hesitated, therefore, to include those species of grass that have been observed in the adjacent country, many of which will perhaps be hereafter found in Wisconsin.

For the grasses of Ohio, besides my own observations in that State, I am indebted to the catalogues and communications of Dr. J. L. Riddell, Mr. Wm. S. Sullivant, Mr. Joseph Clark and the late Mr. T. G. Lea. For those of Michigan, the catalogue of Mr. John Wright, accompanying the Geological Report of Dr. Houghton, for 1839, is the only published resource. To Mr. Dennis Cooley, of Washington, Macomb County, my thanks are especially due for a very complete list of the grasses growing in his vicinity; and Mr. Charles Fox has kindly communicated several rare species from that State. I have but little information in regard to the grasses of Indiana, and did not succed in obtaining a list of those found in that State.

The plants about the shores of Lake Superior have been investigated and partially catalogued by W. A. Burt, W. D. Whitney, and Professor L. Agassiz. Those of Iowa, Minnesota, and the north-western part of Wisconsin are enumerated by Dr. C. C. Parry, in the late Report of Dr. Owen, on the Geology of the same district.

From Illinois I have received a very complete suit of specimens, collected by Dr. S. B. Mead, of Augusta, in Hancock County. A few species are added on the authority of Dr. C. W. Short, of Kentucky, and of the French botanist Michaux, who visited the southern portion of that State, and described its flora as early as 1794.

Within the limits thus indicated there have been detected one hundred and forty nine species, including several only known in cultivation. Their names, general character, time of flowering, &c., will be seen in the following Table:

TABLE OF THE GRASSES OF WISCONSIN AND THE ADJACENT COUNTRY.

Systematic Name.	Common Name.	Duration.	Time of Flowering.	Height or Length of Culms.	Kind of Roots.	Natural Place of Growth.
1. Leersia oryzoides............Su.	White Grass............	Perennial	August....	3 to 5 ft. ..	Creeping.	Wet places..............
2. Leersia Virginica.........Willd.	....	do......	August....	3 to 4 ft. ..	....	Wet shady places........
3. Leersia lenticularis..........Mx.	Fly-catch grass.........	do......	July.......	2 to 4 ft. ..	....	Wet grounds..............
4. Zizania aquatica..............L.	Wild rice................	Annual..	August....	2 to 9 ft. ..	Fibrous ..	In shallow water.........
5. Zizania miliacea............Mx.	Wild rice................	do. ? ...	August....	6 to 10 ft. .	do. ?....	In water..................
6. Lepturus paniculata..........Nutt.	....	do......	June	1 foot.	do. ?....	....
7. Alopecurus aristulatus........Mx	Water fox tail..........	Perennial	June to Aug.	1 to 2 ft. ..	Creeping.	Stagnant water..........
8. Alopecurus geniculatus........L.	Floating fox tail	do......	July & Aug.	1 to 2 ft. ..	do......	Margins of ponds........
9. Alopecurus pratensis..........L.	Meadow fox tail.........	do......	May.......	2 feet......	do......	Meadows................
10. Phleum pratense..............L.	Timothy.................	do......	June......	2 to 4 ft. ..	Fibrous ..	Meadows................
11. Phleum alpinum..............L.	....	do......	....	1 foot.	....	On mountains............
12. Vilfa vaginæflora...........Tor.	....	Annual..	September.	6 to 12 in..	Fibrous ?.	Dry gravely places.......
13. Sporobolus junceus..........Kh.	....	Perennial	August....	2 to 3 ft. ..	....	Prairies..................
14. Sporobolus heterolepis......Gray	....	do......	August....	1 to 2 ft. ..	....	Dry soil..................
15. Sporobolus serotinus........Gray	....	Annual?.	September.	8 to 15 in. .	....	Wet places..............
16. Sporobolus asper..........Wood	....	Perennial	....	2 feet......	Fibrous ..	....
17. Agrostis vulgaris..........With.	Red top..................	do......	July.......	1 to 2 ft. ..	Creeping.	Moist meadows..........
18. Agrostis alba.................L.	White top................	do......	July.......	1 to 2 ft. ..	do.	....
19. Agrostis scabra...........Willd.	Thin grass...............	do......	June & July	1 to 2 ft. ..	....	....
20. Agrostis perennans ....Gray	....	do	July.......	1 to 2 ft. ..	....	Damp shady places......
21. Cinna arundinacea............L.	....	do......	August....	2 to 5 ft. ..	....	Shady swamps...........
22. Cinna pendula...............Trin.	....	do......	....	....	....	Damp woods.............
23. Muhlenbergia sobolifera....Trin.	....	do......	August....	1 to 2 ft. ..	Creeping.	Openings................
24. Muhlenbergia glomerata....Trin.	....	do......	August....	1 to 2 ft. ..	do.	Swamps..................
25. Muhlenbergia Mexicana.....Trin.	....	do......	August....	2 to 3 ft. ..	do.	Low grounds.............
26. Muhlenbergia sylvatica..T. & Gr.	....	do......	September.	2 to 4 ft. ..	do.	Rocky woods............
27. Muhlenbergia Willdenovi...Trin.	....	do......	August....	3 feet.	do.	Shady woods............
28. Muhlenbergia diffusa.......Schr.	Nimble Will.............	do......	August ...	8 to 18 in. .	Fibrous ?.	Dry hill sides...........
29. Brachyelytrum aristatum...Beauv.	....	do......	June......	1 to 3 ft. ..	Creeping.	Woods...................
30. Calamagrostis Canadensis..Beauv.	Blue joint...............	do......	July.......	3 to 6 ft. ..	do.	Wet Grounds............
31. Calamagrostis coarctata......Tor.	....	do......	August....	3 to 6 ft. ..	do.	Wet Grounds............
32. Calamagrostis longifolia....Hook.	....	do......	....	1 to 4 ft. ..	do.	Sandy lake beach.......

33. Calamagrostis arenaria......Trin.	Sand reed..............	Perennial	August....	2 to 3 ft. ..	Creeping.	Sandy lake beach........
34. Oryzopsis asperifolia.........Mx.	Mountain rice..........	do.....	May.......	12 to 18 in.	....	Deep shady woods........
35. Oryzopsis Canadensis.......Tor.	....	do.....	May.......	8 to 18 in. .	....	Dry woods..............
36. Oryzopsis melanocarpa.....Muhl.	Black-seed millet.......	do.....	July.......	2 to 3 ft. ..	....	Woods..................
37. Stipa avenacea...............L.	Black oat grass.........	do.....	July.......	1 to 2 ft. ..	....	Openings and prairies....
38. Stipa juncea.................L.	Porcupine grass........	do.....	August....	2 to 3 ft. ..	....	Dry prairies............
39. Aristida dichotoma..........Mx.	Poverty grass...........	Annual?.	September.	5 to 15 in. .	....	....
40. Aristida purpurascens.......Poir.	....	Perennial	September.	2 to 3 ft. ..	....	....
41. Aristida stricta...........Beauv.	....	do.....	June......	2 to 3 ft. ..	....	Rocky shady places......
42. Aristida oligantha ....Mx.	....	....	....	....	....	Prairies................
43. Aristida tuberculosa........Nutt.	Long awned poverty grass	Annual..	July.......	6 to 18 in..	Fibrous..	Pine barrens, dry prairies.
44. Spartina cynosuroides.....Willd.	Cord grass.............	Perennial	August....	2 to 4 ft. ..	Creeping.	Banks of rivers, &c......
45. Bouteloua racemosa.........Lag.	....	do.....	August....	1 to 3 ft. ..	....	Openings and prairies....
46. Bouteloua oligostachya......Tor.	....	....	....	8 to 12 in. .	....	Drift ridges............
47. Bouteloua papillosa........Gray	....	....	August....	12 to 15 in.	....	....
48. Eleusine Indica..........Gaertn.	Wire grass.............	Annual..	May to Oct.	8 to 15 in. .	Fibrous..	About yards, &c.........
49. Leptochloa mucronata........Kth.	....	do.....	August....	2 to 3 ft. ..	do......	....
50. Leptochloa fascicularis......Gray	....	do.....	August....	8 to 15 in. .	do......	Wet meadows............
51. Tricuspis seslerioides.......Torr.	Tall red top............	Perennial	August....	3 to 5 ft. ..	....	....
52. Diarrhena diandria.........Wood	....	do.....	August....	15 to 30 in.	Creeping.	Shady river banks.......
53. Dactylis glomerata............L.	Orchard grass..........	do	June......	2 to 3 ft. ..	Fibrous..	Meadows................
54. Kœleria cristata ....Pers.	....	do.....	July.......	20 to 30 in.	....	Prairies and openings....
55. Reboulea Pennsylvanica....Gray	....	do.....	June......	2 feet......	....	Moist meadows..........
56. Reboulea obtusata..........Gray	....	do.....	June......	2 to 3 ft. ..	....	Dry places..............
57. Melica speciosa...........Muhl.	....	do.....	June......	3 to 4 ft. ..	....	Rich soil...............
58. Glyceria Canadensis........Trin.	Rattle-snake grass.....	do.....	July.......	2 to 3 ft. ..	Creeping.	Wet grounds............
59. Glyceria pallida............Trin.	....	do.....	July.......	1 to 3 ft. ..	do......	Very wet places.........
60. Glyceria nervata............Trin.	....	do.....	June......	1 to 3 ft. ..	do......	Moist meadows..........
61. Glyceria aquatica..........Smith	....	do.....	June......	3 to 5 ft. ..	do......	Marshes................
62. Glyceria fluitans..........R. Br.	....	do.....	June......	2 to 5 ft. ..	do......	Marshes................
63. Poa annua ....L.	....	Annual..	April to Nov	3 to 8 in. ..	Fibrous..	Cultivated grounds......
64. Poa pungens...............Nutt.	....	Perennial	April......	1 to 2 ft. ..	....	....
65. Poa debilis ....Torr.	....	do.....	May.......	18 inches. .	....	Woods..................
66. Poa nemoralis ....L.	....	do.....	June......	1 to 2 ft. ..	Creeping.	Woods..................
67. Poa sylvestris..............Gray	....	do.....	....	2 to 3 ft. ..	....	Rocky banks............
68. Poa alpina....................L.	....	do.....	June......	6 inches. ..	Fibrous..	....
69. Poa serotina................Ehr.	False red top..........	do.....	June... ..	2 to 3 ft. ..	....	Wet meadows...........
70. Poa trivialis.................L.	Rough meadow grass....	do.....	July.......	1 to 3 ft. ..	Fibrous..	Meadows................
71. Poa pratensis................L.	June grass.............	do.....	May to July	1 to 3 ft. ..	....	Dry soil................

72. Poa compressa ... L.	Blue grass	Perennial	June to Aug.	9 to 18 in.	Creeping	Meadows
73. Eragrostis reptans ... Nees		Annual	August	6 to 15 in.		
74. Eragrostis megastachya ... Link		do.	July	12 to 18 in.	Fibrous	Waste places
75. Eragrostis pilosa ... Beauv.		do.	August	6 to 15 in.	do.	
76. Eragrostis capillaris ... Nees		do.	August	1 to 2 ft.	do.	Sandy waste places
77. Eragrostis spectabilis ... Gray		do.	August	1 to 2 ft.	do.	
78. Festuca tenella ... Willd.		do.	July	6 to 12 in.	do.	Dry sterile places
79. Festuca ovina ... L.	Sheep's fescue	Perennial	July	6 to 15 in.	Fibrous	Dry places
80. Festuca elatior ... L	Tall fescue grass	do.	June	3 to 5 ft.		Moist meadows
81. Festuca pratensis ... Huds.	Meadow fescue	do.	June	2 to 3 ft.	Creeping	
82. Festuca nutans ... Willd		do.	July	2 to 4 ft.		Woods
83. Bromus ciliatus ... L.		do.	July	3 to 4 ft.		
84. Bromus Kalmi ... Gray		do.	June	1½ to 3 ft.		
85. Bromus secalinus ... L.	Chess	Annual	June	2 to 3 ft.	Fibrous	Wheat fields, &c.
86. Uniola latifolia ... Mx.		Perennial	August	3 to 4 ft.	Creeping	
87. Phragmites communis ... Trin.	Reed	do.	August	6 to 12 ft.		Shallow ponds
88. Arundinaria macrosperma ... Mx.	Cane	do.	March	30 to 40 ft.		
89. Triticum vulgare ... Vill.	Wheat	Annual	June	2 to 5 ft.	Fibrous	Cultivated
90. Triticum repens ... L.	Couch grass	Perennial	July	1 to 3 ft.	Creeping	Woods
91. Triticum caninum ... L.		do.	August	1 to 3 ft.	Fibrous	
92. Triticum dasystachyum ... Gray		do.	August	1 to 3 ft.	Creeping	
93. Triticum compositum ... L.	Egyptian wheat					Cultivated
94. Lolium perenne ... L.	Darnel	Perennial	June	1 to 2 ft.	Fibrous	Meadows
95. Lolium temulentum ... L.	White darnel	Annual	July	2 feet	do.	
96. Elymus Virginicus ... L	Wild rye	Perennial	August	2 to 3 ft.		Moist Woods
97. Elymus Canadensis ... L.	Lyme grass	do.	August	3 to 5 ft.	Creeping	Woods
98. Elymus striatus ... Willd.		do.	July	2 to 3 ft.		
99. Elymus hystrix ... L.	Bottle brush grass	do	July	2 to 4 ft.	Fibrous	Woods
100. Hordeum jubatum ... L	Squirrel tail grass	Biennial	June	1 foot	do.	Damp level prairies
101. Hordeum pusillum ... Nutt.		Annual	May	4 to 10 in.	do.	
102. Hordeum vulgare ... L.	Four rowed barley	do.	May	2 to 3 ft.	do.	Cultivated
103. Hordeum distichum ... L.	Two rowed barley	do.	June	2 to 3 ft.	do.	do.
104. Secale cereale ... L.	Rye	do.	June	4 to 6 ft.	do.	do.
105. Aira cæspitosa ... L.	Tufted hair grass	Perennial	June	2 to 4 ft.		Wet places
106. Aira flexuosa ... L	Common hair grass	do.	June	1 to 2 ft.	Fibrous	
107. Trisetum molle ... Kth.		do.	July	1 foot		
108. Danthonia spicata ... Beauv.		do.	July	1 to 2 ft.		Dry places
109. Avena striata ... Mx.		do.	May	1 to 2 ft.		Woods
110. Avena præcox ... L.		Annual	June	3 to 4 in.	Fibrous	

111.	Avena savita L.	Oats	Annual	July	2 to 4 ft.	Fibrous	Cultivated
112.	Avenantherum avenaceum Beauv.	Tall meadow oat grass	Perennial	May	2 to 3 ft.	Creeping	Meadows
113.	Holcus lanatus L.	Meadow soft grass	do.	June	1 to 2 ft.		Wet meadows
114.	Hierochloa borealis R. & S.	Seneca grass	do.	May	1 to 2 ft.	Creeping	Wet meadows
115.	Anthoxanthum odoratum L.	Sweet scented vernal grass	do.	May	12 to 18 in.	Fibrous	Meadows
116.	Phalaris arundinacea L.	Reed grass	do.	July	2 to 4 ft.		Wet meadows
117.	Phalaris Canariensis L.	Canary grass	Annual	July	2 feet	Fibrous	Cultivated
118.	Milium effusum L.	Millet grass	Perennial	June	3 to 6 ft.	do.	Wet shady places
119.	Paspalum fluitans Kth.		Annual	September	1 to 2 ft.	do.	Wet places
120.	Panicum sanguinale L.	Crab grass	do.	August	1 to 2 ft.	do.	Waste grounds
121.	Panicum glabrum Gaud.		do.	August	1 to 2 ft.	do.	Sandy fields
122.	Panicum filiforme L.		do.	August	1 to 2 ft.	do.	Dry sandy soil
123.	Panicum agrostoides Spr.		Perennial	July	1 to 3 ft.		Wet meadows
124.	Panicum proliferum Lam.		Annual	September	1 to 2 ft.	Fibrous	Wet meadows
125.	Panicum capaillare L.		do.	August	1 to 2 ft.	do.	Cultivated grounds
126.	Panicum virgatum L.		Perennial	August	3 to 5 ft.		Wet places
127.	Panicum latifolium L.		do.	June	1 to 2 ft.	Fibrous	Openings
128.	Panicum clandestinum L.		do.	July	1 to 3 ft.	do.	Thickets
129.	Panicum xanthophysum Gray		do.	June	12 to 15 in.		Openings and prairies
130.	Panicum panciflorum Gray		do.	June	1 to 2 ft.		
131.	Panicum dichotomum L.		do.	June	8 to 20 in.		Fields and woods
132.	Panicum depauperatum Muhl.		do.	June	8 to 15 in.		Dry sandy soil
133.	Panicum longisetum Tor.		do.?	August	18 inches		
134.	Panicum nervosum Muhl.		do.				
135.	Panicum miliaceum L.	Millet	Annual		1 to 2 ft.	Fibrous	Cultivated
136.	Panicum crus-galli L.	Barn-yard grass	do.	August	2 to 4 ft.	do.	Wet places
137.	Setaria verticillata Beauv.		do.	July	2 feet	do.	
138.	Setaria glauca Beauv.	Bottle grass	do.	August	2 to 3 ft.	do.	Old fields
139.	Setaria viradis Beauv.		do.	July	1 to 3 ft.	do.	Cultivated places
140.	Setaria Italica Kunth.	Millet	do.	July	2 to 4 ft.	do.	Cultivated
141.	Cenchrus tribuloides L.		do.	August	9 to 18 in.	do.	Dry sandy soil
142.	Zea Mays L.	Indian corn	do.	July	5 to 10 ft.	do.	Cultivated
143.	Tripsacum dactyloides L.	Gama grass	Perennial	July	3 to 6 ft.	Creeping	
144.	Andropogon furcatus Muhl.		do.	September	4 feet		Dry places
145.	Andropogon scoparious Mx.	Broom grass	do.	August	3 to 4 ft.		Dry prairies
146.	Andropogon Virginicus L.		do.	September	3 feet		Dry places
147.	Andropogon Macrorurus Mx.		do.	September	2 to 3 ft.		
148.	Sorghum nutans Gray		do.	August	3 to 5 ft.		Dry places
149.	Sorghum saccharrtum Pers.	Broom corn	Annual	August	6 to 9 ft.	Fibrous	Cultivated

Of the 149 species of grass eleven are found in Ohio, and not in either of the other States or Territories adjoining Wisconsin. They are:

Zizania mileacea, Mx.	No. 5
Alopecurus geniculatus, Linn.	8
Sporobolus asper, Sullivant	16
Glyceria pallida, Trin.	59
Festuca elatior, Linn.	80
Festuca pratensis, Huds.	81
Paspalum fluitans, Kunth.	119
Panicum filiforme, Linn.	122
Setaria verticillata, Beauv.	137
Andropogon Virginicus, Linn.	146
Andropogon macrorurus, Mich.	143

Five Specimens have only been detected in Illinios, to wit:

Lepturus paniculatus, Nutt.	No. 6
Aristida oligantha, Mx.	42
Leptochloa fascicularis, Gray	50
Holcus lanatus, Linn.	115
Tripsacum dactyloides, Linn.	143

Seven species brought from the regions about Lake Superior, appear to be peculiar to the shores of that great lake—they are:

Phleum alpinum, Linn.	No. 11
Cinna pendula, Trin.	22
Calamagrostis longifolia, Hook	32
Calamagrostis arenaria, Trin.	33
Poa alpina, Linn.	68
Aiva flexuosa, Linn.	106
Trisetum molle, Kunth.	107

These plants have mostly an alpine or sub-alpine character.

The four following species have only been observed in Wisconsin:

Sporobolus junceus, Kunth.	No. 13
Poa debilis, Torr.	65
Panicum xanthophysum, Gray.	129
Panicum longisetum, Torr.	133

As a correct knowledge of the different species of grass is important, not only to the farmer but to many other classes of our citizens, I have deemed it proper to give so much of the botanical character of each species as is necessary to distinguish them one from another. In this part of the work, I am especially indebted to the valuable Manual of the Botany of the Northern States, by Dr. Asa Gray, who kindly allowed me to make free use of the very accurate descriptions of that work.

Such is the minuteness and apparent obscurity of the several parts or organs from which the distinctive characters are mainly drawn, that the study of the Gramineæ is one of the most difficult in the whole science of botany, especially to those who are only beginning that fascinating study. But with the aid of a common magnifying glass, and a careful dissection of the flowers, taken at the right season of the year, any one may be able to decide upon the name of the common species of grass, with considerable certainty. This being done, reference can at once be had to whatever has been written in regard to them, in works on agricultural or botanical subjects.

The technical terms employed in describing the grasses, as well as other objects in natural science, are mostly included in the later editions of Webster's American Dictionary; so that the obstacles to the study of nature, arising from the necessary use of these exact terms, are in a great degree obviated.

The wild grasses growing in this State were found by the experience of the early settlers well adapted to the support of cattle, and even to yield the best of beef, butter and cheese. This is attributable, not to any one plant, but to a number of plants, and among them several leguminous and cyperaceous species, as well as true grasses.

This natural combination of grasses suggests the propriety of the culture of a number of species in our artificial pastures and meadows. It is well known that grasses vary very much in their value; some being best suited for hay, others for pasture; some for their early growth in the spring, others for their duration or continuing to yield a source of animal food late in the season. A judicious combination of different species, having reference to their qualities, and to the purposes of the cultivator, is doubtless far better than to rely entirely upon one or two species.

Sinclair* informs us that twenty-two different species were found on a single square foot of a rich ancient pasture in England. The superiority of such pastures arises from the variety of different habits and properties which exist in a numerous combination of different grasses. From the beginning of spring till winter there is no month that is not the peculiar season in which one or more grasses attain to the greatest degree of perfection. Hence the comparatively never-failing supply of nutritve herbage obtained from natural pastures, which it is vain to look for in those artificially formed with one or two grasses only.

A large number of the wild grasses herein described, though not noted as of any value to the agriculturist, are yet valuable in their way, inasmuch as they help to make up the great mass of vegetable covering, spread over the surface of the earth. They are all necessary in the great purposes of nature.

It will be observed that a full list of synonyma, or the different names by which each species of grass is or has been known and described, is included. This will prevent much confusion that might otherwise occur, and as has often been the case heretofore. If a writer speaks of *Herd's-grass,* for instance, we must inquire whether he writes from Pennsylvania or New York; if the former, he means *agrostis vulgaris* or red-top; if from the latter State, he is to be understood as speaking of *Phleum pratense* or timothy! So among botanists, new names have been occasionally given to grasses that had been previously described and named. In such cases the original name is to be restored and the new one is thrown among the synonyms. It is therefore important to give all these different names by which the same grass is known.

Besides the peculiarities pointed out by the botanist, by which grasses are distinguished from other plants, there are others, detected by the aid of chemistry. Silica, the element of sand and flint is found to exist in the coating of the culms and in small masses or concretions in some woody species. The chaff appears to be most abundantly supplied with this earthy element; and its presence in all species of the grass family heretofore analyzed shows the necessity of supplying silica to the soil

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* Hortus Gramineus Woburnensis, p. 235.—I am indebted to Dr. Benj. McVickar, of Milwaukee, for the use of a copy of this rare and valuable work.

where it is deficient, and where grasses and grains are to be cultivated with profit and success.

The skillful microscopist is able to separate this coating of silica from the other portions of the vegetable by means of heat, or of acids, and thus exhibit "a perfect cast of even the most minute vegetable structure in flint. The paleæ of *Festuca pratensis* exhibits a beautiful arrangement of silica without any preparation."*

I have given the results of the chemical examination of all such species as have been carefully analyzed, and to the results of which I have access. These tables will be of great importance to the practical agriculturists of our State by showing the necessity of keeping their soils always supplied with such ingredients as these analysis show to be essential for the growth and perfection of the plant. By their aid he can calculate with considerable accuracy the amount of each element annually abstracted, and consequently the amount that should be annually restored in the shape of manures, or by other means. For these tables, it will be observed, I am chiefly indebted ro the Report of Professor E. Emmons on the Agriculture of the State of New York, a work which not only does honor to the author but to the State by whose liberal and enlightened policy, the means necessary for the prosecution of the work were amply provided. It only remains for our farmers to obtain correct analysis of their soils to enable them to judge what crops are most suited to them; and what deficiencies, if any, are to be supplied, to render them suitable for the culture of any particular crop.

The proportion of grasses, as compared with the whole number of species of flowering plants varies with the latitudes, elevation, degree of moisture in the air, and other conditions affecting climate and the geographical distribution of plants. In Wisconsin this proportion is about one-thirteenth; and this is the fraction for Germany and France.† In New York‡ and Vermont‖ the proportion is a little greater, being one-twelfth.

In general the relative number of grasses diminishes as we approach the equator; but this rule appears to be reversed on our sea coast, for at

* Quickett, Practical Treatise on the Microscope, page 333.

† Humboldt, Views of Nature, p. 286.

‡ Torrey, Nat. Hist. N. York, Botany, vol. i., p. 7.

‖ Oakes, in Thompson's Vermont.

Wilmington, N. Carolina, the proportion is increased to one-tenth,* and in the vicinity of the Santee canal in South Carolina, the proportion is still further increased to one-ninth.†

The culture of the gramineæ may be regarded as giving origin to four different and distinct kinds of husbandry:

1. The culture of the grasses proper, for the purpose of supplying food for stock.
2. The culture of the grain bearing grasses, mostly for bread.
3. The culture of the aquatic grass, rice, (oryza sativa, Linn.,) on which a very large proportion of the human family are fed.
4. The culture of the sugar cane, (Saccharum officinarum, Linn.,) for the sake of its juice.

It is only with the first two that we have any concern as cultivators in this climate; rice and the cane requiring a greater annual temperature than is here found.

Whether the culture of grass and the rearing of stock, or the culture of grains is the most important and will yield the greatest return for the capital and labor employed, at any given locality, is quite an important inquiry. Usually upon the first settlement of a country, or the first emergence of a people from the barbarous state, the culture of grains predominate; the cattle being allowed to shift for themselves, and rely upon the natural grasses and herbage. The culture of grasses as food for stock is therefore an indication of a more advanced state of the agricultural art.

Usually in this country the two kinds are combined in the same townships or even on the same farms, but there is a decided tendency towards the increase of the first at the expense of the second kind of husbandry. Doubtless this mixed culture is best for western farmers, but yet there must be a certain relative proportion that one should bear to the other; and it should be our aim to ascertain what this proportion is, and to conform to it as nearly as circumstances will allow. The question resolves itself into this: whether the production of grain or of meat is the most profitable?

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* Catalogue of Rev. M. A. Curtis, in the Boston Jour. of N. Hist., vol. i, p. 82.

† According to the enumeration of Prof. H. W. Ravenal—Pro. Am. Ass., 1850, p. 2.

In Holland, almost the entire surface is devoted to pasture and hay, and in that country this peculiar kind of agriculture is carried to the greatest degree of perfection. It is a significant fact that landed property is there of greater value and commands a higher annual rent than in any other country.*

The relative proportion of pasture and meadow lands, as compared with the whole amount cultivated in different countries is stated at about one-seventh in France, one-fourth in Germany, and three-fourths in Great Britain.

In our own country it is stated that in Seneca county, New York, the proportion of cultivated lands devoted to grass has gradually increased from one-eighth to one-third ;† and according to a very recent report, it appears that in Ohio the whole number of acres cultivated is 11,437,692, of which there is in grass 3,662,692 acres, or nearly one-third.

What this proportion is in other States, or in our own State, I have not been able to ascertain with any degree of certainty.

If it should be well ascertained that land cultivated in grass is more productive and valuable in Wisconsin, than when cropped with grain, it may be that the partial failure of wheat a few years since, by turning attention in this direction may, upon the whole, be a great benefit rather than an injury to the State. The culture of grass for pasture and hay requires less manual labor, and less expensive machinery than that of grains ; and there is moreover less liability to failure of crops. Most of the diseases by which grain is attacked are in the heads, and the weavel or other insects usually destroy not only the culms and leaves, but the grain itself.

There are in most of the Western States numerous natural meadows, and low swampy grounds, the subsoil of which is the richest of any. Most of these can easily be drained, and rendered productive of artificial grasses with but small expense when compared with the advantages to be gained in the land, and in increasing the healthiness of the neighborhood.

* Loudon—Enc. of Agriculture.

† See the very valuable survey of that county, by the late John Delafield, in Trans. N. Y. St. Agr. Society, 1850, p. 502.

The greatest drawback on this kind of husbandry in this climate is the length of the winters, and the consequent necessity of providing a large amount of fodder in the growing season to be fed out during the long winter months.

It will be seen that little attempt has been made to describe the best modes of culture for grasses and grains; the object being to call attention to the different kinds, and to give such figures and descriptions as will enable any one to detect the various species, and thus become familiar with their respective merits and demerits. Much caution must be used in applying the rules laid down in books for the culture and management of crops. These rules are usually constructed to suit particular districts where the soil and climate may be very different from any we have in Wisconsin; and consequently much of the great mass of matter found in the books becomes useless, until tested here, and the results made known through our local publications. The operator must use his own judgment in deciding between that which is valuable, and that which is not worthy of his attention. But this very important portion of the subject must be left for some other person whose greater experience may enable him to do it ample justice.

It is known that the cultivation of a constant succession of the same or similar crops, soon destroys the value of the soil, and renders it, in a great degree, unfit for future use. Some of the older States are now suffering the evils resulting from this injudicious practice. To prevent the bad consequences of such a system, it is necessary to restore constantly to the soil the amount of food of plants annually abstracted. This is usually done by the direct application of such food, in the form of manure, lime, plaster, bone-dust, &c.; but it is found that a certain succession of different kinds of crops will, in a great measure, prevent this exhaustion of the soil. In such a system each cultivated field is allowed to lie a certain portion of the time in grass, either for the purposes of meadow or pasture.

The culture of the grasses, therefore, becomes one of the most important means of keeping up the natural fertility of the earth, and thus enable sher to bring forth her promised fruits and harvests.

The importance of introducing new grasses, and of efforts to improve those already cultivated, cannot be over-estimated. It is not at all certain that we have the best kinds, nor that those we have are brought to the greatest degree of perfection. Doubtless grasses might be improved by a proper course of culture, as well as fruits and blooded stock. New and peculiar varieties might be produced, suited to different purposes, combining the excellencies of two or more species, and thus adding largely to the value of our pastures and meadows. This improvement would also extend to the stock fed upon the improved grasses, yielding us a better article of beef, butter, &c.

Loudon relates* that the introduction, into the island of Jamaica, of a grass from Guinea (*Panicum polygonatum*), as food for birds, has been the cause of the increase of horned cattle in that island, until it has a better supply, both for the butcher and planter, than almost any other country. Few markets in Europe furnish beef of better quality, and at a cheaper rate than is now done by the people of Jamaica.

The following table, showing the weight of a bushel, and the number of grains in an ounce, of different kinds of grass seed, is interesting and useful. It is taken from a small Treatise on Grasses, by P. Lawson & Sons, seedsmen, Edinburgh:

Names.	Weight per Bushel in lbs.	No. of Seeds in one ounce.
Agrostis alba	13	500,000
Agrostis vulgaris	12	425,000
Aira cæspitosa	14	132,000
Alopecurus pratensis	5½	76,000
Anthoxanthum odoratum	6	71,000
Avena elatior	7	21,000
Calamagrostis arenaria	15	10,000
Dactylis glomerata	11½	40,000
Festuca elatior	14	20,500
Festuca ovina	13¼	64,000
Festuca pratensis	13	26,000
Glyceria aquatica	13¼	58,000
Glyceria fluitans	14½	33,000
Holcus lanatus	7	95,000
Lolium perenne	18	16,000
Milium effusum	25	95,000
Phalaris arundinacea	48	42,000
Phleum pratense	46	74,000
Poa nemoralis	15	173,000
Poa pratensis	13¼	243,000
Poa trivialis	15¼	217,000

* Encyclopedia of Agriculture, p. 195.

The following Table, compiled from the results of the experiments at Woburn, contains information of much value in regard to many species of grass:

No.	Name of Grass.	Produce per Acre—lbs.	Per centage of loss in drying.
8	Setaria viridis	6,806	.42
9	Alopecurus geniculatus	20,419	.70
10	Alopecurus pratensis	40.837	.57
17	Phleum pratense	10,209	.50
18	Agrostis vulgaris	17,696	.63
25	Agrostis alba	19 057	.65
53	Muhlenbergia Mexicana	27,906	.68
60	Dactylis Glomerata	21,780	.29
61	Glyceria nervata	126,596	.40
62	Glyceria aquatica	13,612	.30
63	Glyceria fluitans	5 445	.35
66	Poa annua	9,188	.42
68	Poa nemoralis	5,445	.31
70	Poa alpina	7,487	.70
71	Poa trivalis	10.209	.72
72	Poa pratensis	3,403	.57
79	Poa compressa	5,445	..
80	Festuca ovina	--	.65
81	Festuca elatior	13,613	.52
90	Festuca pratensis	12,251	.60
94	Triticum repens	7 827	.57
95	Lolium perenne	13,612	.50
97	Lolium temulentum	30,628	.50
98	Elymus canadensis	20,419	.43
99	Elymus striatus	27,225	.50
105	Elymus hystrix	10,209	.67
106	Aira flexuosa	10.209	.61
113	Aira cæspitosa	19,058	.65
114	Holcus lanatus	9,529	.73
115	Hierochloa borealis	7,827	.73
116	Anthoxanthum odoratum	27,225	.45
117	Phalaris arundinacea	54,450	.32
118	Phalaris canariensis	7,827	.61
120	Milium effusum	6,806	.38
139	Panicum sanguinale	5,445	.60

From the reports of the United States census of 1840 and 1850 we obtain the following Table of the gramminaceous products of Wisconsin:

	1840.	1850.
(Population)	30 945	305,191
Wheat, bushels	212.116	4 286,131
Barley, bushels	11.062	209,602
Oats, bushels	406 514	3,414 672
Rye, bushels	1.965	81.253
Indian corn, bushels	379.359	1,988.979
Hay, tons	30 938	275,662

Of the wheat produced in 1849, as shown in this table, about two-thirds were exported, mostly by way of Lake Michigan, being shipped at the ports of Milwaukee, Kenosha, and Racine, either in the form of grain or flour.

Table of the exports of wheat and flour, at Milwaukee, from 1845 to 1853:

YEAR.	Wheat (bushels.)	Flour (barrels.)	YEAR.	Wheat (bushels.)	Flour (barrels.)
1845	95,500	7,500	1850	297,578	100,017
1846	213,448	15,756	1851	130,744	101,811
1847	598,011	34 840	1852	428,512	88.213
1848	612,474	92.732	1853	1,181,090	159,216
1849	1,148,807	136,657			

Besides the above, large quantities are shipped annually at the ports of Kenosha and Racine; and recently Sheboygan and Ozaukee have begun to export this invaluable grain.

Among the items exported by way of Lake Michigan, besides wheat and flour, are large quantities of oats and barley; and also corn, hay, grass-ssed, rye and broom-corn.

The following Table shows the prices of grain in Milwaukee, in the month of October, for the last four years, including the low prices of 1851, and the high rates of the past year. The prices are in cents per bushel:

	1850.	1851.	1852.	1853.
Wint r Wheat	60 to 73	40 to 70	66 to 75	91 to 111
Spring Wheat	38 to 65	30 to 50	48 to 66	82 to 100
Rye	———	32 to 35	50 to 56	52 to 58
Barley	45 to 60	35 to 50	40 to 56	40 to 50
Oats	25 to 30	15 to 18	26 to 29	25 to 30

It may not be unimportant to copy here some account of the method of preparing straw, or the culms of grass for the manufacture of hats. "The period of flowering, or at the time the grass is in full flower, or when the blossom is about decaying, is the best stage of growth at which to cut the culms. They may be bleached by the process detailed by Mr. Cobbett, in his 'Cottage Economy.' The culms being selected and placed in a convenient vessel, boiling water is poured over them, in quantity sufficient to cover the straw; in this they are to remain ten minutes; when thus scalded the culms are to be spread out on a grass plat to bleach; by turning them once a day, the bleaching is generally effected in seven or eight days. According to my experience, the bleaching may be effected in a much shorter space of time. Instead of ten minutes, the culms are suffered to remain in the scalding water from one to two hours; they are then spread out on the grass and regularly moistened as they become dry, and turned once a day for two days: after this it is taken up and washed clean from dust, &c. It is then in a moist state placed in a close vessel and subjected to the fumes of burning sulphur for two hours. This has been found sufficient to bleach the straw in the most perfect manner."*

The VEGETABLE KINGDOM consists of two grand divisions, one (PHÆNOGAMIA) having flowers, with at least the essential organs of stamens and pistils, and producing seed which contains an embryo; the other (CRYPTOGAMIA) destitute of flowers, and with seeds containing no embryo.

The Phænogamous, or flowering plants, are again divided into two classes; one with stems formed of bark, wood, and pith, the wood increasing from year to year by layers formed on the exterior, (hence called EXOGENS); the leaves are net-veined, the embryo with two or more opposite cotyledons or lobes. The other class of flowering plants, to which the grasses belong, have stems not arranged in regular layers;† the growth is from the centre (hence called ENDOGENS); the leaves are mostly furnished with parallel veins, and sheathing at the base, not toothed or notched; the embryo with a single cotyledon.

The grasses, (GRAMINEÆ,) are those Endogenous Phængams, with stems (*culms*) mostly hollow, closed at the joints, with leaves alternate, apparently sessile, their sheaths clasping the stem, and slit open on the side opposite the blade down to the next joint: the flowers, with glumes or bracts, arranged in little groups or spikelets. By these simple characters any true grass may be known.

The graminæ are chiefly herbaceous; their roots fibrous, though often growing from a *rhizoma*, or underground stem, which is creeping and branched; the sheaths are often extended above the leaves into a kind

* Sinclair, Hort. Gram. Woburnensis, p. 427.

† See plate XI., figure 3, which represents a cross section through the culm of phleum pratense, as seen with the aid of the microscope, and shows the endoginous structure.

of margin, called a *ligule;* the spikelets with one, two, or many flowers, panicled, or spiked; the outer leaflets of the flowers are called *glumes,* the inner, *paleae;* stamens three, rarely one to six; styles two, plumose; fruit, a grain (called *caryopsis,*) free, or sometimes united with the paleae; embryo at the base, and on the outside of the albumen.

ARTIFICIAL ARRANGEMENT OF THE GRASSES OF THE NORTH-WEST.

This table is intended to aid in ascertaining the name of an unknown grass. The mode of using it is quite simple, and will be easily understood by a little attention. We first examine the flowers, and finding only one in each little group or spikelet, we refer to No. 2, if more than one flower, refer to No. 26. If the flowers are arranged in panicles, look down to No. 3; then see whether there are awns, if so, refer to No. 4. Should there be no glumes, and the grass under examination aquatic, we know it to be a zizania, or wild rice. But this conclusion must be confirmed by reference to the more full description in the body of the work, or in books on botany.

Having the name, we may refer to all that has been published concerning our specimen in the numerous works relating to agriculture and botany.

1. Spikelets with but one flower	2
1. Spikelets with two or more flowers	26
2. Flowers arranged in panicles	3
2. Flowers in spikes	16
3. With awns	4
3. Without awns	12
4. Glumes large	5
4. Glumes minute, unequal, one hardly perceptible	11
4. Glumes none, grass aquatic	2—ZIZANIA
5. Without abortive rudiments	6
5. With an abortive rudiment of a second flower	44—HOLCUS
6. Paleæ two	7
6. Paleæ three, upper one with an awn flowers polygamous	56—SORGHAM
7. Palea with one awn	8
7. Lower palea with three twisted awns	15—ARISTIDA
8. Paleæ cartilaginous	9
8. Paleæ herbacious	10
8. Paleæ membranaceous, with one keel	8—AGROSTIS
9. Flowers sessile	13—Oryzopsis
9. Flowers stipate, fruit black	14—Stipa

10. Flowers, naked, with one stamen.......... 9—Cinna

10. Flowers hairy, stamens three.......... 12—Calamagrostis

11. Stamens three.......... 10—Muhlenbergia

11. Stamens two.......... 11—Brachyclytrum

12. Glumes two.......... 13

12. Glumes none, leaves retrorsely scabrous.......... 1—Leersia

13. Paleæ membranaceous.......... 14

13. Paleæ coriaceous.......... 48—Milium

14. Fruit coated.......... 15

14. Fruit naked.......... 7—Sporobolus

15. Flowers stalked.......... 8—Agrostis

15. Flowers sessile.......... 6—Vilfa

16. Flowers awned.......... 17

16. Flowers without awns.......... 22

17. Spikes solitary.......... 18

17. Spikes numerous not bearded, unilateral paleæ cartilaginous.......... 50—Panicum

17. Spikes two or more polygamous, sterile flowers, bearded.......... 55—*Andropogon*

18. Spikes simple, or nearly so.......... 19

18. Spikes paniculate, or lobed.......... 21

19. Involuere none.......... 20

19. Involuere of two or more bristles.......... 51—Setaria

19. Involuere burr-like.......... 52—Cenchrus

20. Paleæ with awns one to three times their length.......... 4—Alopecurus

20. Paleæ with awns five times their length.......... 37—Hordeum

21. Both glumes and paleae awned.......... 10—Muhlenbergia

21. Glumes awnless, paleae awned.......... 46—Anthoxanthum

22. Flowers perfect or polygamous.......... 23

22. Spikes monœcious.......... 25

23. Spikes one-sided.......... 24

23. Spikes cylindrical, solitary terminal.......... 5—Phleum

24. Spikes two or more, spikelets suborbicular.......... 49—Paspalum

24. Spikes digitate or verticillate, linear.......... 50—Panicum

24. Spikes pedunculate, in a two-sided panicle.......... 16—Spartina

24. Spikes sessile, in a one-sided panicle.......... 3—Lepturus

25. Spikes all terminal, sterile above, fertile at base.......... 54—Tripsacum

25. Fertile spikes lateral, sterile ones terminal panicled.......... 53—Zea

26. Inflorescence in panicles.......... 27

26. Inflorescence in spikes.......... 39

27. Flowers awned.......... 28

27. Flowers without awns.......... 33

28. Lower palea awned on the back.......... 29

28. Lower palea awned on the apex.......... 32

29. Awn near the base of the palea.......... 30

29. Awn near the apex of the palea.......... 31

30. Apex bifid, awn bent .... 42—Avena
30. Apex multifid .... 39—Aira
31. Paleae with two bristly teeth .... 40—Trisetum
31. Paleae bifid .... 30—Bromus
32. Lower palea entire, fruit coated .... 29—Festuca
32. Awn between two teeth, twisted .... 41—Danthonia
33. Terminal flower perfect 34
33. Terminal flower abortive, or a mere pedical 36
34. Paleae entire, outer one mucronate 35
34. Glumes very unequal, resembling the lower abortive palea .... 50—Panicum
34. Glumes equal, longer than the palea .... 47—Phalaris
34. Lower palea truncate-mucronate, inner bifid .... 31—Uniola
34. Flowers silky-bearded on the rachys .... 32—Phragmites
34. Spikelets terete, paleae seven nerved .... 26—Glyceria
34. Spikelets two to six, five nerved .... 27—Poa
34. Spikelets two to twenty, three nerved .... 28—Erogrostis
35. Scales two—styles two .... 29—Festuca
35. Scales and styles three .... 33—Arundinaria
36. Panicle contracted 37
36. Panicle large diffuse .... 25—Melica
37. Lower palea one pointed, or mucronate 38
37. Lower palea pointless .... 24—Reboulea
37. Lower palea three cleft .... 20—Tricuspis
38. Stamens three .... 23—Kœlesia
38. Stamens two .... 21—Diarrhena
39. Spikelets two-ranked 37
39. Spikelets unilateral 43
40. Glumes broad 41
40. Glumes subulate 42
41. Glumes two, in the upper spikelet only .... 35—Lolium
41. Glumes two, in each spikelet .... 34—Triticum
42. Glumes collateral, spikelets in twos or more .... 36—Elymus
42. Glumes opposite, spikelets solitary .... 38—Secale
43. Spikes digitate—spikelets in two rows .... 18—Eleusine
43. Spikelets remote short, forming a long slender racime .... 17—Bouteloua
43. Spikelets conglomerate, or paniculate .... 22—Dactylis
43. Spikes racined, slender .... 19—Leptochloa

TRIBE I. ORYZEAE.

Spikelets one-flowered, sometimes monœcious, in branched panicles; glumes often wanting or obsolete; inner palea 3-nerved; scales 2; stamens 1 to 6.

GENUS 1. LEERSIA. *Solander.*

(Named from Dr. John D. Leers, a German Botanist.)

Spikelets one-flowered, compressed in one-sided racemose panicles, jointed with the short pedicels; glumes none; paleae chartaceous, compressed carinate, without awns, bristle-ciliate on the keels, nearly equal in length, but the lower one broader, carinate, and inclosing the flat grain; stamens 1 to 6, usually 2 or 3; scales membranaceous; stigmas feathery, the hairs branching. Perennial swamp plants; culms and sheaths retrorsely scabrous.

1. Leersia Oryzoides. *Swartz.*

Synonyma.—Phalaris oryzoides, Linnæus; Asprella oryzoides, Lamarck; white grass, cut grass, false rice, &c.

Panicle diffusely branched, often sheathed below; spikelets rather spreading elliptic-oblong; paleae strongly bristly-ciliate, whitish: stamens three. Perennial; flowers in August; culms 3 to 5 feet high. About ditches, sluggish streams, and swamps. A coarse, rough, white-topped grass, of no use as food for cattle. A native of Europe and Asia as well as of America. It has been observed in Ohio, Michigan, Illinois, and at Milwaukee in Wisconsin. In some of the Southern States, where this grass is known as "rice's cousin," on account of its relation to the cultivated rice (*oryza sativa*), it is used as hay, but at the North it is deemed of no value. Dr. Darlington* considers it a nuisance, which the farmer should take measures to expel by draining the land on which it grows. At the West it does not occur in sufficient quantities to render any such precaution necessary.

2. Leersia Virginica. *Wildenow.*

Syn.—Asprella Virginica, Rœm & Schult.

Panicle simple, slender, not sheathed at the base; spikelets closely appressed and somewhat imbricated on the slender branches, oblong; stamens two; paleae sparingly ciliate greenish. Perennial; flowers in August; culms 2 to 4 feet high. A slender-panicled, delicate-looking

* Agricultural Botany, page 106.

grass, about ditches and other wet places. Ohio, Michigan, Illinois, and at Milwaukee, Wisconsin. It possesses no agricultural value.

3. Leersia Lenticularis. *Michaux.*

Syn.—L. ovata Poir. Fly-catch grass.

Stem erect; panicle erect; spikelets large, roundish, imbricated; stamens two; paleae with the keel and veins ciliate. Perennial; flowers in July; culms 2 to 4 feet high.

Found in wet places in Ohio and Illinois, but rarely. Pursh* calls it a singular and elegant grass, and informs us that he observed it catching flies in the same manner as the *Dionæa muscipula* (Venus' fly-trap); the paleae being nearly of the same structure as the leaves of that plant.

The figures I have given [plate I, fig. 1,] of the paleae of this species will explain to the eye in what manner this fly-catching is performed, if at all. It is difficult to understand how insects can be "retained as in a trap by the proboscis," as suggested by Mr. Nuttall,† inasmuch as the ciliatures are all directed upwards, and would rather prevent the entrance than the exit of the insect. If caught at all, it must be by the closing of the valves by some spontaneous motion like that of the sensitive plant. I am indebted to Dr. A. Gray for specimens of the flowers of this plant, from which the drawings were made; and also to Dr. Geo. Engleman, of St. Louis, for specimens and important information in regard to this and other species of grass.

Plate 1. Figure 1.

a a flower of the natural size.
b the same magnified.
c the paleae opened, showing the nature of the "fly-trap."
d a flower.
e an anther.
f the germ and stigmas.
g the spines, or ciliatures, much magnified.

* Flora. Vol. I., p. 62.

† Genera of N. Am. Plants, Vol. I., p. 43.

GENUS 2. ZIZANIA. *Gronovius.*

(From *Zizanion,* the ancient name of some wild plant, supposed to be Lolium perenne.)

Flowers monœcious, the staminate and pistilate in one-flowered spikelets on the same panicle ; glumes none, or rudimentary, forming a little cup ; paleae herbaceo-membranaceous, convex, awnless in the staminate, the lower tipped with a straight awn in the pistilate flowers ; stamens six ; stigmas pencil-form. Stout aquatic grasses.

4. ZIZANIA AQUATICA. *Linnœus.*

SYN.—Z. clavulosa, Michx. Hydroporum esculentum, Link. Tuscarora rice, water oats, Indian rice, wild rice, &c. Folle avoine, of the French. Panicle large, pyramidal, lower branches staminate, spreading, upper branches pistillate, erect ; pedicels clavate ; lower paleae long-awned rough ; styles distinct ; grain linear slender. Annual ; flowers in July and August ; culms 2 to 9 feet high.

Swampy margins of streams, in shallow water. The stagnant water of swamps, and the still water of the smaller lakes, seem not to be favorable to the growth of the *zizania aquatica,* but a gently flowing current, as the margin of streams and the outlets of the small lakes, where the water has a depth of from one or two to perhaps six or eight feet, with a soft, slimy, mud bottom, is the appropriate *habitat.*

It forms an important item of food for the Indian tribes, who obtain it by paddling a canoe among the rice, when, with a hooked stick, they draw the stems over the canoe, and beat off the grain.* The harvest continues but a very few days, for when ripe the slightest touch shakes the grain off, and if the wind should blow hard for a day or two the rice is all lost. It is gathered both "in the milk," and after it has attained to maturity. Those who have used the wild rice prefer it to the common rice.

It would be well for the Agricultural Society to encourage some expe-

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* I am indebted to Messrs. G. P. Putnam & Co. for an "electrotype copy" of their plate representing Indian women gathering wild rice, one of the ornaments of their Illustrated Record of the Great Exhibition at N. York ; a very valuable work, which should be in the hands of every person of taste in the country. The original drawing was by Capt. Eastman, and was first published in Schoolcraft's History of the Indian Tribes, part 3, page 63, plate 4.—*See ante,* p. 397.

riments to ascertain the value of this rice for general cultivation and use, and also whether it is susceptible of improvement by artificial treatment. Though it has been known since the days of Linnæus, and though it is found in most of the streams from the Atlantic coast (where it flourishes in brackish water,) to the Rocky Mountains, it seems not, until very recently, to have attracted any considerable degree of attention.*

This very elegant grass is found throughout our State, as well as in Illinois, Indiana, Ohio, Michigan, Iowa, and Minnesota. It affords sustenance for the numerous flocks of birds that annually pass Wisconsin on their way to the warmer regions of the south. Cattle are very fond of their soft juicy culms and leaves, and often wade far into the water to obtain them. The difficulty of cutting hay in water two feet deep, will be readily understood; I am not aware of its having been attempted but once, when a woman was engaged in the water (her skirts floating on the surface) gathering the hay.

It is undoubtedly an annual plant, and must be raised from the seed each year, though botanists have usually expressed some doubts on this subject. If we may judge from the processes of nature, we would suggest that the seed be planted immediately after it ripens, and in water not stagnant nor flowing with much current. The large awn probably assists the seed in burying itself in the soft mud.

Figure 4, plate II., represents one of the anthers of the wild rice discharging the minute grains with which they are filled, called pollen. In this species, where the pistillate, or grain-bearing flowers, are above the staminate, these little grains are specifically lighter than the atmospheric air, which causes them to rise when discharged from the anther like so many little balloons, and come into contact with the stigmas. In Zea mais, or Indian corn, the pollen grains are heavier than the air, and fall upon the styles (called the silk), which are consequently placed below the staminate flowers, or the tassel. Such are the beautiful adaptations every where found in the works of the Great Creator.

The pollen grains of the Zizania aquatica are nearly globular, and are so small that six hundred of them, placed side by side, would only extend one inch; and a cubic inch would contain two hundred and sixteen mil-

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* *See ante,* p. 264.

lions of these grains. They are observed to have a small circular cavity, or opening, through the outer surface as represented in fig. 11, plate II. Each grain is found to be, a sack composed of two coats or coverings, within which is contained a transparent fluid filled with particles still more minute—supposed to be grains of starch. When moisture is applied to the pollen grains, the inner coat expands and is protruded through the opening or weak place in the outer coat, and the contents are discharged with an explosive force. The minute grains thus liberated from the pollen sack will be seen in constant motion resembling the motion of living animals.

PLATE 2. FIGURE 1.

1. A panicle, at the time the seed is ripe, one-fourth the natural size.
2. Extremity of a branch showing the staminate flowers, (natural size.)
3. Staminate flower magnified.
4. Anther, magnified.
5. Germ and stigmas, magnified.
6. Pistillate flower.
7. The same when ripe.
8. The seed.
9. A portion of the awn magnified.
10. The rachis of the fertile flowers.
11. Pollen grains very highly magnified.

5. ZIZANIA MILLIACEA. *Michaux.*

Panicle diffuse, ample, the staminate and pistillate flowers intermixed; awns short; styles united; grain ovate smooth; leaves involute. Annual; flowers in August. Culms 6 to 10 feet high. Grows in water. On Hoffman's Prairie, and along the canal, near Dayton, Ohio.

But little is known respecting this species, if indeed it is distinct from the last. It appears to be more common at the South, where it takes the place of our *z. aquatica.*

GENUS 3. LEPTURUS. *Robert Brown.*

From *leptos*, slender, and *ura*, tail, from the long slender spikes.

Flowers in spikes, polygamous; rachis filiform, jointed; joints with one spikelet; glumes, one or two, growing to the rachis, simple, or two-parted.

6. Lepturus Paniculatus. *Nuttall.*

Culms compressed; leaves short, rigid, sheathing the base of the panicle; panicle incurved, acutely triangular, rigid, bearing 6 to 10 compressed subulate spikes on one side, each one to two inches long; spikelets remote, on one side of the rachis; glumes rigidly fixed, unequal, parallel; paleae two, the outer of the same texture as the glumes, the inner membranaceous. Annual; flowering in June. Culm 1 foot high. Found at Augusta, Illinois, by Dr. S. B. Mead.

TRIBE II. PHLEOIDEÆ.

Infloresence in dense, cylindrical or one-sided spikes; spikelets one-flowered; glumes two, of nearly similar tenture with the paleae.

GENUS 4.—ALOPECURUS, *Linnæus.*

(Greek; *alopex,* fox, and *ura,* tail, from the shape of the spike.)

Glumes boat-shaped, strongly compressed-keeled, nearly equal, united at the base; lower paleae awned on the back below the middle; upper paleae wanting; stamens 3; styles mostly united; stigmas long, feathered.

7. Alopecurus Aristulatus. *Michaux.*

Syn. A. subaristatus, Pers. Wild water fox-tail.

Glaucous; culm decumbent below, at length bent and ascending; paleae rather longer than the obtuse glumes, scarcely exceeding the awn, which rises from just below its middle; anthers oblong, bright orange.

In water, and very wet places. Perennial. Flowers June to August. Culms 1 to 2 feet long. Usually confounded with *A. geniculatus.* Grows naturally in Wisconsin, and also in Ohio, Michigan, Illinois, on the St. Peters river in Minnesota, and about Lake Superior.

Plate 3. Fig. 1. A portion of the culm and leaves.
2. A spike.
3. A flower magnified.
4. The glumes.
5. Paleae and awn.
6. Awn still more magnified.
7. A stamen, the anther exploded.
8. The germ and stigmas highly magnified.
9. Section, showing the stem and sheath.

8. Alopecurus Geniculatus. *Linnæus.*

Floating Fox-tail.

Culm ascending, bent at the lower joints; paleae rather shorter than the obtuse glumes, the awn from near its base and projecting half its length beyond it; anthers linear; upper leaf as long as its sheath. Moist meadows; introduced in Ohio. Perennial; flowers in July and August. Culms 1 to 2 feet high. It prefers clayey margins of ponds, &c., and is of no use in agriculture.

Plate I, Fig. 2.—*a*, spike; *b*, a flower magnified; *c*, palea, awn and stigma.

9. Alopecurus Pratensis. *Linnæus.*

Meadow foxtail.

Culm upright, smooth, paleae equalling the acute glumes, which are united below the middle; awn exserted more than half its length, twisted; upper leaf half the length of its somewhat inflated sheaths. Perennial; flowers in May; culms 2 feet high. The seeds are covered with the paleae, which is soft and woolly.

This species is so seldom cultivated in this country, that it is doubtful whether it is entitled to a place in this essay. It prefers low, wet lands, and is adapted to clayey loam rather than a sandy soil. It forms a permanent sod; and sheep are said to be particularly fond of it. Several years are required to attain its greatest perfection, and probably on this account it will not be introduced into this country very extensively. Sinclair* informs us that it constitutes part of the produce of the richest pastures of Lincolnshire, Devonshire, and in the vale of Aylesbury; and, though not so well adapted for alternate husbandry, it is one of the best grasses for permanent pasture.

The following analysis is by Profs. Way and Ogston, of grass of this species grown on a calcareous soil in England.†

Phosphoric acid	6.25
Sulphuric acid	2.16
Carbonic acid	0.65
Lime	3.90
Magnesia	1.28
Per oxyde of iron	0.47
Potash	37.03
Chloride of potassium	9.50
Silica	38.75
	100.00

* Hort. Gram. Wob., p. 142.

† Working Farmer, vol. 3, p. 173; and 6th An. Rep. of Bd. of Ag. Ohio, 1851, p. 187.

Percentage of water in green grass	80.20
Percentage of ash in green grass	1.55
Percentage of nutritive matter in dry hay	2.18
Percentage of ash in dry hay	7.82

GENUS 5. PHLEUM. *Linnæus.*

(GREEK—*phleos*, the ancient name of some plant, supposed to be the Cat-tail.)

Glumes 2, equal, carinate much longer than the paleae, rostiate or mucronate; paleae 2, thin, included in the glumes, truncate, awnless; styles distinct; stigma plumose, with simple hairs; scales two, unequally two-lobed, glabrous; caryopsis ovoid, closely covered with the paleae.

10. PHLEUM PRATENSE. *Linnæus.*

Timothy. Herd's grass* (in New York and New England). Meadow cats-tail of Europe.

Culm erect; spike cylindrical elongated; glumes cyliate on the back, truncate, tipped with a bristle less than half their length; anthers purplish. Perennial; flowers in June, and ripens the seed in July; culms 2 to 4 feet high.

Associated with clover this is, and perhaps deservedly, about the only grass cultivated for hay or pasture in Wisconsin. Sinclair found the culms to contain more nutritive matter than any other grass examined by him; and this matter continues to increase until the seed is fully ripened. It is not so valuable when cultivated alone.

It was introduced into England from Virginia, by Mr. Peter Wyche, about the year 1760. Its name of Timothy is derived ftom Timothy Hanson, who first brought its seeds from New York to Carolina.

It is extensively cultivated in all the North-western States. A native of Europe and Asia, from whence it was introduced into the United States.

An acre of ground will yield from one and a half to two tons of hay; or, if cultivated for the seed, about thrity bushels are obtained. It requires a rich soil to produce the best crop; and the strength of the soil must be kept up by artificial means, for Timothy very soon exhausts its virtues.

A legal bushel of Timothy-seed in Wisconsin is forty-six pounds.

* In Pennsylvania and the States south of it, this name is applied exclusively to Red-top, *Agrostis vulgaris.*

When growing in very dry places, bulbs are frequently formed on the roots of Timothy grass, as a sort of store-house of moisture, &c., from which to draw supplies of nutriment for the future growth of the plant.

PLATE I, FIG. 3.—*a*, the flower fully expanded; *b*, the same closed (magnified). PLATE XI, FIG. 3, is a cross-section of the culm of this species, showing the minute structure of endogenous plants.

The following analysis of the ash of this important species of grass, is by Prof. E. Emmons, and published in his Agriculture of the State of N. York; vol. 2, p. 71.

Silica	41.650
Phosphates	16.925
Carbonate of lime	0.200
Magnesia	0.500
Potash	30.760
Soda	1.020
Soluble silica	0.200
Chloride of sodium	2.490
Sulphuric acid	4.130
Organic matter and loss	2.125
	100.000

The proportion of water lost in drying is	70.69
In dry hay the proportion of nutritive matter is	93.58
In dry hay the proportion of ash is	6.42

11. PHLEUM ALPINUM. *Linnæus.*

Spike ovate-oblong; glumes strongly ciliate-fringed on the back, truncate, tipped with a rough or barbed awnlike bristle, about their own length. Perennial; culms one foot high. Native of the mountains of Europe. About Lake Superior.—*Mr. W. D. Whitney.*

TRIBE III. AGROSTIDEÆ.

Infloresence panicled, or rarely spiked; spikelets solitary, one-flowered; glumes and paleae of nearly similar texture, usually carinate; scales two.

GENUS 6. VILFA. *Adanson.*

Spikelets in a contracted or spike-like panicle; glumes carinate, one-nerved, not awned or pointed, the lower smaller, flowers nearly sessile in the glumes; paleae two, much alike, naked, neither awned nor mucronate, usually longer than the glumes; the upper palea bi-carinate stigmas simply feathery; caryopsis oblong or cylindrical deciduous; culms wiry or rigid; leaves involute, usually bearded at the throat; their sheaths often inclosing the lateral panicles.

12. VILFA VAGINÆFLORA. *Torrey.*

SYN.—Agrostis Virginica, Muhl—(not of Linn.)

Culms slender, ascending, numerous; leaves involute, awl-shaped, somewhat rigid; panicles simple and spiked, the lateral and often the terminal concealed in the sheaths; paleae and glumes about equal; only one-third longer than the linear caryopsis. Annual; flowers in September; culms 6 to 12 inches high. Dry gravely places, in Ohio, (Wm. S. Sullivant,) and Illinois (Dr. S. B. Mead.)

GENUS 7. SPOROBOLUS. *R. Brown.*

(GREEK—*Spora* seed, and *Ballo* to cast forth.)

Spikelets one or rarely two-flowered, in a contracted or open panicle; paleae longer that the unequal glumes; stamens 2 to 3; grain a globular utricle, containing a loose seed, deciduous.

13. SPOROBOLUS JUNCEUS. *Kunth.*

SYN.—Agrostis juncea, Michx.; A. Indica Muhl.; Vilfa juncea, Trin.

Leaves involute, narrow, rigid, the lowest elongated; culm naked above, bearing a narrow, loose panicle; glumes purple ovate, the lowest one-half as long as the upper, equaling the nearly equal paleae. Perennial; flowers in August; culm 2 to 3 feet high. Eagle Prairie, Wis.

14. SPOROBOLUS HETEROLEPSIS. *Gray.*

SYN.—Vilfa heterolepsis, Gray.

Leaves involute-thread-form, rigid, the lowest as long as the culm, which is naked above; panicle pyramidal very loose, open, sparcely flowered, glumes very unequal, the lower awl-shaped, the upper ovate-oblong and taper-pointed and longer than the equal paleae. Perennial; flowers in August; culms 1 to 2 feet high.

Dry soil. Ohio, Illinois; and on the St. Croix river, Wisconsin, (Dr. C. C. Parry. This plant omits a strong odor, like that of *Eragrostis megastachya.*

15. SPOROBOLUS SEROTINUS. *Gray.*

SYN.—Agrostis serotina, Torr. Vilfa serotina, Tor. and Gray. V. tenera, Trin.

Smooth ; culms very slender flattish, few-leaved, leaves very narrow channeled, keeled ; panicle soon much exserted, elongated, the diffuse capillary branches scattered, distant, alternate ; pedicels capillary; glumes ovate, a little unequal, obtuse, about half the length of the oblong, obtuse paleae. Sandy swamps or wet places. Annual ; flowers in September ; culms 8 to 15 inches high. Michigan.

16. SPOROBOLUS ASPER. *Wood.**

Root long, white, fibrous ; culm stout, glabrous, geniculate at the base; leaves rigid glabrous, tapering to a long pungent point ; branches with short leaves, barren, also ending in a long pungent point ; sheaths ciliate at the edge and bearing dense tufts of long, white hairs at top ; panicles small, terminal and lateral, half inclosed in the long sheath ; spikelets blackish-green ; lower glume very short, upper nearly as long as the paleae ; grain compressed obovate. Perennial ; culms 2 feet high. Ohio. Wm. S. Sullivant.

GENUS 8. AGROSTIS. *Linnæus.*

[From the Greek, *agros* a field, its place of growth.]

Spikelets one-flowered, in an open panicle ; glumes two, somewhat equal, or the lower rather longer, usually longer than the paleae, pointless ; paleae two, very thin, pointless, naked ; the lower 3 to 5 nerved and frequently awned on the back, the upper often minute or wanting ; stamens usually three ; grain free ; culms cespitose, slender, panicle diffuse, the branches fasciculate-verticillate.

17. AGROSTIS VULGARIS. *Withering.*

SYN.—Agrostis polymorpha, Hudson. A. hispida, Willd. A. pumila, Linn. A. alba, Muhl., (not Linn.) Red top. Herd's Grass† of Pennsylvania and States south of it. Bent grass of English writers.

Panicle oblong, with spreading slightly rough short branches (purple);

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* Class book of Botany, p. 599.

† This name is applied to the *Phleum pratense* in N. York and the N. England States

leaves linear; ligule very short, truncate; lower palea nearly equaling the glumes, mostly awnless, three-nerved; the upper one-half its length. Perennial; flowers in July; ripens in August; culms 1 to 2 feet high. A very valuable species.

Moist meadows. Wisconsin, Michigan, Illinois and Ohio. A native also of Europe.

The red-top is deserving of more attention from farmers than it has heretofore received. It is a valuable grass well liked by cattle, and exhausts the soil far less than *Phleum pretense*, which is almost the only grass now cultivated in Wisconsin. It is adapted to moist places, and would soon find its way to the grounds now occupied by the comparatively useless sedges; and even the tamarac and cedar swamps might be converted into productive meadows at but little expense.

Analysis of the ash of red-top, by Prof. Emmons:*

Silica	41.90
Phosphates	13.75
Potash	4.92
Chloride of sodium	2.00
Carbonate of lime	10.03
Magnesia	6.64
Soda	9.61
Organic matter	2.35
Sulphuric acid	7.39
Loss	1.50
	100.00

18. Agrostis Alba. *Linnæus.*

Syn.—A. stolonifera, Linn. A. stricta, Willd. A. decumbens, Muhl. White bent grass and Fiorin grass of the English. White top.

Panicle narrow, contracted after flowering, (greenish-white, or slightly tinged with purple,) the branches rough; ligule oblong or linear; lower palea, rather shorter than the glumes, five-nerved, awnless, or rarely short awned on the back near the tip; culms ascending, rooting at the lower joints. Perennial; flowers in July; culms 1 to 2 feet high. Michigan, Ohio, and about Lake Superior.

A valuable grass, though esteemed much less than formerly. It is

* Agr. of New York, vol. ii, p. 73.

late, not very productive, and contains less nutritive matter than the other more cultivated grasses. The straw is very fine and tough, being excellent for braiding into hats, &c. It also bleaches well.

19. Agrostis Scabra. *Willdenow.*

Syn.—A. laxiflora, Richards. A. Michauxii, Trin. A. oreophila, Trin. Trichodium laxiflorum, Michx. T. montanum Torr. T. scabrum, Muhl. Thin grass, hair-grass.

Culms very slender, erect, smooth; leaves short and narrow; panicle very loose and divergent, purplish, the long capillary branches flower-bearing at and near the apex; lower palea awnless or occasionally short awned on the back, shorter than the rather unequal very acute glumes; the upper minute or obsolete. Perennial; flowers in June and July; culms 1 to 2 feet high.

Very abundant in Wisconsin, especially about the prairies; also in Ohio, Illinois, Michigan and about Lake Superior.

The large panicles are extremely delicate, and when mature are easily separated from the culm. In this condition they are blown about by every wind, scattering the seed far and wide; this being one of the contrivances by which nature distributes the seeds of plants very profusely, and explains the appearance of grass in certain places where it had not been before observed, and where no seed had been planted by the hand of man.

20. Agrostis Perennans. *Gray.*

Syn.—Cornucopiæ perennans, Walt. Trichodium perennans, Ell. T. decumbens, Michx. T. scabrum, Muhl—(not Agrostis scabra, Willd). Agrostis anomala, Willd.

Culms slender, erect from a decumbent base; leaves flat; panicle at length diffusely spreading, pale green, the branches short, divided and flower-bearing from, or below the middle; lower palea awnless (rarely short-awned,) shorter than the unequal glumes; the upper minute or obsolete.

Damp, shady places. Perennial; flowering in July and August. Culms 1 to 2 feet high. Milwaukee, in Wisconsin; also in Ohio and Michigan.

GENUS 9. CINNA. *Linnæus.*

Glumes lanceolate, acute, strongly keeled, hispid serrulate on the keel; the lower rather smaller; flowers stalked in the glumes, smooth, naked; lower palea longer than the upper, short awned on the back below the pointless apex; stamen one, opposite the one nerved upper palea; grain linear-oblong, free. Perennial; rather sweet-scented grasses, with simple upright culms, (2 to 7 feet high,) bearing a large compound panicle, its branches in fours or fives, linear-lanceolate flat leaves, and conspicuous ligules.

21. CINNA ARUNDINACEA. *Linnæus.*

SYN.—Agrostis cinna, Lamarck. Muhlenbergia cinna, Trin.

Panicle spreading, large, loose; lower glume and the upper palea about one-fourth shorter than the lower palea, which the upper palea barely equals; spikelets much compressed, green, rarely purplish. Moist woods and shady swamps. Perennial; flowers in August. Culms 2 to 5 feet high. Wisconsin, Illinois, Michigan, Ohio and Minnesota.

PLATE I, FIG. 4.—*a*, a branch of the panicle; *b*, spikelet magnified; *c*, the same with the glumes removed; *d*, a flower fully expanded.

22. CINNA PENDULA. *Trinius.*

SYN.—C. suaveolens, Blytt. Muhlenbergia pendula, Bongard.

Branches of the very loose panicle long and capillary, drooping; glumes slightly unequal, the lower nearly as long as the lower paleae; upper paleae a little shorter. Spikelets about half the size of the preceding; pedicels rough. Damp woods. Perennial; flowers in August. Lake Superior—Mr. W. D. Whitney.

GENUS 10. MUHLENBERGIA. *Schreber.*

(In honor of Dr. Henry Muhlenberg, of Pennsylvania.)

Spikelets one-flowered, in contracted panicles; glumes mostly acute or bristle pointed, persistent; the lower rather smaller, minute; flowers nearly or quite sessile in the glumes; paleae usually hairy-bearded at the base, herbaceous, deciduous with the inclosed grain, often equal; the lower three-nerved, mucronate or awned at the tip; stamens three. Panicles contracted or glomerate, terminal and axillary.

23. MUHLENBERGIA SOBOLIFERA. *Trinius.*

SYN.—Agrostis sobolifera, Muhl. Cinna sobolifera, Link.

Culm erect, sparingly branched; panicle simple, contracted, very slender or filiform; glumes barely pointed, almost equal, one-third shorter than the equal paleae; lower palea abruptly short-mucronate. Open rocky woods. Perennial; flowers in August. Culms 1 to 2 feet high. Ohio, Michigan and Illinois.

24. MUHLENBERGIA GLOMERATA. *Trinius.*

SYN.—Agrostis racemosa, Michx. A. setosa, Muhl. Polypogon glomeratus, Willd. P. setosus, Spreng. P. racemosus, Nutt, Cinna racemosa, Kunth.

Culm erect, sparingly branched or simple; panicle oblong, linear, contracted into an interrupted glomerate spike, long-peduncled, the branches sessile; glumes awned, nearly equal, and (with the bristle-like awn) about twice the length of the unequal very acute paleae. Perennial; flowers in August and September. Culms 1 to 2 feet high. Grows mostly in swamps. Wisconsin, Illinois, Michigan and Ohio.

25. MUHLENBERGIA MEXICANA. *Trinius.*

SYN.—Agrostis Mexicana, Linn. A. lateriflora, Michx. A. filiformis, Muhl. Cinna Mexicana, Link.

Culm erect, much branched; panicles lateral and terminal, often included at the base, contracted, the branches densely spiked-clustered, linear, (green and purplish;) glumes awnless, sharp-pointed, unequal, the upper about the length of the very acute lower palea. Perennial; flowers in August. Culms 2 to 3 feet high. A troublesome weed in low grounds. Wisconsin, Illinois, Michigan and Ohio.

Dr. Darlington says that this species makes an indifferent pasture in the latter part of summer. Here it is not found in sufficient quantity to be of any value, except as it helps to make up the general grassy surface by which the earth is beautified and adorned.

26. MUHLENBERGIA SYLVATICA. *Torrey and Gray.*

SYN.—Agrostis sylvatica, Torr A. diffusa, Muhl.

Culm ascending, much branched and diffusely spreading, smooth;

panicle contracted, densely many-flowered; glumes almost equal, bristle pointed, nearly as long as the lower palea, which bears an awn twice or thrice the length of the spikelet. Perennial; flowers in September. Culms 2 to 4 feet long. Rocky woods. Illinois, Michigan, Ohio, and about Lake Superior.

27. MUHLENBERGIA WILLDENOVII. *Trinius.*

SYN.—Agrostis tenuifolia, Willd. Cinna tenuifolia, Link.

Culm upright, slender, simple, or sparingly branched; panicle contracted, slender, loosely flowered; glumes slightly unequal, short-pointed, half the length of the lower palea, which bears an awn three or four times the length of the spikelet. Perennial; flowers in August. Culms 3 feet high. Shady woods. Wisconsin, Illinois, Michigan and Ohio.

28. MUHLENBERGIA DIFFUSA. *Schreber.*

SYN.—Dilepyrum minutiflorum, Michx. Drop-seed. Nimble-will.

Culms diffusely much branched; panicle contracted slender, rather loosely many-flowered, terminal and lateral; glumes extremely minute, the lower obsolete, the upper truncate; awn once or twice longer than the paleae. Perennial; flowers in August and September. Culms 8 to 18 inches high. Dry hills and woods. Mount Tabor, Ohio; Michigan, Illinois.

Under the name of "Nimble-will" this is known, especially in Kentucky and Tennessee, as an important pasture grass, though it is never cultivated for that purpose. Cattle feed on it readily. It has not yet been observed in Wisconsin. In Mississippi it is occasionally made into hay with other native grasses.

GENUS 11. BRACHYELYTRUM, *Beauvois.*

[Greek; *brachys*, short, and *elytron*, a covering, from the very short glumes.]

Spikelets one-flowered, with a clavate pedicel or rudiment of another flower; glumes two, minute, the lower one scarcely perceptible, upper pointless, persistent, shorter than the thick stalk of the flower; paleae inclosing the linear-oblong grain, somewhat equal, rough with scattered short bristles; the lower 5-nerved, contracted at the apex into a long straight awn; the upper two-pointed; stamens two; anthers and stigmas linear, elongated.

29. Brachyelytrum Aristatum. *Beauvois.*

Syn.—Muhlenbergia erecta, Schreb. M. aristata, Pers. M. brachyelytrum, Trin. Dilepyrum aristosum, Michx.

Culm simple; with rather downy sheaths; broad, flat, lanceolate, pointed leaves, and large spikelets; panicle contracted, simple. Rocky woods. Perennial; flowers in June and July. Culms 1 to 3 feet high. Wisconsin, Illinois, Michigan, Ohio, and about Lake Superior.

GENUS 12. CALAMAGROSTIS. *Adanson.*

[From *kalamos*, a reed, and *agrostis*, a genus of grasses.]

Spikelets one-flowered, pedicellate, with an abortive pedicel or rudimentary flower; panicle open, contracted, or spiked; glumes keeled, nearly equal or exceeding the paleae, which are surrounded at the base by a copious tuft of white bristly hairs; the lower palea bearing a slender awn on the back, or rarely awnless; upper mostly shorter; stamens three.

30. Calamagrostis Canadensis. *Beauvois.*

Syn.—C. Mexicana, Nutt. C. Purshii, Kunth. C. confinis, Spreng. Arundo Canadensis, Michx. A. confinis, Willd. A. cinnoides, Muhl. A. agrostoides, Ph. Blue joint.

Panicle oblong, loose, (often purplish); lower palea nearly as long as the lanceolate acute glumes, not exceeding the very fine hairs, bearing an extremely delicate awn below the middle scarcely equaling or exceeding the hairs; rudimentary pedicel minute. Perennial; flowers in July. Culms 3 to 5 feet high. Wet grounds.

Wisconsin, Illinois, Minnesota, Michigan, Ohio, and about Lake Superior, where it is considered a very valuable grass; it is mowed in August, and suffered to remain until winter, when it can be more readily hauled away. It is said to be greedily eaten by cattle, and to be as nourishing as herd's-grass, (timothy). Its growth is so rank that even a small meadow affords a great store of hay.* This grass has also attracted some attention in Minnesota.

* W. D. Whitney—Geological Report, p. 379.

31. CALAMAGROSTIS COARCTATA. *Torrey.*

SYN.—C. Canadensis, Nutt. Agrostis glauca, Muhl. Arundo coarctata, Torr.

Panicle contracted, dense; lower palea shorter than the taper-pointed tips of the lanceolate glumes, almost twice the length of the hairs (excepting the strong tuft borne by the conspicuous rudiment) bearing a rigid and exserted short awn above the middle; grain hairy, crowned with a bearded tuft. Wet grounds. Perennial; flowers in August. Culms 3 to 6 feet high. Michigan, and Lake Superior; also in Minnesota. (Dr. D. Houghton.)

32. CALAMAGROSTIS LONGIFOLIA. *Hooker.*

Culm stout from thick running root-stocks; leaves rigid, elongated, involute above and tapering into a long thread-like point; branches of the pyramidal panicle smooth; glumes lanceolate, the upper as long as the similar paleae, the lower one-fourth shorter; the copious hairs more than half the length of the naked paleae; sheaths clothed with deciduous wool. Sandy coast of Lake Superior. Perennial. Culms 1 to 4 feet high.

33. CALAMAGROSTIS ARENARIA. *Trinius.*

SYN.—Arundo arenaria, Linn. Psamma littoralis, Beauv. P. arenaria, R. & Sch. Ammophila arundinacea, Host. Sea reed, sand reed.

Culm rigid, from stout running root-stocks; leaves long, soon involute; panicle contracted into a dense cylindrical spike; hairs only half the length of the paleae; glumes acute. Perennial; flowers in August. Culms 2 to 3 feet high. Sandy sea and lake beaches. Lake Superior, (W. D. Whitney); also on the sea coast, and in Europe.

The long spreading roots of this coarse and rank grass, by extending themselves in the loose sand, prevents its removal by the wind; and they are employed in some sandy districts for this purpose.

TRIBE IV. STIPACEÆ.

Inflorescence panicled, or racemose; spikelets solitary, one-flowered, usually large; glumes membranaceous; paleae mostly two, lower one coriaceous, involute, 1 to 3-awned, closely inclosing the upper and the grain; scales mostly three.

GENUS 13. ORYZOPSIS. *Michaux.*

[From *oryza*, rice, and *opsis*, likeness.]

Glumes several-nerved, nearly equal, commonly rather longer than the elliptical flower, which is deciduous at maturity with a very short bearded callus; lower palea coriaceous, with a simple untwisted and deciduous awn jointed on its apex; stamens three; scales mostly two, conspicuous; styles sometimes united; stigmas plumose.

34. Oryzopsis Asperifolia. *Michaux.*

Syn.—Urachne asperifolia, Trin. U. leucosperma, Link. Mountain rice.

Culms clothed with sheaths bearing a mere rudimentary blade, overtopped by the long and rigid linear leaf from the base; panicle very simple and raceme-like, few flowered, awn two or three times the length of the rather hairy whitish paleae. Perennial; flowers in May, ripens in June and July; culms 12 to 18 inches high. Deep, shady woods; Wisconsin, Michigan, Ohio, and about Lake Superior.

The numerous radical leaves of this species remain green during the winter, and afford a refreshing bite for such cattle as have the good fortune to find them. It grows quite abundantly in some localities in this State.

Pursh considers the mountain rice worthy the attention of farmers, as the large seeds contain the finest flour.* But the grain drops off so easily upon the slightest touch, that it would be difficult to gather any considerable quantity. I am not aware that any experiments have been made to ascertain the value of this species, either as food for man or beast.

Plate IV. Fig. 1, a plant the natural size when in flower in the spring; 2, spikelet; 3, the glumes; 4, lower palea; 5, scale; 6, grain.

35. Oryzopsis Canadensis. *Torrey.*

Syn.—O. parviflora, Nutt. Stipa juncea, Michx. S. Canadensis, Poir. Milium pungens, Torr. Urachne brevicaudata, Trin.

Culms slender, the lowest sheaths leaf bearing; leaves involute thread-shaped, rigid; panicle contracted, the branches usually in pairs; paleae hairy-bearded, whitish; awn short and very deciduous or wanting. Perennial; flowers in May; culms 8 to 18 inches high. Rocky woods and dry places. Michigan and about Lake Superior.

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* Flora, vol. 1, p. 60.

36. Oryzopsis Melanocarpa. *Muhlenburgh.*

Syn.—Milium racemosum, Smith. Piptatherum nigrum, Torr. Urachne racemosa, Trin. Black-seeded millet.

Leaves lanceolate taper-pointed, flat; sheaths bearded in the throat; panicle simple or sparingly branched, the spikelets loosely racemed; awns twice the length of the blackish paleae; styles distinct, short. Perennial; flowers in July; culms 2 to 3 feet high, leafy to the summit. Woods, &c. Wisconsin and Ohio.

GENUS 14. STIPA. *Linnæus.*

[Greek—*stgpe*, tow; from the feathery awns of some species.]

Spikelets one flowered; flowers stipitate; glumes membranaceous, equal; lower palea coriaceous, closely embracing the upper and cylindrical grain, bearing a long and twisted simple awn at the apex; stamens mostly three; stigmas plumose.

37. Stipa Avenacea. *Linnæus.*

Syn.—S. barbata, Michx. S. virginica, Pers. Black oat-grass.

Culm slender, leafy chiefly at the base; leaves almost bristle-formed; paleae blackish, nearly as long as the pointed glumes; awns very long, naked, bent above, twisted below; panicle somewhat secund, and spreading, the branches mostly in pairs. Perennial; flowers in July; culms 1 to 2 feet high. Dry prairies; Wisconsin, Illinois, Michigan.

Plate V. Fig. 1, panicle natural size; 2, stamens, &c., enlarged; 3, the seed with its long, twisted, and bent awn.

38. Stipa Juncea. *Linnæus.*

Syn—S. pubescens, Lag. S. ucranica, Lam. Porcupine grass.

Panicle short, loose; glumes loose, filiformly acuminated to more than twice the length of the palea, which is attenuated at the base into an acute stripe one-third of its length and pubescent; paleae obtuse above; awn smooth, straight, very long; leaves long convolute-filiform, smooth inside. Perennial; flowers in August; culms 2 to 3 feet high. Illinois, Michigan, and on the rolling prairies of Iowa and Minnesota.—*Dr. C. C. Parry.* A native also of southern Europe and northern Africa. When in fruit, the pungent stripe adheres to everything that comes in its way, like the quills of the porcupine.

GENUS 15. ARISTIDA. *Linnæus.*

[Latin *arista,* a beard or awn.]

Flowers stipitate; glumes membranaceous, unequal, often bristle-pointed; paleae two, the lower tipped with a triple awn; upper much smaller, awnless; ovary stipitate, smooth; scales two, entire, smooth; panicle racemed.

39. Aristida Dichotoma. *Michaux.*

Syn.—Curtopogon dichotomus, Beauv. Poverty grass.

Culms in tufts, much fork-branched; spikelets in short contracted racemes; lateral awns minute, the middle one not longer than the paleae, bent down. Annual? flowers in September; culms 5 to 15 inches high. Dry, sterile places; Illinois and Ohio.

40. Aristida Purpurascens. *Poiret.*

Syn.—A. racemosa, Muhl.

Culms mostly simple, clothed with long, smooth leaves below; panicle spiked, densely flowered; awns nearly equal, three or four times the length of the paleae, at length spreading, middle one rather longest. Perennial; flowers in September; culms 2 to 3 feet high. Michigan and Illinois.

41. Aristida Stricta. *Michaux.*

Syn.—A. adscencionis, Walt. Chætaria stricta, Beauv.

Culm and leaves straight, erect; leaves pubescent; raceme long, somewhat spiked, crowded; awns spreading, twice as long as the paleae, middle one longest; spikelets appressed; glumes unequal, very acute; lower palea hairy at the base. Perennial; flowers in June and July; culms 2 to 3 feet high. In rocky, shady situations; Michigan and Illinois.

42. Aristida Oligantha. *Michaux.*

Culms strict, erect, sparingly branched, leaves convolute-filiform; flowers distant, alternate, solitary; awns jointless, three times the length of the glumes; panicle contracted. [Probably not distinct from A. stricta.] Prairies of Illinois.—*Michaux.*

43. Aristida Tuberculosa. *Nuttall.*

Long-awned poverty grass.

Culm branched below, tumid at the joints; panicle simple loosely-flowered;

the branches in pairs, one of them short, and about two-flowered, the other elongated and several flowered; small tubercles in the axils; glumes bristle awned, longer than the palea, which is tipped with the common stalk of the three equal divergently bent awns, twisting together at the base. Annual; flowers in July and August; culms 6 to 18 inches high. Dry prairies; Illinois; pine barrens of the St. Croix river, Wisconsin.—*Dr. C. C. Parry.*

TRIBE V. CHLORIDEÆ.

Spikelets usually several flowered, (rarely one-flowered,) with the upper flowers imperfect, disposed in one-sided racemose or digitate spikes; glumes persistent, the upper one appearing as the outer one; rachis jointless; stamens 2 or 3.

GENUS 16. SPARTINA. *Schreber.*

[From *spartine* a cord, on account of the long tough leaves.]

Spikelets one-flowered, very flat, closely imbricated in two rows on the outer side of a triangular rachis; glumes unequal, acute, or bristle-pointed, serrulate on the keel, the upper one larger; palea membranaceous awnless, shorter than the upper glume; stamens three.

44. SPARTINA CYNOSUROIDES. *Willdenow.*

SYN.—Trachynotia cynosuroides, Michx. Limnetis cynosuroides, Perroon. Fresh water cord-grass.

Culm rather slender; leaves long and narrow, tapering to a very slender point, keeled, flat, smooth except on the margins; spikes five to ten, scattered, spreading; glumes awn pointed, the lower equaling the lower palea. Perennial; flowers in August; fruit ripe in September; culms 2 to 4 feet high.

River banks, and margin of lakes—common. Wisconsin, Illinois, Indiana, Ohio, Michigan and Minnesota.

GENUS 17. BOUTELOUA. *Lagasca.*

[Probably named after some Spaniard.]

Spikelets crowded and closely sessile in a short spike on one side of a flattened rachis; the spikes in a simple raceme; glumes keeled, the lower one shorter; lower palea of the perfect flower three-nerved, three-toothed at the apex; the upper palea two-nerved and two-toothed; the nerves projecting into mucronate points; or in the short pedicelled abortive flower, into bristles or awns; stamens three.

45. BOUTELOUA RACEMOSA. *Lagasca.*

SYN.—Chloris curtipendula, Michx. Atheroprogon apludoides, Muhl. Eutriana curtipendula, Trin. Cynosurus secundus, Pursh.

Culm erect; leaves narrow taper-pointed; spikes numerous, linear-oblong, rather distant, somewhat reflexed, forming a strict racime; spikelets two (rarely three-flowered); lower palea of the perfect flower tricuspidate; of the abortive flower with three bristles; anthers bright-red. Perennial; flowers in August; culms 1 to 3 feet high. Dry prairies and Oak openings, from Waukesha to the Mississippi river in Wisconsin; also in Illinois, Michigan, Ohio, Iowa and Minnesota.

A remarkable and very handsome grass, common on the prairies and openings of Wisconsin.

46. BOUTELOUA OLIGOSTACHYA. *Torrey.*

SYN.—Atheropogon oligostachyum, Nutt.

Spikes 2 or 3, nearly terminal, many-flowered, glumes and paleae pubescent; lower palea distinctly three-awned, the two lateral awns shorter, arising near the middle of the palea; neutral valve three-awned; leaves setaceous smooth, very short; culm round, filiform, nearly naked, smooth erect; culms 8 to 12 inches high. Drift ridges, St. Peters river, Minnesota, and in the interior of Iowa, Dr. C. C. Parry.

47. BOUTELOUA PAPILLOSA. *Gray.*

SYN.—Atheropogon papillosa, Engleman. (Sill. Jour. vol. 46, p. 104.)

Culms cespitose, leafy at the base; leaves lanceolate-linear, hispid on the mid-rib and margin; Spikes 1 to 3, subterminal; glumes papillose-hispid; outer palea of perfect flower trifid. Flowers in August; culms 12 to 15 inches high. Sandy soil. Near Cassville, Dr. D. Houghton; Beardstown, Ill., Dr. Engleman; St. Croix, Dr. Parry.

PLATE I, FIG. 5.—*a*, the spike; *b*, a spikelet; *c*, outer glume; *d*, the abortive flower; *e*, a portion of the leaf.

GENUS 18. ELEUSINE. *Gærtner.*

[From *Eleusin,* the name of an ancient town where Ceres the goddess of harvests was worshipped.]

Spikelets two to six-flowered, closely imbricate-spiked, on one side of a flattish rachis; the spikes digitate clustered; glumes membranaceous, awnless, and pointless; the lower ovate, keeled, larger than the upper; stamens three; pericarp thin, free from the oval wrinkled seed.

48. Eleusine Indica. *Gærtner.*

Syn.—Cynosurus Indicus, Linn.

Dog's-tail or wire-grass, yard-grass. Called crow's-foot at the South. Culms branched at the base, ascending flattened; spikes 2 to 5, greenish; spikelets about five-flowered. Annual; flowers through the season; culms 8 to 15 inches long. About yards, &c. Introduced Ohio, Illinois.

In the latter part of summer it makes a fine green carpeting for yards and lanes that had been previously naked and muddy; cattle and hogs are fond of feeding on it.—*Darlington.*

In Mississippi it is used as a pasture grass, and for hay.

GENUS 19. LEPTOCHLOA. *Beauvois.*

[From *leptos* slender and *chloa* grass, the spikes being long and slender.]

Spikelets 3 to many-flowered, loosely spiked on one side of a long filiform rachis; spikes racemed; glumes membranaceous, keeled, often awl-pointed, the upper one somewhat larger; lower palea three-nerved, larger than the upper; stamens two or three.

49. Leptochloa Mucronata. *Kunth.*

Syn.—Oxydenia attenuata, Nutt. Eleusine mucronata, Mx.

Sheaths hairy; spikes numerous, in a long panicle-like raceme; spikelets small; glumes more or less mucronate, nearly equaling or exceeding the three or four-awnless flowers. Annual; flowers in August; culms 2 to 3 feet high. Illinois; at North Bend, Ohio, Dr. C. W. Short.

50. Leptochloa Fascicularis. *Gray.*

Syn.—Festuca fascicularis, Lam. F. polystachya, Michx. Diplachne fascicularis, Beauv.

Smooth; leaves longer than the geniculate decumbent culms; the upper sheathing the base of panicle-like raceme, which is composed of many strict spikes; spikelet seven to eleven-flowered; much longer than the lanceolate glumes; paleae hairy-margined towards the base; the lower one with two small lateral teeth and a short awn in the cleft of the apex. Annual; flowers in August; culms 8 to 15 inches long. Wet meadows. Illinois.—Michaux.

TRIBE VI. FESTUCINEÆ.

Spikelets several-flowered, panicled; the uppermost flower often imperfect or abortive; paleae pointless, or the lower sometimes tipped with a straight awn or bristle; stamens 1 to 3; scales 2.

GENUS 20. TRICUSPIS. *Beauvois.*

[Latin, *tricuspis*, three-pointed; form of the lower palea.]

Spikelets 3 to 12 flowered; glumes unequal; rachis of the spike bearded below each flower; palea chartaceous, lower one much larger than the upper, convex, hairy on the back, three-nerved, tricuspidate at apex by the projection of the nerves, upper palea emarginate, two-keeled; stamens three; stigmas plumose, dark purple.

51. Tricuspis Sesterioides. *Torrey.*

Syn.—Poa flava, Linn. P. seslerioides, Michx. P. quinquefida, Ph. Windsoria poæformis, Nutt. Tridens quinquefida, Roem. & Schultz. **Eragrostis tricuspis**, Trin. Uralepis cuprea, Kunth. Tall red-top.

Culm upright, very smooth; leaves smooth; panicle large, compound, the rigid capillary branches spreading, naked below; spikelets very numerous, five to seven-flowered, shining, purple, the flowers hairy towards the base. Perennial; flowers in August. Culms 3 to 5 feet high. Illinois and Ohio. Has been cut for hay in Pennsylvania, but is not esteemed of much value.

GENUS 21. DIARRHENA. *Rafinesque.*

[Greek, *dis*, two, and *arren*, man, from the two stamens; or *arrenes*, rough, from the scabrous keels of the upper palea.]

Glumes ovate, much shorter than the flowers, coriaceous, the lower much smaller; lower palea ovate, convex on the back, three-nerved above, sharp-pointed; scales ovate, ciliate; stamens two; grain very large, obliquely ovoid, pointed, rather longer than the paleae.

52. Diarrhena Diandra. *Wood.*

Syn.—Festuca diandra, Michx. Diarrhena Americana, Beauv.

Smooth, culms simple, with long broadly-linear flat leaves towards the base, naked above, bearing a few short-pedicelled spikelets in a very simple panicle. Perennial; flowers in August. Culms 15 to 30 inches high. Shady river banks and woods. Illinois and Ohio.

GENUS 22. DACTYLIS. *Linnæus.*

[Greek, *daktylis*, a finger's breadth.]

Spikelets crowded in one sided clusters, forming a branching dense panicle; glumes and the five-nerved lower palea herbaceous, keeled, awn-pointed, rough-ciliate on the keel; stamens 3; grain lance-oblong, acute

53. Dactylis Glomerata. *Linnæus.*

Cock's-foot. Orchard-grass.

Rough and rather glaucous; leaves broadly linear, keeled; branches of the panicle naked at the base; spikelets three to four-flowered. Perennial; flowers in June; culms 2 to 3 feet high. About fields and meadows, especially in shady places. Introduced from Europe, and cultivated.

This species of grass is very valuable, both for pasture and hay, though most useful as a pasture grass. Its quality of growing well in the shade of trees, in orchards, &c., would seem to point it out as suitable for our oak openings, where it would soon doubtless take the place of the wild herbage and less valuable natural grasses. To obtain the greatest benefit from the orchard-grass, it is necessary to keep it short, as it decreases in value very materially if allowed to ripen its seed, but continues to grow rapidly when pastured. It matures at the same time as the clover with which it is generally cultivated; and exhausts the soil much less than timothy. The seed is usually sown in autumn, immediately after wheat and rye; about a bushel (of 11½ pounds) to the acre. It is often sown early in the spring. By many farmers who have cultivated this grass it is preferred even to timothy; and it is well worthy the attention of the farmers of this State, where it is but seldom seen among the tame grasses.

GENUS 23. KŒLERIA. *Persoon.*

[In honor of M. Koeler, a German botanist.]

Spikelets three to seven-flowered, in a dense narrow spike-like panicle; glumes and lower palea membranaceous, compressed-keeled barely acute, or the latter often mucronate or bristle-pointed just below the tip; stamens three; styles very short.

54. Kœleria Cristata. *Persoon.*

Syn.—K. nitida, Nutt.

Panicle narrowly spiked, interrupted at the base; spikelets two to four-flowered; lower palea acute, often mucronate-pointed; leaves flat, the lower often sparingly hairy or ciliate. Perennial; flowers in July. Culms 20 to 30 inches high. Dry, gravelly places. Wisconsin, Illinois, Michigan, Iowa and Minnesota.

GENUS 24. REBOULEA. *Kunth.*

Spikelets usually two-flowered, in a contracted, slender panicle; glumes about equal in length, but very dissimilar, rather shorter than the flowers; the lower narrowly linear, keeled, one-nerved; the upper obovate, three-nerved; lower palea oblong, obtuse, boat-shaped, naked, chartaceous, minutely roughened, at least when old; stamens three; grain linear-oblong, grooveless.

55. Reboulea Pennsylvanica. *Gray.*

Syn.—Kœleria Pennsylvanica, DC. Aira mollis, Muhl.

Panicle long and slender, rather loose; upper glume obovate, barely obtuse, often slightly mucronate; the flowers lanceolate. Perennial; flowers in June and July. Culms 2 feet high. Moist meadows. Illinois, Ohio, Michigan, and about Lake Superior.

56. Reboulea Obtusata. *Gray.*

Syn.—Aira obtusata, Michx. A. truncata, Muhl. Kœleria truncata, Torr. Holcus striatus, Lin.

Panicle dense and contracted, somewhat interrupted, the spikelets much crowded on the short erect branches; upper glume rounded-obovate, truncate-obtuse, rough on the back; the flowers lanceolate-oblong. Perennial; flowers in June. Culms 2 to 3 feet high. Dry soil. Wisconsin, Illinois, Ohio, and about Lake Superior.

PLATE I, FIG. 6.—*a*, spikelet; *b*, the glumes; *c*, the palea and stamens; *d*, the upper flower.

GENUS 25. MELICA. *Linnæus.*

[From the Greek *meli*, honey.]

Spikelets two to five-flowered; the 1 to 3 upper flowers imperfect and dissimilar, convolute around each other; glumes large, chartaceous-membranaceous, scarious-margined, convex, obtuse, the upper seven to nine-nerved; paleae of the same texture as the glumes; the lower seven-nerved, flattish-convolute or convex, obtuse, entire; stamens three; stigmas branched-plumose.

57. MELICA SPECIOSA. *Muhlenburg.*

Melic-grass.

Spikelets few on each branch of the loose panicle, smooth, with two perfect flowers and a stalked rudiment composed of three abortive ones; glumes and paleae very obtuse. Perennial; flowers in June. Culms 3 to 4 feet high. Grows in rich soil. Wisconsin, Illinois and Ohio.

GENUS 26. GLYCERIA. *R. Brown.*

Greek, *glykeros*, sweet, from the sweetness of the grain of some species.

Spikelets mostly terete; rachis separating into joints; glumes two-pointless, nearly equal, membranaceous; paleae nearly equal, awnless, chartaceous; the lower obtuse five to seven-nerved; upper one bi-carinate; stamens 2 or 3; stigmas decompound; grain oblong.

58. GLYCERIA CANADENSIS. *Trinius.*

SYN.—Bryza Canadensis, Michx. Poa Canadensis, Beauv. Poa aquatica, Ph. Rattlesnake-grass.

Panicle oblong-pyramidal, at length spreading; spikelets tumid, oblong, six to eight-flowered, drooping, purplish; lower palea ovate, acutish, longer than the upper one; stamens two; leaves long, roughish. Perennial; flowers in July. Culms 2 to 3 feet high. Wet grounds. St. Croix river, (Dr. C. C. Parry); Illinois; near Lansing, Michigan, (Rev. C. Fox), and about Lake Superior. Resembles the English quaking grass (*Briza media*) in general aspect only.

59. GLYCERIA PALLIDA. *Trinius.*

SYN.—Windsoria pallida, Torr. Triodia pallida, Spreng. Uralepis pallida, Kunth. Poa dentata, Torr.

Branches of the rather simple panicle capillary, erect-spreading rough; spikelets few, somewhat appressed, oblong-linear, five to seven flowered; paleae nearly equal; the lower oblong, minutely five-toothed at the obtuse apex; the upper lanceolate conspicuously two-toothed; leaves short, sharp-pointed, pale. Perennial; flowers in July. Culms 1 to 3 feet long. Grows in shallow water and very wet places. Columbus, Ohio, (Mr. W. S. Sullivant.)

60. GLYCERIA NERVATA. *Trinius.*

SYN.—G. Michauxii, Kunth. Poa nervata, Willd. P. striata, Michx. P. lineata, Pers. P. parviflora, Ph. Briza Canadensis, Nutt.

Branches of the panicle capillary, at length drooping; spikelets numerous oblong, three to seven flowered, commonly purplish; paleae oval obtuse, nearly equal in length; leaves rather long. Perennial; flowers in June. Culms 1 to 3 feet high. Moist meadows—common. Wisconsin, Ohio, Michigan, and about Lake Superior.

This species grows abundantly in the wet meadows of Wisconsin, and is one of the most valuable of the native grasses. It retains its nutritive matter until the seed is fully ripe, and the large fan-like shoots that spring up immediately afterwards are very succulent and valuable. It is remarkably hardy. It has been cultivated in England, and found to possess many valuable properties in that humid climate.

61. GLYCERIA AQUATICA. *Smith.*

SYN.—G. spectabilis, Trin. Poa aquatica, Linn.

Panicle much branched, ample, the numerous branches ascending, spreading with age; spikelets oblong, or linear-oblong, five to nine-flowered, usually purplish; lower palea oval, truncate-obtuse, the upper rather shorter; leaves large. Perennial; flowers in June. Culms 3 to 5 feet high. Wet meadows and in shallow water of marshes. Wisconsin, Michigan, about Lake Superior, Indiana and Ohio. Native also of Europe.

This grass has been cultivated in Great Britain for its very abundant yield of coarse hay. It is usually cut before it attains its full growth, and forms an excellent fodder for milch-cows. Cattle are said to be very fond of it, and perhaps it may be worth the attention of those who have marsh lands. It would certainly be a good substitute for the wild sedges (species of carex, &c.) now generally suffered to grow in our marshes.

62. GLYCERIA FLUITANS. *R. Brown.*

SYN.—Festuca fluitans, Linn. Poa fluitans, Scopol. Manna-grass.

Spikelets seven to thirteen-flowered linear-terete appressed to the branches; lower palea oblong, obtuse, rather longer than the blunt two-toothed upper one; panicle secund, slightly branched, divaricate; stamens three; ligule long; culm flattened. Perennial; flowers in June. Culms 2 to 5 feet long. In shallow water of swamps and marshes. Wisconsin, Illinois, Indiana, Michigan, Ohio, Minnesota, and about Lake Superior. A native also of Europe.

Cultivated in Europe about alluvial marshes and in the margins of streams and ponds, for which places it is well suited; and it affords an early, sweet and nutritious grass. Its seeds afford food for water fowls and fish, and are used as an article of human food under the name of *manna seeds,* or *Manne de Prusse.* They are esteemed a delicacy in soups and gruels. When ground into meal it affords bread, but little inferior to that from wheat.

PLATE I, FIG. 7.—*a,* spikelet; *b,* a flower; *c,* glumes; *d,* lower palea; *e,* upper palea; *f,* cross section of the same; *g,* the germ, showing also the stamens, stigmas, &c.

The following is the analysis of this species of grass made by Prof. Emmons,* of Albany, N. Y. The ash contained:

Silicic acid	35,250
Phosphates	19,350
Lime	0,055
Magnesia	0,025
Potash	9,130
Soda	19,840
Sodium	1,605
Chlorine	2,445
Sulphuric acid	8,910
Organic acids	2,450
Loss	0 940
	100,000

* Ag. of N. Y., Vol. 2, p. 78.

The proportion of water in green grass of this species as reported by Prof. Emmons is	58.369
Dry matter	41.631
Ash	2.198
In dried grass the proportions are, of ash	5.279
Nutritive matter	94,721

GENUS 27. POA. *Linnæus.*

(Greek, *poa*, grass.)

Spikelets ovate-oblong compressed, few flowered, pedicellate, in diffuse panicles; glumes 2, shorter than the palea, the lower smaller; lower palea compressed-keeled, pointless five-nerved, commonly clothed at base with soft matted or cob-web-like hairs; upper palea rather smaller, two-toothed; stamens 2 or 3; stigmas simply plumose, usually flat and soft.

63. Poa Annua. *Linnæus.*

Culms spreading, flattish; leaves short; panicle often one-sided, at length spreading; spikelets crowded, very short-pedicelled, three to seven-flowered, ovate-oblong; flowers minutely downy above; root fibrous. Annual; flowers from April to November. Culms 3 to 8 inches long. Cultivated grounds. Sparingly introduced in the West. Wisconsin, and about Lake Superior; Cleveland, Ohio. A native also of Europe.

A small, delicate and tender grass of spontaneous growth everywhere, which is found to be excellent food for cows, affording milk and butter of the best quality. It is, however, never cultivated for the purposes of pasturage, other grasses of greater value being much more readily cultivated, and are more permanent. It makes a very beautiful, soft turf.

64. Poa Pungens. *Nuttall.*

Syn.—P. flexuosa, Muhl. P. cuspidata, Barton.

Culm flattened, stoloniferous from the base; root-leaves long and linear, those of the culm 2 or 3, lanceolate, very short, all abruptly sharp-pointed; branches of the spreading panicle, mostly in pairs; spikelets three to five flowered; glumes pointed, rough on the keel; lower palea oblong-lanceolate, rather obtuse, hairy along the keel below. Perennial; flowers in April and May. Culms 1 to 2 feet high. Illinois and Ohio.

65. Poa Debilis. *Torrey.*

Panicle loose, few-flowered, a little spreading, the branches few, in pairs, or the lowest in threes, a little rough, flexuous; spikelets ovate, obtuse, two to four-flowered; glumes acutish smooth; flowers broadly oblong, very obtuse, smooth, except the slight web at the base; leaves and sheaths smooth; ligule oblong acute; culms terete, weak. Perennial; flowers in May. Culms 18 inches to two feet high. In woods. At Milwaukee, in Wisconsin.

Plate VI.—Fig. 1, a young plant; 2, a spikelet; 3, glumes; 4, the flower, the glumes being removed.

66. Poa Nemoralis. *Linnæus.*

Culm flattish; leaves pale, rather long; ligules very short; branches of the loose nearly sessile panicle, filiform, nearly erect, with several about three-flowered spikelets above the middle; flowers lanceolate, acutish, obsoletely nerved, minutely soft-hairy along the keel below, naked on the sides; culm and leaves smooth. Perennial; flowers in June Culms 1 to 2 feet high. Woods, &c. Wisconsin and Illinois. A native also of Europe.

This wild grass prefers the shade of trees, and possesses but little value to the farmer, though its early growth in the spring, its fine, succulent, nutritive herbage, indicate that it is worthy of attention. It has recently been cultivated to some extent in England.

67. Poa Sylvestris. *Gray.*

Culm flattened, slender, upright; leaves pale, linear; those of the culm much shorter than the internodes; ligules short; panicle pyramidal oblong, long-peduncled; branches numerous from each joint, bearing two to three-flowered spikelets from about the middle; flowers oblong, obtuse, rather distinctly nerved, densely silky-hairy on the whole length of the keel and on the margins to the middle. Perennial. Culms to 3 feet high. Rocky banks and meadows. Wisconsin, Ohio and Michigan.

68. Poa Alpina. *Linnæus.*

Spikelets ovate, compressed, large, short pedicelled; leaves short obtuse, broad; ligules below short, truncate, above oblong, acute; culm erect; roots fibrous; panicle ovate, erect, the branches in pairs. Perennial; flowers in June. Culms 6 inches high. Lake Superior. Also in the mountains of Europe.

69. Poa Serotina. *Ehrhart.*

Syn.—Poa palustris, Muhl. P. crocata, Michx. False red-top.

Culm terete slender, bearing narrowly linear leaves, shorter than the internodes, and a long-peduncled, ample panicle; branches mostly in fives, rough, naked at the base, compound above, bearing numerous short-pedicelled, 2 to 4 flowered spikelets; glumes lanceolate, sharp-pointed; flowers oblong-lanceolate, acutish, obscurely nerved, hairy only next the base; ligules conspicuous. Perennial; flowers in June and July. Culms 2 to 3 feet high. Wet meadows, &c. Wisconsin, Illinois, Ohio, and about Lake Superior. Native also of Europe.

70. Poa Trivialis. *Linnæus.*

Syn.—P. stolonifera, Muhl. Rough meadow grass.

Culms and sheaths usually rather rough; branches of the pyramidal diffuse panicle mostly in fives; spikelets two to three-flowered; flowers lanceolate, acute, prominently nerved, a little hairy on the keel; ligule acute, long; root fibrous. Perennial; flowers in July. Culms 1 to 3 feet high. Meadows, &c. Wisconsin and Ohio. Introduced from Europe.

This species of Poa is but little inferior in many of its qualities to the *Poa pratensis*, which it much resembles. It requires a moist rich soil, and should only be cultivated in connection with other species of grass. It is not adapted to permanent pasture as it gradually dies out, probably from the exhaustion of its peculiar food from the soil. It is preferred by oxen, horses, and sheep, to many other grasses, being cropped close, while the others are suffered to grow.

The following analysis of the ash is from the Transactions of the New York Agricultural Society, for 1850, page 616:

Potash	9.13
Soda	19.84
Lime	0.05
Magnesia	0.02
Silica	35.25
Sulphuric acid	8.91
Phosphoric acid	19.35
Chlorine	2.44
Loss	5.01
	100.00

Every 100 pounds of fresh grass contains 61.4 pounds of water, and 38.6 of dry matter
Every 100 pounds of hay contains 5 pounds of ashes and 95 of nutritive matter.

71. Poa Pratensis. *Linnæus.*

Syn.—Poa viridis, Muhl.

Meadow grass, spear grass, June grass, Indian grass, wild grass, &c.—blue grass in Kentucky. Culms and sheaths smooth; branches of the panicle commonly in fives, spreading, spikelets three to five-flowered; flowers elliptical-lanceolate, nerved, acute, hairy on the lateral nerves and keel; ligule blunt, short; seeds acuminate, pointed, furrowed on the flat side; rhizoma creeping. Perennial; flowers from May to July. Culms 1 to 3 feet high. Dry soil, naturalized in Wisconsin, Ohio, Michigan, Illinois, and about Lake Superior. Native of Europe.

Plate VII. Figure 1, a plant of the natural size; 2, a spikelet; 3, a flower, the glumes removed; 4, a portion of the stigma magnified, showing the pollen grains.

The *poa pratensis* was not cultivated in England until the beginning of the present century, and is there not much esteemed either for pasture or hay. Upon opening the virgin forests, and destroying the wild herbage of the openings and prairies of Wisconsin, it is the first to spring up and cover the ground with its rich velvet of green. Indeed it precedes the march of immigration, and is found about the Indian villages and along their trails; "Indian grass," or "wild grass," being among the names by which it is here known. This humble grass is therefore one of the best friends of the early settlers, and should be looked upon with gratitude and treated with respect. For the purposes of the meadow, it s not to be ranked with other "tame grasses," but is invaluable for pasturage. The abundance of long and narrow radical leaves that shoot up from the creeping roots, after the falling of the seed, if left to grow, form a great store-house of food for cattle during the winter. In Kentucky it is ranked as one of the most valuable grasses, and is there universally called "blue grass." The culms are used for braiding, and making the finer kind of hats.

A great advantage of this grass is its disposition to intrude itself everywhere, spreading over the surface, and crowding out the more tender and valueless weeds. No *cultivation* is necessary to secure an abundant crop of *poa pratensis*. It is well adapted for supporting the slopes of terraces, and steep side-hills; its dense mass of matted roots enables it to support the earth on a steeper slope than any other known species of grass.

These slopes should never be steeper than forty-five degrees. The hills surrounding the city of Milwaukee have been, in a number of instances, improved by terraces supported by these sods, and make a very beautiful appearance, at moderate expense; affording level spaces for the support of fruit-bearing trees and shrubs.

The following analysis of the ash of this grass are from Emmons' Ag. of N. Y., Vol. ii, p. 77–78. The first was of plants cut when the flowers were just appearing; the second of well made hay, rather after the maturity of the plant:

	First.	Second.
Silica	......	56.320
Silicic acid	48.300	......
Phosphates	11.650	14.981
Lime	0.030	......
Carbonate of lime	not determined.	3.540
Potash	3.531	15.624
Soda	12.505	6.828
Sodium	4.180	......
Magnesia	a trace.	1.996
Sulphuric acid	5.156	0.200
Chlorine	6.365	0.863
Organic acid	4.400	......
Loss	3.883	......
	100.000	100.351

The amount of water in the newly cut grass, in 100 parts, is	64.17
Dry matter remaining	34.12
Ash	1.71

In dry hay the nutrive matter is	95.00
Ash	5.00

72. Poa Compressa. *Linnæus.*

Blue grass—wire-grass. Culms much flattened, obliquely ascending from a creeping rhizoma, the uppermost joint near the middle; leaves short, bluish green; panicle dense, contracted, the short branches 2 to 4 together, covered to near the base, with the 4 to 9-flowered spikelets; flowers linear-elliptical, rather obtuse, hairy below on the lateral nerves and keel; ligule short, obtuse. Perennial; flowers from June to August. Culms 9 to 18 inches long. Naturalized in Wisconsin, Illinois, Ohio, Iowa, Minnesota, and about Lake Superior.

This, the true "blue grass," soon finds its way among the wild grasses when the white man plants himself upon our soil. It is highly nutritious; cows which feed on it yield the richest milk and finest butter; it is therefore a very valuable grass, but is deficient in yield.* It springs up early in the season. It is hardly worth cultivating to the exclusion of other grasses, but could advantageously be mixed with them.

GENUS 28. ERAGROSTIS. *Beauvois.*

(GREEK—*Era* the earth, and *Agrostis* a genus of grass.)

Spikelets paniculate 2 to 70-flowered; lower palea three-nerved, not webby at the base; the upper persistent; culms often branching; leaves linear, frequently involute; ligule short, bearded; glumes unequal.

73. ERAGROSTIS REPTANS. *Nees.*

SYN.—Poa reptans, Michx.

Spikelets linear-lanceolate, flat, 10 to 30-flowered clustered, almost sessile; flowers lanceolate, ovate, smooth, acute; leaves short, almost awl-shaped, smoothish; culms branched, prostrate and creeping. Annual; flowers in August. Culms 6 to 15 inches long. Ohio, Illinois, Michigan.

74. ERAGROSTIS MEGASTACHYA. *Link.*

SYN.—Poa eragrostis, Linn. Briza eragrostis, Linn. Eragrostis major, Host. Megastachya eragrostis, Beauv.

Branches of the panicles single, or in pairs, mostly naked in the axils, covered with the spikelets; panicles oblong, crowded; spikelets 8 to 40-flowered, lead colored, on short petioles; flowers ovate, obtuse or mucronate; leaves flat, smooth; culms low branched at the base, spreading. Annual; flowers in July and August. Culms 12 to 18 inches long. About gardens and waste places. Emits a disagreeable odor. Wisconsin, Illinois, Michigan, Ohio.

75. ERAGROSTIS PILOSA. *Beauvois.*

SYN.—Poa pilosa, Linn. P. pectinacea, Michx. P. tenella, Ph.

Panicle pyramidal, large, loose; branches, all but the lower, scattered, and naked in the axils, compound; spikelets 5 to 12 flowered, purplish, nearly linear, flattish, about equaling the pedicels, flowers ovate, acutish; leaves flat or involute, bearded with long hairs in the throat; culms low,

* Darlington

branched at the base, spreading. Annual; flowers in August. Culms 6 to 15 inches long. Wisconsin, Illinois, Ohio and Michigan.

76. Eragrostis Capillaris. *Nees.*

Syn.—Poa capillaris, Linn.

Panicle expanding, very compound, loose, delicate; the axils naked; spikelets oblong, acute; 2 to 4 flowered, purplish, on long capillary pedicels; sheaths and base of the flat leaves often hairy. Annual; flowers in August. Culms 1 to 2 feet high. Sandy waste places. Illinois, Ohio, Michigan.

77. Eragrostis Spectabilis. *Gray.*

Syn.—Poa spectabilis, Pursh. P. hirsuta, of authors, not of Mx.

Panicle divergently spreading, the branches rigid, reflexed with age, a bearded tuft in the principal axils; spikelets oblong or linear, 7 to 10 or 15-flowered, purplish, the lateral ones often not exceeding their appressed pedicels; flowers ovate, minutely ciliate; culm and long leaves rigid, mostly smooth; lower sheaths often downy. Annual; flowers in August and September. Culms 1 to 2 feet high. Illinois and Michigan.

GENUS 29. FESTUCA. *Linnæus.*

[Latin—*Festuca,* an herb.]

Spikelets three to many-flowered, panicled or racemose; flowers not webbed at the base; glumes unequal, mostly keeled; paleae chartaceous, roundish on the back, the lateral nerves vanishing below the entire apex which is acute, pointed or often bristle-awned; the upper mostly adhering at maturity to the inclosed grain; stamens mostly three.

78. Festuca Tenella. *Willdenow.*

Syn—F. bromoides, Michx. F. octoflora, Walt.

Panicle very simple and spike-like, somewhat one-sided; spikelets 7 to 9-flowered; awns shorter than the involute-awl-shaped paleae, leaves almost bristle-form; culm filiform. Annual; flowers in July. Culms 6 to 12 inches high. Dry, sterile places. Wisconsin, Illinois, Michigan and Ohio.

79. Festuca Ovina. *Linnæus.*

Sheep's Frescue-grass.

Panicle very simple, much contracted, partly one-sided; spikelets of about 6 smooth, lanceolate-oblong flowers, bearing awns half their length, or less; leaves involute-bristle-form, short, chiefly tufted at the base of the slender culms, which are setaceous and somewhat angled above. Perennial; flowers in July. Culms 6 to 15 inches high. Michigan—introduced. A native of Europe.

On dry side hills this sheep's grass might probably be cultivated with advantage. It has a fine foliage, which is succulent, and may be better adapted to the masticating organs of sheep than the larger grasses, whose nutritive powers are greater.* It has been long cultivated in Great Britain, being one of the first to receive the attention of farmers. The straw affords a very fine material for braiding and making hats.

80. Festuca Elatior. *Linnæus.*

Tall Frescue-grass.

Panicle branched, loose, rather spreading; spikelets ovate-lanceolate, crowded, 4 to 6-flowered; lower palea pointless or very short pointed; rhizoma creeping; leaves broadly linear. Perennial; flowers in June. Culms 3 to 5 feet high. Moist meadows; introduced—Ohio. Resembles the following, but is not as valuable for the purposes of the farmer.

81. Festuca Ppatensis. *Hudson.*

Meadow frescue-grass.

Panicle simple, or sparingly branched; spikelets 5 to 10-flowered; lower palea barely acute; root fibrous; seeds oblong slender, very acute, rounded on one side, with a long furrow on the other, covered with the paleae. Perennial; flowers in June and July. Culms 2 to 3 feet high. Introduced—Ohio.

This valuable grass has not been found in this State, but is included in the catalogue of plants growing spontaneously in Ohio. Sinclair states † that the meadow frescue constitutes a considerable portion of all the rich natural pastures and irrigated meadows; it makes excellent hay, and though a large plant, the leaves or herbage are succulent and tender. It is apparently muchliked by cattle, as they never allow it to form rank tufts which is often the case with the larger grasses.

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* Sinclair, Hort. Gram. Wob. p. 259.

† Hortus Gramineus, Woburnensis, p. 152.

The "Randall grass" recently introduced into Virginia, and thence into some of the Western states, is supposed to be an improved variety of this species. It is spoken of as very valuable, especially for fall and winter pasture, being but little affected by early frosts, and remaining quite green during the winter, under the snow; hence sometimes called "Evergreen grass."

82. Festuca Nutans. *Willdenow.*

Panicle diffuse, at length nodding; branches long, slender, mostly in pairs, rough, naked below; spikelets ovate, three to five-flowered, near the extremity of the branches, on pretty long pedicels; flowers ovate-oblong, rather obtuse, smooth, awnless, very obscurely five-nerved; culms naked above; leaves broad-linear, taper-pointed dark-green, often hairy. Perennial; flowers in July. Culms 2 to 4 feet high. Woods. Wisconsin, Illinois, Ohio and Minnesota.

Plate I. Figure 8.—*a*, spikelet; *b*, glumes; *c*, lower palea; *d*, upper palea; *e*, section of the upper palea; *f*, the flower, much magnified.

GENUS 30. BROMUS. *Linnæus.*

[Greek—*Bromos* food.]

Spikelets five to many-flowered, panicled; glumes unequal, membranaceous, the lower one to five-nerved; the upper three to nine-nerved; lower palea convex on the back or slightly keeled, about seven-nerved at the base, awned or bristle-pointed from below the mostly two-cleft tip; upper palea at length adhering to the groove of the oblong or linear grain; stamens three.

83. Bromus Ciliatus. *Linnæus.*

Syn.—B. Canadensis, Michx. B. pubescens, Muhl. B. purgans, Linn.

Panicle compound, very loose, the elongated branches at length divergent drooping; spikelets seven to twelve-flowered; lower glume one-nerved, the upper three-nerved; flowers oblong-lanceolate, tipped with an awn half to three-fourths their length; upper palea bristly-ciliate; the lower silky with appressed hairs near the margins, smoothish on the back; leaves large smooth or somewhat hairy; sheaths often hairy near the top. Varies much as to pubescens, &c. Perennial; flowers in July and August. Culms 3 to 4 feet high. Wisconsin, Illinois, Ohio, Michigan and about Lake Superior.

Plate I, Fig. 9.—*a*, spikelets; *b*, glumes; *c*. lower palea; *d*, the stamens.

84. Bromus Kalmii. *Gray.*

Syn.—B. ciliatus, Muhl. B. purgans, Torrey.

Panicle simple, small, the spikelets drooping on capillary peduncles, closely seven to twelve-flowered, densely silky all over, with rather long and spreading hairs; lower glume strongly three-nerved, the upper five-nerved; awn only one-third the length of the lanceolate-oblong flowers; culm slender; leaves and sheaths conspicuously or sparingly hairy. Perennial; flowers in June and July. Culms 18 inches to 3 feet high. Wisconsin, Illinois, Ohio and Michigan.

85. Bromus Secalinus. *Linnæus.*

Cheat or chess.

Panicle spreading; the drooping peduncles but little branched; spikelets oblong-ovate, turged, smooth, of eight to ten flowers, not over-lapping each other, mostly longer than the awn; lower glume five-nerved; upper seven-nerved. Annual; flowers in June. Culms 2 to 3 feet high. About wheat fields, &c., in Wisconsin, Illinois, Michigan, Ohio and around Lake Superior. A native of Europe and Central Asia.

A pest about grain fields, supposed by some careless observers to be degen erated wheat. It is as improbable to those who have properly investigated natural history, that wheat should by deficiency of soil or any other cause turn into cheat as that chickens should be hatched from the eggs of ducks or turkeys. A very little study, and close examination of the facts will remove this prejudice from the mind of every one. For some very judicious observations on this subject, see the article of Mr. John Townley, in this work, vol. ii, (1852,) page 281.

GENUS 31. UNIOLA. *Linnæus.*

(A diminitive of the Latin *unio.*)

Spikelets many-flowered, very flat, two-edged; one or more lower flowers sterile and consists of a single palea; glumes lanceolate, compressed-keeled; palea of perfect flowers two, membranaceo-coriaceous, the lower one boat-shaped, striate-nerved; upper one smaller doubly keeled; grain free, smooth laterally flattened, inclosed in the paleae. Stamens one to three.

86. Uniola Latifolia. *Michaux.*

Spikelets slender-pedicelled, drooping, in an ample, loose panicle, oblong-ovate, ten to fifteen flowered; flowers nearly appressed, ovate-lanceolate, slightly scythe-shaped, ciliate on the keel, the lowest one neutral, and like a third glume;

leaves flat, broad; stamens one. Perennial; flowers in August. Culms 3 to 4 feet high. Illinois and Ohio.

GENUS 32. PHRAGMITES. *Trinius*,

(GREEK—*Phragmos* growing in or forming hedges.)

Spikelets three to seven-flowered; flowers rather distant; rachis silky-bearded; glumes membranaceous, shorter than the flowers, lanceolate, keeled, sharp-pointed, very unequal; paleae membranaceous, slender, the lower narrowly awl-shaped, thrice the length of the upper; styles long; grain free.

87. PHRAGMITES COMMUNIS. *Trinius*.

SYN.—Arundo phragmites, Linn. Reed.

Panicle loose, diffuse when old; spikelets three to five-flowered. A tall stout grass, with numerous broad leaves and a large terminal panicle. Perennial; flowers in August and September. Culms 6 to 12 feet high. Grows in shallow ponds and swamps. Wisconsin, Illinois, Northern Indiana, Michigan, Ohio and Minnesota. A very large and showy grass, but has not yet been found to possess any essential value to man.

GENUS. 33. ARUNDINARIA. *Richards*.

(From the Latin, *Arundo*, a reed.)

Spikelets many-flowered, somewhat compressed; florets distant, perfect or staminate only; glumes concave, awnless, small, lower smaller than the upper; paleae herbaceous, lower one ovate, concave, sharply mucronate, many-nerved the upper one two-keeled. Scales three longer than the ovary, which is sessile and glabrous; stamens three; styles three, very short; stigmas plumose, the hairs long, simple, or sparingly branched; caryopsis free, ovoid-oblong, somewhat curved terete; culms woody.

88. ARUNDINARIA MACROSPERMA. *Michaux*.

SYN.—Miegia gigantea, Nutt. Cane.

Leaves linear-lanceolate, green on both sides, smoothish; panicle terminal, sub-racemose, simple; spikelets seven to ten-flowered, purple, smooth, acuminate. Perennial; flowers in March and April. Culms 30 to 40 feet high; an arborescent grass. Southern Illinois and Indiana, extending up the Ohio river to the Falls at New Albany. Extensively used for fishing rods.

TRIBE VII. HORDINAÆ.

Spikelets several (rarely one) flowered, sessile, on opposite sides of a zigzag, toothed rachis, forming a solitary spike; glumes horizontal, often side by side on the same plane, sometimes deficient; the terminal or lateral florets often abortive; paleae awned or awnless; stamens three.

GENUS 34. TRITICUM. *Linnæus.*

[From the Latin *tritus,* beaten, or threshed.]

Spikelets three to several flowered, compressed, with the flat sides towards the rachis; glumes nearly equal and opposite; lower paleae nearly like the glumes, convex, awned, or merely mucronate; the upper one flat, bristle-ciliate on the two keels, free, or adherent to the groove of the grain; ovary pubescent at the summit.

89. TRITICUM VULGARE. *Villars.*

SYN.—T. sativum, Linn. Wheat, winter wheat, spring wheat.

Spike imbricated, with a tough rachis; spikelets four to five-flowered, broad-ovate, obtuse; florets mucronate or often awned; grain free. Annual; flowers in June. Culms 2 to 5 feet high. Runs into numerous varieties by culture.

Wheat was cultivated by the Egyptians in very early times, and it appears to have been harvested by the same instrument, the sickle, that has always been used down to the time when Americans introduced the "cradle" and the "reaper." Though with ordinary culture, only about twenty bushels are raised on an acre of land, yet we know that with careful culture, involving but little additional expense or labor, the yield may be increased to double that quantity; and even 55 bushels have been raised on an acre of land in New York.

The yield of wheat in Wisconsin may be stated at about twenty bushels per acre, though for a number of years it has fallen below that amount. From one and a half to two bushels of seed is used per acre, which is usually put in some where from the 1st to the 20th of September for winter wheat, and from the 1st to the 20th of April for spring wheat. Harvest usually occurs about August 1st, or from July 15th to August 15th. The sickle is never used, and the cradle only on uneven grounds, or such as has not yet been entirely cleared of the stumps of the original forest trees. The reaping machines are very generally employed; and threshing machines are taken about the country by persons who make the threshing of wheat their peculiar calling.

For a number of years the wheat crop in Wisconsin has gradually diminished, farmers having turned their attention to other grains, and to other kinds of tillage. One principal cause of this abandonment of wheat has been the diminished yield, an acre only returning twelve to fifteen bushels, or even less; another is the frequent destruction, or at least material injury to the crop, by the ravages of insects, by rust, &c.

The former productiveness of the soil would seem to indicate that this deficiency of yield is owing to the exhaustion of some material element by overcropping. Deep ploughing will restore the soil in some degree, by bringing up that which has not been reached by the roots of the plants; but nothing short of a full restoration from year to year of the exhausted elements, whatever they be, will render the yield of wheat permanent and reliable.

Next to rice, wheat sustains more of the human family than any other grain; and in many respects it is the most valuable. The best varieties are those that, though small in berry, are fresh, plump, thin skinned, and bright, slipping through the fingers readily.

Sir John Richardson found wheat cultivated in the "fur countries," as far north as Fort Laird (latitude 60° 5'), where, however, the grain does not ripen perfectly every year.*

Analysis of wheat of the State of New York; from Emmons' Agriculture of New York, vol. 2, pp. 144—153:

	Winter wheat, grain.	Spring wheat, grain.	Straw.	Chaff.
Silica	3.525	4.240	49.100	80.60
Silicic acid	1.700	-----	------	-----
Phosphates	60.725	67.440	19.600	8.80
Carbonate of lime	-----	-----	------	4.70
Lime	0.050	0.020	3.460	-----
Magnesia	2.880		0.324	-----
Potash	7.180	14.720	22.245	1.80
Soda	16.920	3.356	5.195	3.20
Sodium	0.195	-----	------	-----
Chlorine	0.295	none	0.121	a trace
Sulphuric acid	0.895	0.544	0.876	1.21
Organic acids	2.400	-----	------	-----
Carbonic acid	not detrmd	-----	------	-----
Organic matter	-----	8.480	------	-----
Loss	3.235	1.200	------	-----
	100.000	100.000	100.921	100.31

* Arctic Searching Expedition, p. 410.

90. Triticum Repens. *Linnæus.*

Syn.—Triticum pauciflorum, Schw. Agropyron repens, Beauv. Couch-grass, Quitch-grass.

Rhizoma creeping extensively; spikelets four to eight-flowered; glumes five to seven nerved; rachis rough on the angles; awn none, or never more than half the length of the flower; leaves flat, roughish, or hairy above. Borders of woods and openings. Perennial; flowers in June and July. Culms 1 to 3 feet high. Wisconsin, Michigan, Ohio, Iowa and Minnesota, and about Lake Superior.

A mere weed, of no use for food of cattle, &c. Its disposition to spread should be checked, or it may hereafter become troublesome to the farmer.

Professor Emmons* has analyzed the ash of this grass when in its young state (about 11 inches high, cut May 1st,) and again just previous to the appearance of the flower heads. We give the results below in two parallel columns, for more ready comparison.

	Young.	Old.
Silica	......	40.500
Silicic acid	27.150	......
Phosphates	17.250	15.300
Lime	0.112	0.959
Magnesia	a trace	none
Potash	7.350	24.417
Soda	26.785	1.433
Sodium	3.565	......
Chloride of Sodium	......	3.706
Chlorine	5.425	......
Sulphuric acid	4.811	......
Carbonic acid	1.455	a trace
Coal	......	9.300
Organic acids	5.200	......
Organic matter	......	2.400
Loss	0.897	1.985
	100.000	100.000

91. Triticum Caninum. *Linnæus.*

Syn.—Agropyron caninum, Roem & Shultz.

Roots fibrous (no rhizoma); spikelets four or five-flowered; glumes three-nerved; rachis bristly on the edges; awn longer than the flower; leaves flat,

*Ag. of N. Y., vol. 2, p. 74 and 75.

roughish on both sides. Perennial; flowers in August. Culms 1 to 3 feet high. Introduced. Wisconsin (?), Michigan. and about Lake Superior.

92. TRITICUM DASYSTACHYUM. *Gray.*

SYN.—T. repens, var. dasystachyum, Hook.

Rhizoma creeping; leaves narrow, mostly involute, very smooth and glaucous; spikelets downy-hairy all over, whitish, five to nine flowered; glumes five to seven nerved; rachis rough on the edges; awn sometimes about half the length of the flower, sometimes nearly wanting. Perennial; flowers in August. Culms 1 to 3 feet high. Wisconsin and Michigan.

93. TRITICUM COMPOSITUM. *Linnæus.*

Egyptian wheat.

Spikes compound; spikelets awned, villous, crowded. Cultivated only as a matter of curiosity.

GENUS 35. LOLIUM. *Linnæus.*

[Latin, *Lolium,* the ancient name of one of the species.]

Spikelets many-flowered, sessile, solitary, and placed edgewise on the continuous rachis; glume only one, external; flowers naked at the base; lower palea lanceolate, mucronate, or with a short awn at tip; upper one two-keeled; spike simple.

94. LOLIUM PERENNE. *Linnæus.*

Darnel; ray-grass; rye-grass.

Glume much shorter than the spikelet; flowers six to nine, usually awnless, sometimes awn-pointed; seed oblong, compressed, convex on one side, furrowed lengthwise on the other; palea adherent. Perennial; flowers in June. Culms 1 to 2 feet high. Introduced and occasionally cultivated. A native of Europe and Asia.

This grass, which is quite a favorite in England, has been but sparingly introduced here. It produces an abundance of seed, which is easily collected and readily vegetates on most kinds of soil under circumstances of different management; it soon arrives at perfection, and produces in its first years of growth a good supply of early herbage, which is much liked by cattle. But the after-growth is very inconsiderable; the plant impoverishes the soil in a high degree, and soon dies out. It was first cultivated in Great Britain about the year 1670. An attempt was made some years since to introduce this grass to the attention of agriculturists through the agency of the Patent Office at Washington, but it does not seem to be much cultivated. This is perhaps not owing to its want of merit, so much as to the superior claims of Phleum pratense, which is almost universally cultivated to the exclusion of nearly all other species of grass. It runs into numerous varieties; one, with awn-pointed flowers is known as the Italian Rye Grass, (*L. Italicum,*) but does not differ materially from the other kinds either in botanical characters or agricultural qualities.

95. Lolium Temulentum. *Linnæus.*

White darnel.

Glumes fully equalling the five to seven-flowered spikelet; awn longer than the flower; culm scabrous above, smooth below; leaves rough-edged; ligule truncate; rachis flexuous; lower palea five-veined. Annual; flowers in July. Culms 2 feet high. Introduced. Michigan. Seeds poisonous—the only instance of a deleterious grass.

GENUS. 36. ELYMUS. *Linnæus,*

[Greek name, *Elymos,* of the same plant.]

Spikelets 2 to 4 at each joint of the rachis, all fertile, each two to seven-flowered; the uppermost flower imperfect; glumes nearly side by side in front of the spikelets, rarely wanting; paleae coriaceous, the lower rounded on the back, usually awned at the apex, adherent to the involving paleae.

96. Elymus Virginicus. *Linnæus.*

Wild rye. Lyme grass.

Spike rigidly upright, dense and thick on a short peduncle, usually included in the sheath; spikelets 2 to 3 together, two to three-flowered, smooth, rather short awned; glumes lanceolate, strongly nerved, rough, bristle-pointed, as long as the spikelets. Perennial; flowers in August. Culms 2 to 3 feet high. Wisconsin, Illinois, Ohio, Michigan, and about Lake Superior.

97. Elymus Canadensis. *Linnæus.*

Syn.—E. glaucifolius, Willd. E. Philadelphicus, Linn. Lyme grass. Rye grass.

Spikes rather loose, curved, on an exserted peduncle; spikelets mostly in pairs, of 3 to 5 long-awned, hairy flowers; the lance-awl-shaped glumes tipped with shorter awns, and prominently nerved. Perennial; flowers in August. Culms 3 to 5 feet high Wisconsin, Iowa, Ohio, Michigan, Minnesota, and about Lake Superior. It was introduced into England by Sir Joseph Banks, in 1790, and found very productive, the foliage rather early, but being coarse and rank was unfit for pastures.

98. Elymus Striatus. *Willdenow.*

Syn.—E. villosus, Muhl.

Spike dense and slender, upright or slightly nodding; spikelets mostly in pairs, minutely hairy; glumes linear-awl-shaped, or truly awl-shaped, bristle-awned, about twice the length of the flowers; leaves rather narrow; sheaths smooth, or hairy, or downy. Perennial; flowers in July. Culms 2 to 3 feet high. Wisconsin, Ohio, and about Lake Superior.

99. Elymus Hystrix. *Linnæus.*

Syn.—Asprella hystrix, Willd. A. augustifolia, Nutt. Gymnostachum hystrix, Schreb. Bottle-brush grass.

Spikes upright, loose; spikelets 2 to 3 together, about three-flowered; flowers smoothish, or often rough-hairy, tipped with an awn twice their length; leaves and sheaths smoothish; glumes wanting, or minute rudiments. Perennial; flowers in July. Culms 2 to 4 feet high. In woods, common. Wisconsin, Illinois, Ohio, Michigan, Minnesota, and about Lake Superior.

Plate I, Fig. 10.—*a*, spikelet.
b, a flower, unopened.
c, a portion of the awn magnified.
d, the stamens.
e, the germ.

GENUS 37. HORDEUM. *Linnæus.*

[The ancient Latin name of Barley.]

Spikelets one-flowered, with an awl-shaped rudiment on the inner side, 3 at each joint of the rachis, lateral ones usually abortive; glumes side by side in front of the spikelets, slender and awn-pointed, or bristle-form; paleae herbaceous, the lower convex, long awned from the apex; stamens 3; grain oblong, commonly adhering to the paleae.

100. HORDEUM JUBATUM. *Linnæus.*

Squirrel-tail grass.

Lateral flowers abortive, neutral, on a short pedicel, short-awned; the perfect flower bearing an extremely long awn, about the length of the similar capillary glumes, which form apparently a six-awned involucre, all spreading. Biennial; flowers in June. Culm 1 foot high. In damp level prairies. Wisconsin, Illinois, Iowa and Minnesota. Abundant also on the sea coast.

101. HORDEUM PUSILLUM. *Nuttall.*

Lateral flowers imperfect and neutral, awnless but pointed, the perfect flower bearing an awn nearly twice the length of the palea, equaling the short awns of the rigid glumes; spike linear. Annual; flowers in May. Culms 4 to 10 inches high. Illinois and Ohio. Affords a good "bite" for cattle.

102. HORDEUM VULGARE. *Linnæus.*

Barley. Four-rowed-barley.

Spikelets all fertile, awned; the flowers arranged so as to form a nearly four-sided spike. Annual; flowers in May and June. Culms 2 to 3 feet high. Native of Sicily and Tartary. Extensively cultivated in Wisconsin to supply the breweries of this State, and for exportation to the East.

About fifty bushels (or from 40 to 60) of barley are usually produced on an acre of well tilled land. Two and a half bushels of seed per acre is about the quantity used. Barley is cultivated in the British fur country as far north as Fort Norman on the 65th parallel of latitude, but could not be ripened two degrees further north.*

103. HORDEUM DISTICHUM. *Linnæus.*

Two-rowed barley.

Lateral spikelets sterile, awnless, the fertile ones awned, distichous, or forming a two-sided spike. Annual; flowers in June. Culms 2 to 3 feet high. Native of Tartary. Often cultivated, though not so extensively as the preceding species.

Analysis of different parts of the two-rowed barley plant, from Emmons' Agriculture of New York, Vol. 2, page 126—129:

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* Richardson.

	Whole plant.	Straw.	Chaff.	Grain.
Silica	19,800	53,120	65,360	23,807
Phosphates	31,800	14,500	13,260	57,849
Carbonate of lime	9,500	1,000	4,200	none
Magnesia	1,440	0,160	0,512	none
Potash	22,770	4,300	4,740	12,035
Soda	2,480	5,020	3,751	5,460
Chlorine	1,030	2,460	1,210	none
Sulphuric acid	8,314	11,700	8,967	none
Coal	3,531	......	......	......
Organic matter	5,413	8,113	4,268	......
Carbonic acid	3,141		......	......
Loss	......	......	......	0.849
	100,219	100,379	106,268	100,000

GENUS 38. SECALE. *Linnæus.*

[From the Latin *secare*, to cut; or the Celtic *sega*, a sickle.]

Spikelets two-flowered, the flowers sessile, distichous, perfect, with the linear rudiment of a third, terminal flower; glumes nearly opposite, nearly equal, keeled, awnless or awned; paleae herbaceous, lower one awned, keeled, with unequal sides: upper palea shorter, two-keeled; scales 2, entire, ciliate; stamens 3; ovary sessile, hairy; stigmas 2, snbsessile; caryopsis free, hairy at summit; spikes simple, compressed, linear.

104. SECALE CEREALE. *Linnæus.*

Rye.

Glumes subulate-linear and with the awns scabrous; paleae smooth, the lower one bristly-ciliate on the keel and exterior margin. Annual; flowers in June. Culms 4 to 6 feet high. Extensively cultivated. Though inferior to wheat, it is the principal bread-corn in the northern parts of Europe. It does not require a soil as rich as for wheat, and hence is often substituted by those who do not care to keep up the fertility of the soil by proper manuring and a judicious rotation of crops.

The native country of wheat, rye and oats is unknown, though supposed to be central or western Asia. It is stated that very recently M. C. Koch has found rye growing under circumstances where it appears to be really spontaneous and native. On the mountains of Pont, in the country of Hemschin, Asia, upon granite soil at an elevation of 5,000 or 6,000 feet he found it along the road.* Rye yields 25 to 30 bushels per acre, requiring a bushel or a

* Annals of Scientific Discovery, 1850, page 300.

bushel and a peck of seed. In Ohio it is the custom to turn the more weakly of the sheep into the fields of rye, whence they obtain an abundance of very succulent food, at a time when it is most needed by them, and before it can be obtained from the ordinary pasture grasses.

Analysis of Rye. (Emmons' Ag. of N. Y., Vol.2, pp. 120—123):

	Heads when in bloom.	Leaves and sheaths (young.)	Top half of ripe straw.	Bottom half of ripe straw.	Leaves and sheaths, ripe.	Ripe chaff.	Ripe grain.
Silica	61.800	35.900	70.700	28.250	71.650	85.600	3.450
Coal	4.000	4.500	......	......	......	......	......
Phosphates	17.100	15.600	14.850	15.600	14.250	4.600	55.450
Lime	0.507	......	2.849	1.410	......	......	......
Carbonate of lime	......	5.132	......	......	0.817	1.664	0.282
Magnesia	a trace	2.600	0.300	2.600	0.500	0.500	0.400
Potash	0.266	21.672	3.723	28.402	2.720	3.922	18.217
Soda	none	2.292	1.324	17.615	3.333	1.994	8.931
Chloride of sodium	12.600	......	1.716	0.489	1.184	0.245	0.709
Sulphuric acid	4.296	5.090	0.343	1.546	0.100	0.206	4.724
Carbonic acid	......	0.500	......	......	a trace	a trace	a trace
Chloride of potassium	1.586	......	......	......	......	......	......
Organic acid	6.080	2.400	1.305	4.500	2.650	1.150	6.125
Loss	......	......	2.900	......	2.796	.119	1.712
	104.211	103.535	100.000	100.412	100.000	100.000	100.000

TRIBE VIII. AVENEÆ.

Spikelets 2 to several, panicled, the terminal flower mostly imperfect; glumes and paleae thin and membranaceous or chartaceous; the lower paleae bearing a twisted or bent awn on the back; stamens three; scales two.

GENUS 39. AIRA. *Linnæus.*

(Greek, *aira*, the herb darnel or tares.)

Spikelets two-flowered, in an open diffuse panicle; the flowers both perfect, (sometimes with a third imperfect), usually shorter than the membranaceous keeled, often lead-colored glumes, hairy at the base; lower palea three to five-nerved, awned on the back below the middle; stamens 3; grain oblong, smooth.

105. Aira Cæspitosa. *Linnæus.*

Syn.—A. ambigua, Michx. A. aristulata, Torr. Deschampsia cæspitosa, Beauv. Tufted hair-grass.

Culms in close tufts, leaves flat, linear, roughish, panicle pyramidal or oblong, lower palea crowded-four-toothed at the truncate apex, short awned above the base; awn straight; grain ovate, free, not grooved; glumes not exceeding the flowers. Perennial; flowers in June. Culms 2 to 4 feet high. Wet places. Wisconsin, Ohio, Michigan, and about Lake Superior. Also a native of Europe.

The foliage is coarse, containing but little nutriment, and is only eaten by cattle from necessity. It does not grow here, as in some other localities in sufficient abundance to be troublesome as a weed.

PLATE VIII.—Fig. 1. a plant, natural size.
2. a spikelet of three flowers.
3. same, opened.
4. lower palea.
5. awn.
6. a flower.
7. scales, germ and stigmas.

106. AIRA FLEXUOSA. *Linnæus.*

Common hair-grass.

Culms slender, nearly naked, from the small tufts of involute-bristle-form, often curved leaves; branches of the small spreading panicle capillary, mostly in pairs; lower palea slightly two-toothed; awn from near the base, bent in the middle longer than the glumes. Perennial; flowers in June. Culms 1 to 2 feet high. About Lake Superior, (Agassiz). This species possesses no value for pasture or hay.

GENUS 40. TRISETUM. *Persoon.*

[Latin, *tris*, three, and *seta*, a bristle.]

Spikelets two to several-flowered, mostly in a contracted panicle; lower palea compressed-keeled, two cusps at the top, and an (often twisted) awn on the back; upper palea two-keeled; caryopsis smooth, without a longitudinal furrow.

107. TRISETUM MOLLE. *Kunth.*

SYN.—T. subspicatum, Beck. Avena mollis, Michx.

Minutely soft-downy; panicle dense, much contracted, oblong or linear; glumes nearly equal, about the length of the 2 or 3 smooth flowers; awn diverging, much exserted, not twisted; leaves flat, short. Perennial; flowers in July. Culms about one foot high. Lake Superior.—(Mr. W. D. Whitney.)

GENUS 41. DANTHONIA. *DeCandole.*

[Named in honor of M. Danthoine, a French botanist.]

Spikelets two to ten-flowered, the upper flowers often imperfect; glumes membranaceous, longer than the imbricated flowers; lower palea oblong or ovate, rounded-cylindraceous, seven to nine-nerved, bearing between the sharp-pointed teeth of the tip an awn, (composed of the 3 middle nerves), which is flattish and spirally twisted at the base; upper palea bicarinate.

108. DANTHONIA SPICATA. *Beauvois.*

SYN.—Avena spicata, Linn.

Culms tufted, erect; leaves short, somewhat involute awl-shaped; sheaths bearded at the throat; panicle simple, receme-like, rather one-sided; the few spikelets appressed, seven-flowered; lower palea broadly ovate, loosely hairy on the back, much longer than the lance-awl-shaped teeth, about half the length of the awn. Perennial; flowers in July. Culms 1 to 2 feet high. Dry places Wisconsin, Illinois, Ohio, and about Lake Superior.

PLATE IX.—Fig. 1. a plant of the natural size.
2. spikelet.
3. lower palea.
4. upper palea.
5. germ and stigmas.
6. the awn.

GENUS 42. AVENA. *Linnæus.*

[*Avena*, the ancient Latin name of Oats.]

Spikelets three to many-flowered, panicled, commonly large; the flower herbaceo-chartaceous, or becoming harder, of firmer texture than the large and mostly unequal glumes, the uppermost imperfect; lower palea rounded on the back or keeled, seven to eleven-nerved, bearing a long, usually twisted awn on the back, or below the two-cleft tip, proceeding from the mid-nerve only; stamens 3; grain oblong-linear grooved on one side, usually hairy, free, but generally inverted by the upper palea.

109. AVENA STRIATA, *Michaux.*

SYN.—Trisetum purpurascens, Torr.

Culms tufted, slender; leaves narrow; panicle simple, loose, somewhat one-sided, drooping with age; spikelets three to five-flowered, somewhat terete, on rough capillary pedicels; glumes shorter than the spikelets, purple, one to three-nerved; lower palea strongly seven-nerved, rounded on the back, surrounded by a short bearded tuft at the base, much longer than the ciliate-fringed upper one, bearing a long straightish awn, just below the tapering two cleft tip. Perennial; flowers in May. Culms 1 to 2 feet high. Wisconsin and Michigan.

110. Avena Præcox. *Linnæus.*

Panicle in a dense receme, oblong, the branches in pairs, appressed; spikelets ovate, two-flowered, flowers as long as the glumes; awn exserted; leaves cetaceous, rough; sheaths deeply striate, smooth. Annual; flowers in June. Culms 3 to 4 inches high. Southern Indiana. Also a native of Europe.

111. Avena Sativa. *Linnæus.*

Oats.

Panicle regular; spikelets two-flowered, pendulous, pedunculate; paleæ shorter than the glumes, naked at the base. Annual; flowers in July. Culms 2 to 4 feet high. Very commonly cultivated, but only as food for horses. The native country of the oat is unknown.

Next to the essay of Dr. Salisbury on Maize in value and importance, we may rank that of Prof. John P. Norton "on the analysis of the oat," for which he was awarded the premium of fifty sovereigns offered by the Highland and Agricultural Society of Scotland. It is published in full in Silliman's American Journal of Science, (2d series,) vol. iii, pages 222 and 318.

The following table shows the general results of his very full and accurate analysis:

Composition of the ash of the oat, by Prof. J. P. Norton.

	Grain.	Husk.	Chaff.	Leaf.	Top Straw.	Middle Straw.	Bottom Straw.
Sulphuric acid	....	9.61	5.32	14.80	16.33	18.45	13.29
Phosphoric acid	49.19	1.04	....	....	....	....	....
Chloride of sodium	0.35	0.24	5.11	2.29	3.13	3.03	15.36
Phosphates of lime, magnesia and iron	....	....	5.84	6.13	2.84	3.03	0.78
Potash and soda	31.56	10.26	7.96	14.89	19.09	21.80	43.17
Lime	5.32	1.95	4.53	6.99	7.02	7.23	6.06
Magnesia	8.69	0.38	1.84	2.55	2.84	2.91	2.07
Peroxide of iron	0.88	1.58	0.24	....	0.30	1.40	0.61
Peroxide of manganese	....	0.92	....	....	....	....	....
Soluble silica	0.89	4.46	11.90	5.90	5.13	7.34	5.03
Insoluble silica	0.98	68.39	56.05	45.75	43.31	33.14	12.25
	97.86	98.83	98.90	99.30	99.99	98.33	98.35

The word *oats* is defined by Dr. Johnson as "food for men in Scotland, and horses in England!" and oat-meal still forms almost the sole food of a large portion of the Scots. The investigations of Prof. Norton show that "even including the husk the oat is superior to almost any other corn in those ingredients which go directly to the production of muscle in the body. The strong muscular forms of Scottish ploughmen have long been living witnesses to the good properties of their favorite and almost only food."

About two and a-half bushels of seed are sown on an acre, and the yield is from 40 to 60 bushels; though premiums have been awarded for crops of over 100 bushels per acre. Oats are cultivated as far north on this continent as the 65th parallel of latitude.*

TRIBE IX. PHALARIDEÆ.

Spikelets more or less panicled, somewhat three-flowered, with the middle floret only perfect; the lower and terminal (or the apparently lateral) ones imperfect; either staminate, rudimentary or neutral; or sometimes the terminal floret perfect and the two lower ones imperfect.

GENUS 43. ARRENATHERUM. *Beauvois.*

(GREEK—*Arren* masculine, and *ather* awn, the staminate flowers being awned.)

Spikelets panicled, two-flowered, with the rudiment of a third; the middle flower perfect, with the lower palea bristle-pointed from near the tip; the lowest staminate only, bearing the long bent awn below the middle of the back.

112. ARRENATHERUM AVENACEUM. *Beauvois.*

SYN.—Avena eleator, Linn. Tall meadow oat-grass.

Leaves broad and flat; panicle elongated; contracted, finally spreading; glumes scarious very unequal, the upper almost equaling; the lower shorter than the florets. Perennial; flowers in May and June. Culms 2 to 3 feet high. Introduced, and occasionally cultivated; particularly in Ohio and Michigan; but is not found to be of much value.

GENUS 44. HOLCUS. *Linnæus.*

(GREEK—*Holkos*, draught.)

Spikelets in a contracted panicle, of two to three-flowers, pedicelled, so as to stand side by side, shorter than the mucronate and membranaceous

* Richardson, Arc. Search. Ex., pp. 104–411.

glumes; lower flower perfect, with three stamens, awnless; upper one staminate, or neuter, the lower palea awned on the back below the middle.

113. Holcus Lanatus. *Linnæus.*

Meadow soft-grass.

Soft-downy, pale; panicle oblong; upper glume mucronate under the apex; awn of the staminate flower recurved, seeds ovate, smooth, covered with a soft woolly husk. Perennial; flowers in June. Culms 1 to 2 feet high. Illinois,* Dr. S. B. Mead. A native of Europe, from whence it is supposed to have been introduced into this country.

The numerous downy hairs which cover the surface of the whole plant render the hay, made of it soft and spongy, and in this State it is disliked by cattle, particularly by horses; it is productive and easy of cultivation;† and is still recommended for poor, peaty wet soils, incapable of producing more valuable grasses. It is known in England under the name of "Yorkshire fog."

GENUS 45. HIEROCHLOA. *Gmelin.*

(Greek—*Hielos* sacred, and *chloa* grass.)

Spikelets plainly three-flowered, the flowers all with two paleae; the two lower flowers staminate only, with three stamens sessile, often awned; the upper one perfect, short pedicelled, scarcely as long as the others, with two stamens, awnless.

114. Hierochloa Lorealis. *Roemer and Shultz.*

Syn.—Holcus odoratus, Linn. Hierochloa fragrens, R. and Shultz. H. repens, Beauv. Seneca grass.

Panicle somewhat one-sided, pyramidal; peduncles smooth; staminate flowers with the lower palea mucronate or bristle-pointed at or near the tip; rhizoma creeping. Perennial; flowers in May. Culms 1 to 2 feet high. Wisconsin, Ohio, Michigan and about Lake Superior.

The sweet odor imparted to the air, even when in a living state, by this grass may be observed in passing many of the natural meadows of Wis-

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* The plant referred to this species by Dr. Houghton, broght from the Savannah river, Minnesota, proves on examination of a specimen received from him to be the *Phalaris arundinacea.*

† Sinclair, p. 164.

consin, as well as the other states in the vicinity. It possesses but little agricultural value. It is the sacred grass of many of the Indian tribes as well as of our own European ancestors. It might be propagated readily by the root, and is perhaps worthy of some experiments to ascertain its effect in giving an agreeable flavor to milk and butter.

GENUS 46. ANTHOXANTHUM. *Linnæus.*

(Greek—*Anthos* flower, and *anthon*, of flowers.)

Spikelets spike-panicled, three-flowered, the lateral flowers neutral, consisting merely of a narrow palea which is hairy on the outside, and awned on the back; the central one perfect, of two awnless paleae and two stamens; glumes very thin acute, keeled; the upper about as long as the flowers, twice the length of the lower; scales none; grain ovate, adherent to the inclosing paleae.

115. Anthoxanthum Odoratum. *Linnæus.*

Sweet-scented vernal-grass.

Panicle spiked, the spikelets spreading; one of the neutral flowers bearing a bent awn from near its base, the other short-awned below the tip. Perennial; flowers in May, June and July. Culms 12 to 18 inches high. Introduced from Europe and naturalized, but seldom cultivated. Wisconsin, Ohio.

In the humid climate of England the sweet-scented vernal-grass constitutes a part of the herbage of pastures on almost every kind of soil. It thrives best when combined with many different species, and is therefore adapted to permanent pastures; though not particularly liked by cattle it is eaten in pastures in common with other grasses. The chemical examination of its nutritive matter, shows that it does not abound in saccharine matter, but chiefly in mucilage; and the insoluble extract is in greater proportion than in many other grasses. Its merits however in respect to early growth, continuing to vegetate and throw up flowering stalks until the end of autumn, and its hardy and permanent nature sufficiently uphold its claim to a place in the composition of all permanent pastures.* When newly cut it emits a very pleasant fragrance, (hence its name;) and a writer in the Patent Office Report for 1849-50, attempts to show that the peculiarly delicate flavor of the butter of cer-

* Sinclair, Hort. Gram. Woburnensis, p. 135.

tain localities is due to this grass. The culms are used in making hats.

I am not aware that this fine grass has been analyzed in this country. The following is by Profs. Way and Ogston of plants grown on a calcareous soil in England:*

Phosphoric acid	10.09
Sulphuric acid	3.39
Carbonic acid	1.26
Lime	9.21
Magnesia	2.53
Peroxyde of iron	1.18
Potash	32.03
Chloride of potassium	7.03
Chloride of sodium	4.90
Silica	28.36
	100.00

Percentage of water in green grass	80.25
" ash " "	1.24
Percentage of nutritive matter in dry hay	93.72
" ash " "	6.28

GENUS 47. PHALARIS. *Linnæus.*

[Greek—*Phalos*, shining.]

Spikelets crowded in a dense panicle three-flowered; but the two lateral flowers mere neutral rudiments at the base of the perfect one, which is flattish, awnless, of two shining paleae, shorter than the equal boat-shaped glumes, finally coriaceous shining and closely inclosing the flattened, free and smooth grain; stamens three; leaves broad flat.

116. Phalaris Arundinacea. *Linnæus.*

Syn.—P. Americana, Torrey. Calamagrostis colorata, Nutt. Reed Canary grass.

Panicle more or less branched, clustered, a little spreading when old; glumes obtusely keeled, with flattened pointed tips, the lower one fringed on the margin below the middle; rudimentary flowers cartilaginous hairy, one-eighth the length of the fertile ones. Perennial; flowers in July. Culms 2 to 4 feet high. Wisconsin, Illinois, Ohio, Minnesota and about Lake Superior. Native also of Europe. The "ribbon-grass" of the gardens is a cultivated variety of this species.

* Working Farmer, vol. iii, p. 173, and 6th, An. Report of the Board of Ag., Ohio, 1851, p. 187.

117. Phalaris Canariensis. *Linnæus.*

Canary-grass.

Panicle spiked oval; glumes wing-keeled; rudimentary flowers smooth, chartaceous, half the length of the fertile one. Annual; flowers from July to September. Culms eighteen inches to 2 feet high. Cultivated only for the seed for food of birds, the grass possessing but little nutriment. It is a great impoverisher of the soil.

TRIBE X. PANICEÆ.

Spikelets two flowered, the lower imperfect; glumes and sterile paleae herbaceous or membranaceous; paleae of the fertile flower of firmer texture, coriaceous or chartaceous, awnless, not keeled, flattened, parallel with the glumes.

GENUS 48. MILIUM. *Linnæus.*

(Latin.—*Milium*, millet, probably from *mille*, a thousand.)

Spikelets diffusely panicled, not jointed with their pedicels; glume single membranceous, concave; lower flower consisting of a single palea resembling a glume; palea of upper flower awnless; stamens three; stigmas branched-plumose; grain not grooved, inclosed in the deciduous paleae.

118. Milium Effusum. *Linnæus.*

Millet-grass. White topped millet-grass.

Smooth; leaves broad and flat, thin; panicle spreading; flower ovoid-oblong. Perennial; flowers in June. Culms 3 to 6 feet high. Wisconsin, Ohio, Michigan, and about Lake Superior. Also a native of Europe. Of very little value for hay. The seeds afford food for birds; it has been recommended for moist places in the woods.

Plate X.—Fig. 1. culm.
2. panicle.
3. flower unopened.
4. palea.
5. flower spread open.
6. anther.
7. germ and stigmas.

GENUS 49. PASPALUM. *Lin nus.*

(GREEK—*Paspalos,* the ancient name for millet.)

Spikelets spiked or somewhat racemed in two to four rows on one side of a flattened rachis, jointed with their short pedicels, plano-convex, awnless, apparently but one-flowered; lower flower neutral, of a single membranaceous, awnless palea, as long as the glume; perfect flowers, with two coriaceous awnless paleae, the lower concave, and embracing the upper one; stamens three.

119. PASPALUM FLUITANS. *Kunth.*

SYN.—P. mucronatum, Muhl. Ceresia fluitans, Elliot.

Stem creeping and ascending, much branched, often floating; leaves scabrous; spikes numerous, (10 to 25); glumes white, dotted, a little hairy. Annual; flowers in September and October. Culms 1 to 2 feet long. Grows in wet muddy places. Ohio, near Cincinnati.—(T. G. Lea.)

GENUS 50. PANICUM. *Linnœus.*

(LATIN—*Panicum,* millet, probably from *panis,* bread.)

Spikelets sometimes spiked or racemose, usually panicled; glumes unequal, the lower one short, minute or wanting; lower flower neutral or staminate, rarely awned, mostly consisting of a single palea, which resembles the upper glume; upper floret perfect, coriaceous, inclosing the free and groveless grain; stamens 3; stigma plumose, usually purple.

§ 1. Spikes linear, unilateral; digitate, fasiculate or paniculate; flowers unawned; neutral floret with a single palea; glume minute or wanting. (DIGITARIA, *Scop.*)

120. PANICUM SANGUINALE. *Linnœus.*

SYN.—Digitaria sanguinalis, Scopol. Syntherisma præcox, Walt. Crab-grass, Finger-grass.

Culms geniculate, decumbent and rooting at the base; spikes 4 to 8 or 10, digitate-clustered; upper glume shorter than the flower; leaves linear, lanceolate. Annnal; flowers from August to October. Culms 1 to 2 feet high. Naturalized in Wisconsin, Illinois, Ohio, Michigan. A native of Europe, North Africa, and the West Indies.

In some of the southern states this grass is pulled by hand from among corn, and is used as hay,* being about the only kind of hay used in some districts. Though we regard it as a coarse weed, it is sometimes cultivated in Europe, the seeds being used, like millet, as a substitute for sago and rice.† It has been accused of being the cause of the disease in horses called "slobbers," but with how much truth I cannot say. In this State where the crab-grass has but recently shown itself, and where it has spread but little, it is quite certain that horses are not much afflicted with this troublesome complaint. Should it prove to be a just charge against this grass, it would be well, as far as possible, to prevent its spread in our State.

121. PANICUM GLABRUM. *Gaudin.*

SYN.—Digitaria glabra, Roem. Schultz. D. humifusa, Pers. D. ischæmum, Schreb.

Culms smooth, procumbent and spreading, rarely rooting; spikes 2, somewhat alternate-clustered; upper glume nearly as long as the flower. Annual; flowers in August. Culms 1 to 2 feet high. Introduced from Europe; Illinois and Ohio.

122. PANICUM FILIFORME. *Linnæus.*

SYN.—Digitaria filiformis, Beauv. Paspalum filiforme, Flugge.

Culms erect, very slender; spikes 2 to 8, filiform, alternate and approximated, thread-like; lower glume wanting; leaves narrow; spikelets all distinctly pedicelled, oblong acute. Annual; flowers in August. Culms 1 to 2 feet high. Ohio—Mr. Wm. S. Sullivant.

§ 2. Spikelets scattered in loose panicles, awnless.

123. PANICUM AGROSTOIDES. *Sprengel.*

SYN.—P. elongatum, Ph. P. agrostidiforme, Lam.

Culms compressed, upright; leaves elongated; panicle pyramidal; spikelets ovate-oblong, acute; upper glume five-nerved; leaves long, and with the sheaths smooth. Perennial; flowers in July. Culms 1 to 3 feet high. Minnesota—(Long's Expedition). Also in Illnois—Dr. C. W. Short.

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* Patent Office Report, 1849 and '50, p. 156.

† Loudon—Enc. of Agriculture, p. 763.

124. Panicum Proliferum. *Lamark.*

Syn.—P. miliaceum, Walt. (not of Linn.) P. dichotomiflorum, Michx. P. geniculatum, Muhl.

Smooth, culms rather stout and succulent, geniculate, ascending or procumbent; spikelets lance-oval, appressed; neutral flower with a single palea, little longer than the perfect one. Annual; flowers in September. Culms 1 to 2 feet long. Illinois and Ohio.

125. Panicum Capillare. *Linnœus.*

Panicle capillary, large, loose; the branches finally divaricate; neutral flower with a single palea, which is longer than the perfect one; sheaths hirsute; spikelets lanceolate, acuminate, scattered on long pedicels; culms upright. Annual; flowers in August. Culms 6 inches to 2 feet high. Apparently introduced; grows among cultivated crops and on waste grounds. Wisconsin, Illinois, Ohio, Michigan and Iowa.

126. Panicum Virgatum. *Linnœus.*

Glabrous; culms tall; spikelets ovate-acuminate; sterile flower staminate, paleae 2; panicle elongated, compound, the branches virgate, finally spreading, and somewhat nodding. Perennial; flowers in August. Culms 3 to 5 feet high. Wisconsin, Illinois, Ohio and Iowa.

127. Panicum Latifolium. *Linnœus.*

Syn.—P. Walteri, Poir.

Culm smooth, simple; nodes hairy; leaves broadly oblong-lanceolate; panicle more or less exserted, the branches spreading; spikelets obovate, downy; lower glume ovate, not half the length of the many-nerved upper one. Perennial; flowers in June. Culms 1 to 2 feet high. Wisconsin, Illinois, Ohio, Michigan and Minnesota.

128. Panicum Clandestinum. *Linnœus.*

Syn.—P. pedunculatum, Torrey.

Culm leafy at the top, rigid, the nodes naked; sheaths rough with papillæ, bearing spreading, bristly hairs; leaves oblong-lanceolate; panicle partly or entirely inclosed in the sheaths. Perennial; flowers in July and August. Culms 1 to 3 feet high. Illinois, Ohio, Michigan.

129. Panicum Xanthophysum. *Gray.*

Culm simple, or at length branched near the base; sheaths hairy; leaves lanceolate, very acute, not dilated at the ciliate-bearded clasping base, smooth except the margin, strongly 9 to 11 nerved; panicle long-peduncled, simple, contracted, the appressed branches bearing roundish-obvate spikelets; lower glume ovate acutish, one-third to one-half the length of the nine-nerved upper one. Perennial; flowers in June. Culms 12 to 15 inches high. Prairies and openings of Wisconsin.

Plate 1. Figure 11.

a spikelet.
b lower glume.
c upper glume resembling a palea.
d lower palea.
e palea of the abortive flower.
f hairs on the leaves and sheaths.

130. Panicum Pauciflorum. *Gray.*

Culms upright, roughish; leaves lanceolate, rather faintly nine-nerved, hairy or smooth, fringed on the margin next the base with long and stiff spreading hairs, the sheaths bristly throughout with similar hairs; panicle open, nearly simple, bearing fine tumid obovate spikelets. Perennial; flowers in June and July. Culms 1 to 2 feet high. Iowa, Illinois and Michigan.

131. Panicum Dichotomum. *Linnæus.*

Syn.—P. nitidum, Lam. P. barbulatum and P. ramulorum, Michx. P. nodiflorum, P. pubescens, and P. laxiflorum, Lam.

Culms at first mostly simple; leaves lanceolate flat, with few or indistinct nerves; panicle compound, spreading, exserted; spikelets minute, on long peduncles, obvovate, mostly pubescent; lower glume roundish, one-fourth to one-third the length of the five to seven-nerved upper one. A very variable species. Perennial; flowers from June to August. Culms 8 to 20 inches high. Wisconsin, Illinois, Ohio, Michigan, and about Lake Superior.

132. Panicum Depauperatum. *Muhlenberg.*

Syn.—P. rectum, Rœm. & Schultz. P. involutum, Torr. P. strictum, Ph.

Culms simple or branched from the base, growing in close tufts; panicle contracted, few-flowered, simple; leaves narrowly linear, elongated, extending above the culms; spikelets small, oval-obovate, pedunculate, rather acute, smoothish; lower glume ovate, one-third the length of the nine-nerved upper one. Perennial; flowers in June. Culms 8 to 15 inches high. Wisconsin, Illinois, Ohio, Michigan, and about Lake Superior.

133. PANICUM LONGISETUM. *Torrey.*

[Am. Tour of Science, vol. iv, p. 58.]

Culm terete, smooth; leaves lanceolate, very large, (about an inch broad,) sub-glaucous; spike compound, panicle-like, dense, clandestine at base, somewhat nodding; spikelets alternate and opposite, three-flowered; lower glume very small; the others unequal, ovate acuminate, hispid, each terminated by a long awn; (1 and ½ to 3 inches in length.) Perennial; flowers in August. Culms eighteen inches high. On the banks of the Fox [Neenah] river, &c. (D. B. Douglass.)

134. PANICUM NERVOSUM. *Muhlenberg.*

Culms simple, smooth at the nodes; leaves oblong-lanceolate, smooth, a little ciliate on the margin, cordate at the base, an inch wide, with short sheaths; panicle much branched, smooth, many-flowered, pedunculate or sessile, branches flexuous, somewhat spreading; spikelets oblong; abortive flower staminate. Perennial; flowers in June. Culms 1 to 2 feet high. Illinois and Michigan. Perhaps not distinct from *P. latifolium.*

135. PANICUM MILIACEUM. *Linnæus.*

SYN.—P. milium, Pers. Millet.

Panicle large, open, nodding; leaves lanceolate; sheaths hairy; glumes acuminate-mucronate. Annual; 1 to 2 feet high. Occasionally cultivated in Wisconsin and Michigan. A native of Turkey.

Prof. Emmons, in his very valuable report on the Agriculture of the State of New York,* gives several analyses of Millet, but whether of this species or some of the numerous other plants known by the same name is not stated. He adds that "its analysis shows that it is an exhausting

* In Vol. 2, page 134.

crop, and an exhausting crop is relatively valuable. Its growth is large; and it is probable that when left in the field for fodder the stalks and leaves lose their value. If cut when in blossom, its fodder is valuable, but its seed valueless, and it is then no better than the common grasses. The grain of millet is useless for flour for bread, where maize, rye, wheat and barley can be obtained. Its flour, if it has any is rather coarse, and brownish-yellow, or the color of the seed. Millet seed, however, is rich in nutritive elements, and I believe exceeds all others. It is productive; an acre, when properly tilled, yields seventy bushels. In addition to this the stalk, though not as valuable as timothy, still is equal to oat straw for fodder, and probably superior to it. It requires a rich soil, or at least produces in proportion to its richness."

PLATE XI.—Fig. 1, a panicle of the natural size.
a, a spikelet.
b, lower glume.
c, upper glume.
d, lower glume of neutral flower.
e, upper glume of the same.
f, coriaceous palea.
g, the grain.

136. PANICUM CRUS-GALLI. *Linnæus.*

SYN.—Echinochloa crus-galli, Beauv. Oplismenus crus-galli, Kunth. P. hispidum, Muhl. P. Walteri, Ph. (not of Muhl. and Ell.) Barn-yard grass.

Spikelets imbricated-spiked, on the branches of a raceme or panicle, rough with appressed or stiff hairs; lower palea of the sterile flower awl-pointed or awned; spikes alternate and in pairs; rachis bristly; sheaths smooth; ligules none. Annual; flowers in August and September. Culms 2 to 4 feet high. Wisconsin, Illinois, Indiana, Ohio, Michigan. A native also of Europe and North Africa.

The barn-yard grass is found growing in a wild state in moist, rich grounds about the prairies and openings. In these localities the heads of flowers have a very dark purple color, but in other respects the plant agrees with the introduced variety found abundantly about cultivated grounds, &c. Its coarse, rank nature renders it unfit for use as an agricultural product.

This is one of the grasses, the ash of which has been carefully analyzed by Professor E. Emmons,* of Albany, in the State of New York. It contained—

Silicic acid	17.950
Phosphate of iron	0.325
Lime	3.685
Magnesia	5.449
Phosphoric acid	6.894
Potash	36.656
Soda	1.885
Sulphuric acid	8.524
Coal	1.850
Chloride of sodium	5.723
Carbonic acid, organic matter and loss	11.059
	100.000

The grass yields of water	4.737
dry matter	95.263
The hay contains nutritive matter	87.951
ash	12.049

GENUS 51. SETARIA. *Beauvois.*

(Latin: *seta,* a bristle.)

Spikelets two-flowered, with a cluster of several distinct bristles, resembling awns; glumes two, unequal, membranaceous; lower flower staminate or neuter; paleae one or two, the outer one resembling the glume in texture; upper flower perfect, coriaceous; inflorescence a dense simple or compound, spike-like panicle.

137. Setaria Verticillata. *Beauvois.*

Syn.—Panicum verticillatum, Linn.

Spike cylindrical, (green), somewhat interrupted, composed of apparently whorled short clusters; bristles short, single or in pairs, roughened or barbed downwards. Annual; flowers in July. Culms about 2 feet high. Native of Europe, Asia and North Africa; naturalized. Ohio. About cultivated grounds.

138. Setaria Glauca. *Beauvois.*

Syn.—Panicum glaucum, Linn. Pennisetum glaucum, R. Brown. Bottle-grass.

* Ag. of N. Y., vol. ii., p. 81.

Spike cylindrical, very dense, (tawny yellow); bristles 6 to 11 in a cluster barbed upwards, very much longer than the spikelets; perfect flowers transversely wrinkled. Annual; flowers in August. Culms 2 to 3 feet high. Introduced. Native of Europe Asia and New Holland. Wisconsin, Illinois, Ohio, Michigan.

139. Setaria Viridis. *Beauvois.*

Syn.—Panicum viride, Linn. Pennisetum viride, B. Brown.

Spikes nearly cylindrical, more or less compound, (green); bristles few in a cluster, barbed upwards, much longer than the spikelets; perfect flower striate lengthwise and dotted. Annual; flowers in July. Culms 1 to 3 feet high. Introfluced from Europe. Michigan and Ohio. Common about cultivated lands, preferring a sandy soil. The seeds furnish food for the smaller species of birds.

140. Setaria Italica. *Kunth.*

Syn.—Germanica, Beauv. Panicum Italicum, Linn. Millet. Bengal grass.

Spike compound, interrupted at the base, thick, nodding, (yellowish or purplish); bristles 2 or 3 in a cluster, either much longer or shorter than the spikelets, barbed upwards. Varies much in cultivation. Annual; flowers in July. Culms 2 to 4 feet high. A native of Europe and the East Indies. Cultivated in Wisconsin as millet, under which name is included several different plants.

Plate XI.—Fig. 2, panicle and upper leaf, natural size.
a, a spikelet and cluster of bristles.

GENUS 50. CENCHRUS. *Linnæus.*

[Greek : *kenchros,* Millet, a name improperly applied to this genus.]

Spikelets two-flowered, solitary, in pairs, or more, inclosed in a cleft, spiney or bristly involucre, which becomes coriaceous, forming a deciduous burr in fruit; the involucre sessile in a terminal spike; styles united below; glumes 2, unequal, membranaceous; lower flower staminate or neuter, with 1 or 2 paleae.

141. Cenchrus Tribuloides. *Linnæus.*

Syn.—C. echinatus, Muhl. C. carolinensis, Waltr.

Culms ascending, branching at the base; leaves flat; spike oblong, composed of 8 to 10 spherical heads; involucre prickly all over with spreading, downwardly-barbed, short spines, inclosing 2 or 3 spikelets. Annual; flowers in August. Culms 9 to 18 inches high. Wisconsin, Illinois, Michigan, Iowa and Minnesota. A pestilent weed.

TRIBE XI. SACCHAREÆ.

Fertile paleae membranaceous or scabrous, always of thinner and more delicate texture than the often (indurated) glumes, frequently awned from the tip; spikelets usually in pairs or threes, panicled or spiked, some of them entirely sterile.

GENUS 53. ZEA. *Linnæus.*

(From *zao* to live—the grain being used to sustain life.

Flowers monœcious, the staminate in terminal, paniculate racemes; spikelets two-flowered; glumes two, herbaceous, obtuse subequal; paleae membranaceous, awnless, obtuse; the pistilate spikelets two-flowered, the lower one abortive; glumes two, very obtuse; paleae awnless; style one, filiform, very long, pendulous; caryopsis compressed.

142. Zea Mays.* *Linnæus.*

Corn—Indian corn. Maize.

Leaves flat, linear-lanceolate, acuminate, entire with a broad, thickish midrib channelled above. Annual; flowers in July; ripens in September and October. Culms 5 to 10 feet high.

All the different kinds of maize cultivated in this country are but varieties of this species, agreeing with the essential specific character.

Those who wish more detailed information in regard to this important item of our agricultural products, than it is my purpose to give, will do well to consult the essays of P. A. Brown, in the Farmer's Cabinet, vol. ii, 1837; of D. J. Brown in the Transactions of the American Institute, for 1846, and especially of J. H. Salisbury in the Transactions of the New York State Agricultural Society for 1848, page 678. These essays are very full and complete, forming models after which similar papers should be prepared and published in regard to all the more important products of the farm.

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* The ancient Athenians had a sort of cake prepared at public expense, for common fare called *Maza;* hence probably our word Maize, the specific name of Indian corn.

The following table showing the composition of the ash of the different parts of the plant is compiled from the numerous tables in the essay of Dr. Salisbury:

	Ash of leaves August 16th.	Ash of sheaths August 16th.	Ash of stalks August 16th.	Ash of roots August 2d.	Ash of kernel October 18th	Ash of cob October 18th.
Carbonic acid	3.025	2.60	12.05	not obt'd	a trace	9.445
Silicic acid	21.100	18.20	4.70	33.25	0.850	10.320
Sulphuric acid	6.220	3.01	5.91	not obt'd	0.515	1.336
Phosphates	14.650	11.20	11.20	17.38	......	......
Phosphoric acid	......	.....	.....	.....	49.210	13.105
Lime	5.347	0.62	2.82	0.56	0.075	3.833
Magnesia	1.510	1.02	1.73	0.75	17.600	6.745
Potash	10.170	10.73	10.31	6.94	23.175	34.400
Soda	31.390	32.62	34.54	22.16	3.605	11.495
Sodium	......	.....	.....	.....	0.160	......
Chlorine	1.975	16.42	9.03	not obt'd	0.295	......
Organic acids	2.800	3.25	4.40	not obt'd	5.700	6.430
Chloride of sodium	......	.....	.....	.....	......	1.980
Phosphate of per. ox. of iron.	......	.....	.....	.....	......	0.445
	98.187	99.67	97.69	....	99.175	99.543

In New York premiums have been awarded for large crops of corn, and the products of an acre have reached as high as one hundred and eighty-two bushels: bnt premium crops are usually not over one hundred and fifty bushels per acre.

The "Indian corn hills" found in very numerous localities in Wisconsin, indicate that this has been a favorite grain with aboriginal inhabitants. Their mode of culture was to plant each hill on the same spot from year to year, gradually adding to the little mound, until the whole surface appears as if covered with ant hills. They are not arranged in regular rows; the Indian mathematics and taste not having reached that point.

The culture of this invaluable grain can be carried on with profit as far north as the 51st degree of north latitude, and is planted as low as 40 degrees south, on the coast of Chili. It attains its greatest perfection in the dampest and hottest of the tropical climates.*

* Richardson Arc. Searching Exp. p. 410

About the 20th of April is as early as it will do to plant corn in Wisconsin; and this process may be delayed till the middle of May without endangering the certainty of a fair crop. The yield is from 30 to 50 bushels per acre.

GENUS 54. TRIPSACUM. *Linnæus.*

[GREEK—*Tribo* to rub or grind, perhaps in allusion to its polished fertile spike.]

Spikelets sessile, on jointed spikes, the staminate flowers above; staminate spikelets in pairs, longer than the joint, the flowers with two paleae and three stamens; anthers orange-colored; pistillate spikelets single, two-flowered, deeply imbedded in the thickened rachis, covered by the polished ovate outer glume; style long, stigmas very long, plumose, dark purple; grain ovoid free.

143. TRIPSACUM DACTYLOIDES. *Linnæus.*

Gama-grass. Sesame-grass.

Spikes usually two together with the contiguous sides flat, the upper half staminate culms cæspitose, hard, smooth, solid with pith; leaves very long. Perennial; flowers in July. Culms 3 to 6 feet high. Illinois.—Dr. S. B. Mead.

A very remarkable grass, about which much was said a few years ago, but which proved to be of but little real value. It is used as fodder for stock. It is eaten readily in localities where it grows naturally by all kinds of stock except mules—they perversely refuse it. It is much more common in the Southern States.

GENUS 55. ANDROPOGON. *Linnæus.*

[GREEK—*Andros* man, and *pogon* beard, from the hairy flowers.]

Spikelets in pairs on each joint of the slender rachis, spiked or racemed; one peduncelled, often a mere vestage; the other sessile with the lower flower neutral and of a single palea; the upper perfect, fertile, of two thin paleae shorter than the glumes, the lower awned from the tip; stamens one to three; grain free; rachis hairy or plumose bearded.

144. ANDROPOGON FURCATUS. *Muhlenberg.*

Culms and leaves nearly smooth; spikes three to five, digitate, straight, rigid; spikelets approximated, roughish downy; awn bent; sterile flowers staminate, awnless. Perennial; flowers in September. Culms 4 feet high. Wisconsin, Illinois, Ohio, Michigan and Minnesota.

145. ANDROPOGON SCOPARIOUS. *Michaux.*

SYN.—A. purpurascens, Willd. Pollinia scoparia, Spreng. Broom-grass.

Culms slender, with many branches; lower sheaths and narrow leaves hairy; spikes terminating the branches, very loose, slender, simple; sterile spiklet neutral, its lower glume awned, small on a very hairy pedicel, the fertile with three stamens, and a twisted awn. Perennial; flowers in August. Culms 3 to 4 feet high. Wisconsin, Illinois, Ohio and Michigan.

Plate XII. Fig. 1.

146. ANDROPOGON VIRGINICUS. *Linnæus.*

SYN.—A. dissitiflorum, Michx. Anantherium Virginicum, Spreng.

Sterile spikelet abortive, being only an awn-like plumose pedicel; fertile flower monandrous, straight awned, culms flattish below, sparingly short branched above: sheaths smooth; spikes two or three together in distant appressed clusters. Perennial; flowers in September. Culms about three feet high. Ohio.

147. ANDROPOGON MACROURUS. *Michaux.*

SYN.—Cinna glomerata, Waltr.

Sterile spikelet abortive, being a mere awn-like plumose pedicel; the fertile monandrous, straight-awned; culm stout, bushy branched at the summit, loaded with numerous spikes in dense leafy clusters; sheaths rough, the upper hairy. Perennial; flowers in September. Culms 2 to 3 feet high. Ohio.

GENUS 56. SORGHUM. *Persoon.*

[From *sorghi*, the Asiatic name of one of the species of this genus]

Spikelets two or three together, on the branches of an open panicle, the lateral ones sterile; glumes of the middle or fertile spikelet coriaceous or indurated, sometimes awnless; stamens three.

148. SORGHUM NUTANS. *Gray.*

SYN.—Andropogon nutans, Linn. A. avenaceurs. Michx. Indian grass. Wood-grass.

Culms simple terete; leaves linear-lanceolate, glaucus; sheaths smooth; panicle narrowly oblong; the perfect spikelets at length drooping, clothed with fawn-colored hairs, lanceolate, shorter than the twisted awn; the sterile spikelet a mere hairy pedicel. Perennial; flowers in August. Culm 3 to 5 feet high. Wisconsin, Illinois, Ohio, Michigan, Iowa and Minnesota.

149. Sorghum Saccharatum. *Persoon.*

Broom-corn.

Leaves linear-lanceolate; ligules short, ciliate; panicle with long verticilate branches, loosely expanding. Annual; flowers in August. Culms 6 to 9 feet high. A native of India. Extensively cultivated. Wisconsin, &c.

The panicles are used for brooms and the seed fed to poultry; the whole plant is highly saccharine, and attempts have been made to extract sugar from it, but without much success.

Broom-corn is cultivated most extensively in Walworth County, where large numbers of brooms are annually made to supply the demand at home; and the surplus is exported by way of the cities of Milwaukee, Racine and Kenosha, on Lake Michigan.

The following table of the analysis of the ash of the several parts of broom-corn, is by Dr. J. H. Salisbury, of Albany, N. Y.:*

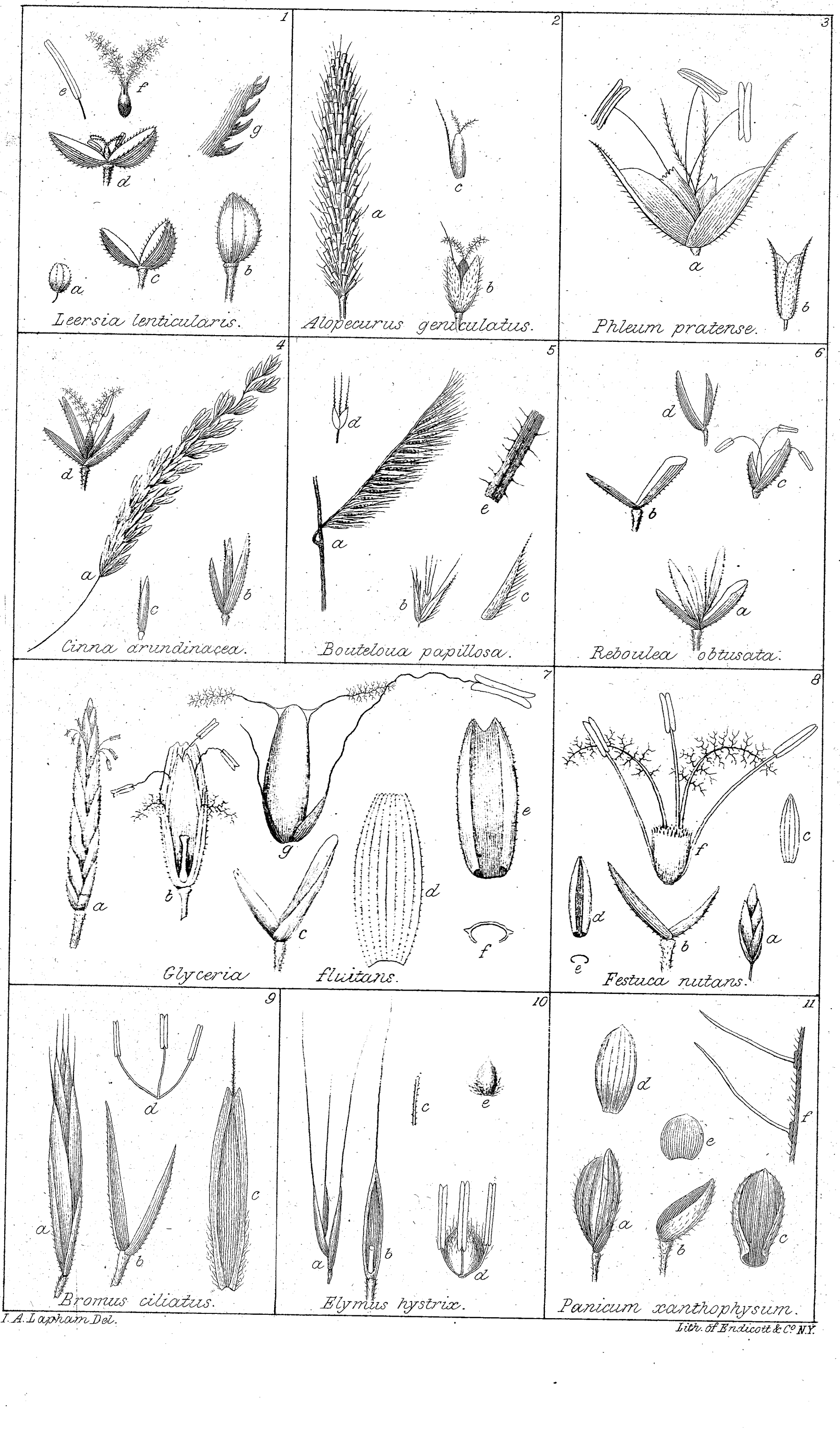
	Stalks.	Sheaths.	Ripe broom corn brush with seeds.	Seed.
Silica	6.24	40.20	32.50	......
Silicic acid	......	......	......	41.975
Earthy phosphates	16.66	15.00	36.15	......
Phosphoric acid	......	......	......	28.760
Phosphate of peroxide of iron	......	......	......	0.525
Lime	6.25	3.00	0.40	0.845
Magnesia	3.74	3.24	0.10	3.010
Potash	30.40	26.56	27.32	3.920
Soda	15.46	7.33	2.37	7.247
Sulphuric acid	9.07	3.57	not det'd.	not det'd.
Chlorine	2.14	1.72	2.50	0.245
Peroxide of iron	2.61	......	......	......
Organic matter and magnesia	6.24	......	......	......
Organic acids	......	......	......	4.200
Loss	1.19	......	......	9.273
	100.00	100.62	101.14	100.000

* See Emmons' Ag. of N. Y., vol. ii, p. 272; also Patent Office Report, 1849-50, p. 473.

It is stated that broom-corn was first introduced into our country in the days of Dr. Franklin, who chanced to see an imported corn-whisk in the possession of a lady, and while examining it as a novelty spied a grain of it still attached to the stalk. This he took and planted.*

* Darlington, Flora Chestreca, 3d Ed. p. 388, quoted from Watson's Annals.

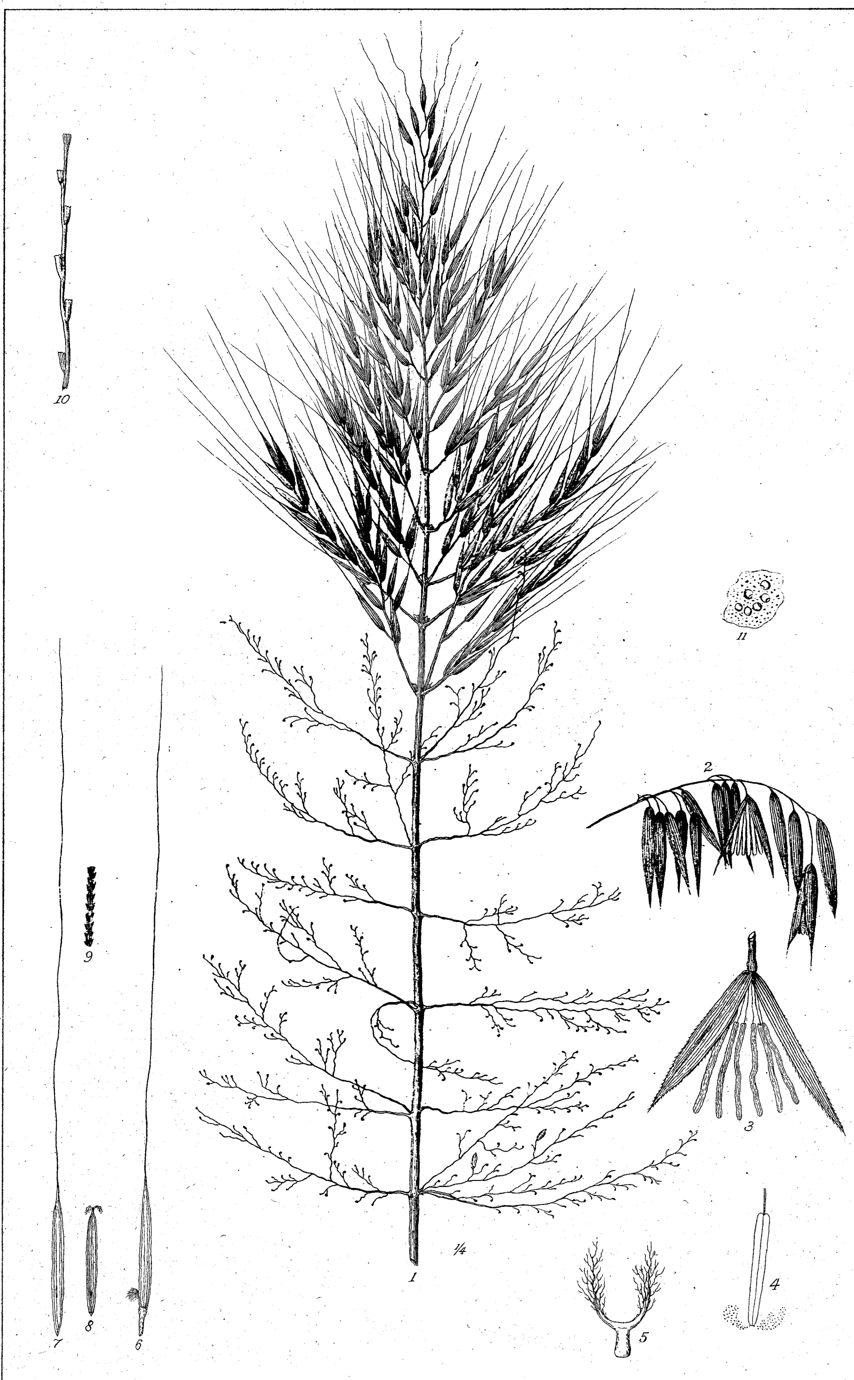
Plate I.



I. A. Lapham Del.

Lith. of Endicott & Co. N.Y.

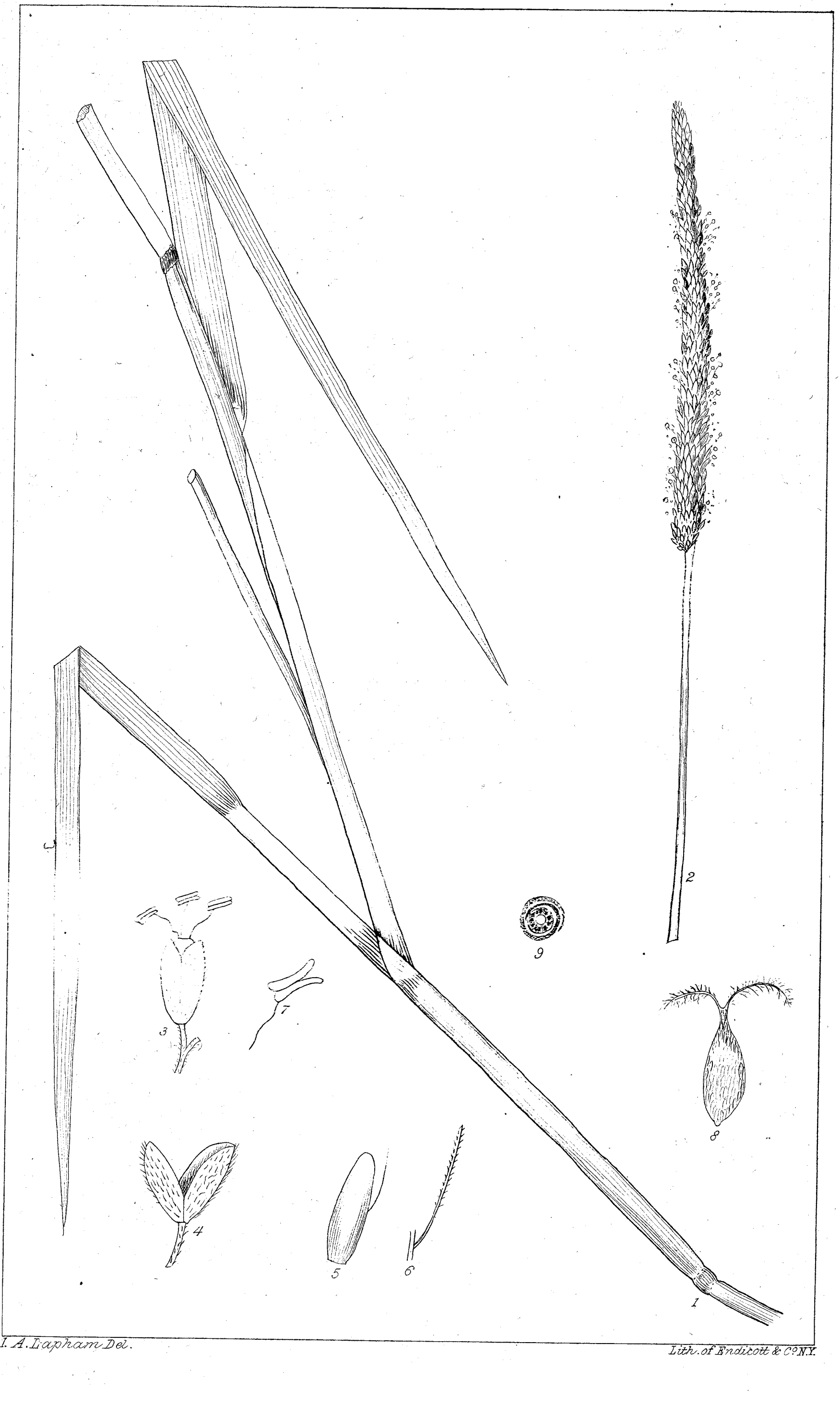
ZIZANIA AQUATICA. II



I. A. Lapham Del: Lith. of Endicott & Co. NY.

WILD RICE.

1 Ripe panicle. — 2 branch of staminate flowers. — 3 staminate flower magnified. —
4 anther and pollina. — 5 germ and stigmas. — 6 pistillate flower. — 7 same when ripe. —
8 grain. — 9 awn, mag.d — 10 rachis of fertile flower — 11 pollina grains very highly mag.d —



I. A. Lapham Del. Lith. of Endicott & Co N.Y.

1 Culm. — 2 Spike. — 3 Flower — 4 Glumes. — 5 [illegible] Awn. — 6 Awn. —
7 Stamen exserted — 7 [illegible] — [illegible] Section of stem & sheath.

ORYZOPSIS ASPERIFOLIA IV

I. A. Lapham Del. Lith. of Endicott & Co N.Y.

MOUNTAIN RICE

1 The Plant nat. size._ 2 a Spikelet._ 3 The Glumes._ 4 Outer palea.

I. A. Lapham Del.

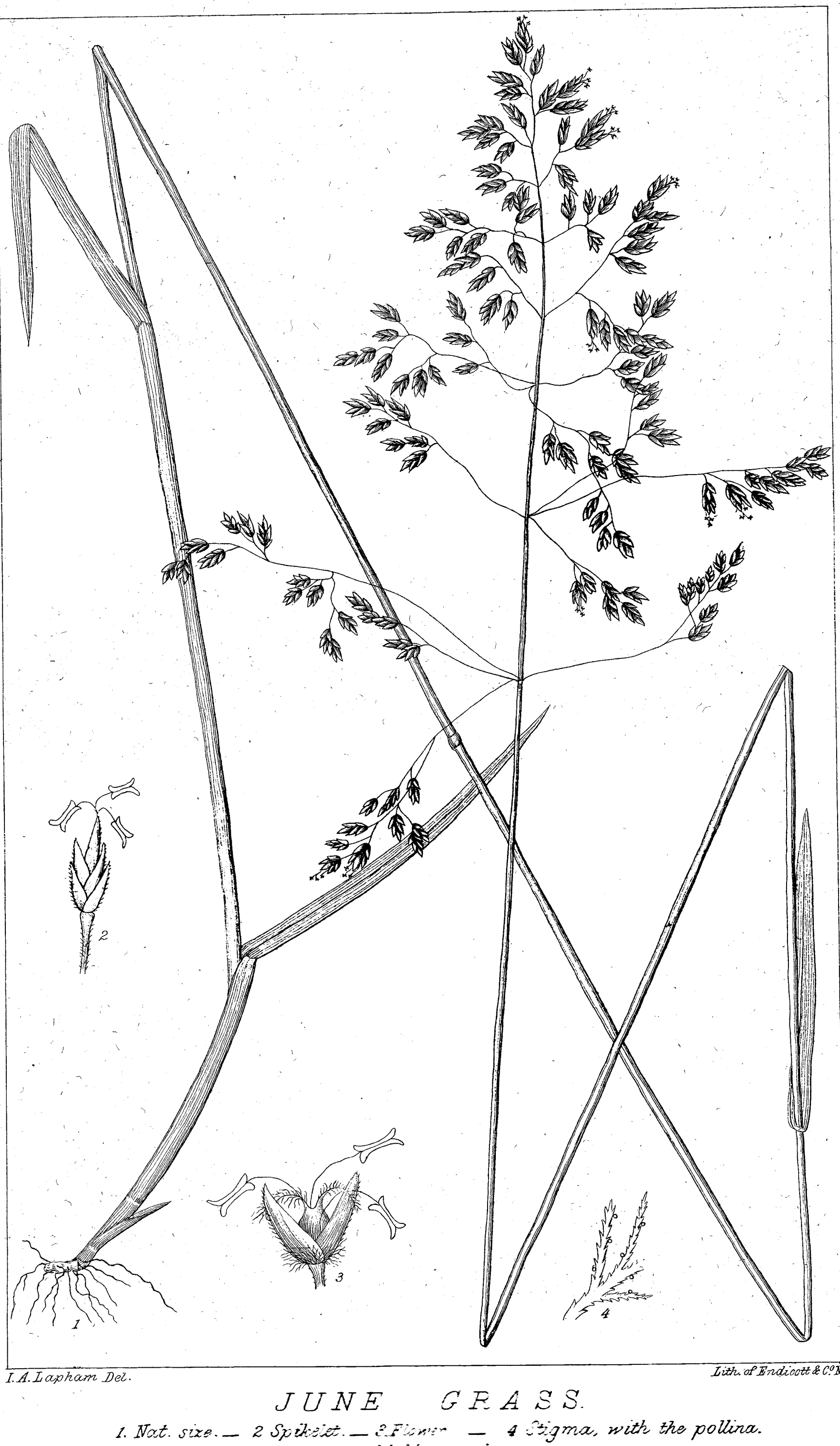
Lith. of Endicott & Co. N.Y.

1 Panicle. — 2 Flower, the glume & palea removed. — 3 Mature seed & awn. —

POA DEBILIS

I. A. Lapham Del. Lith. of Endicott & Co N.Y.

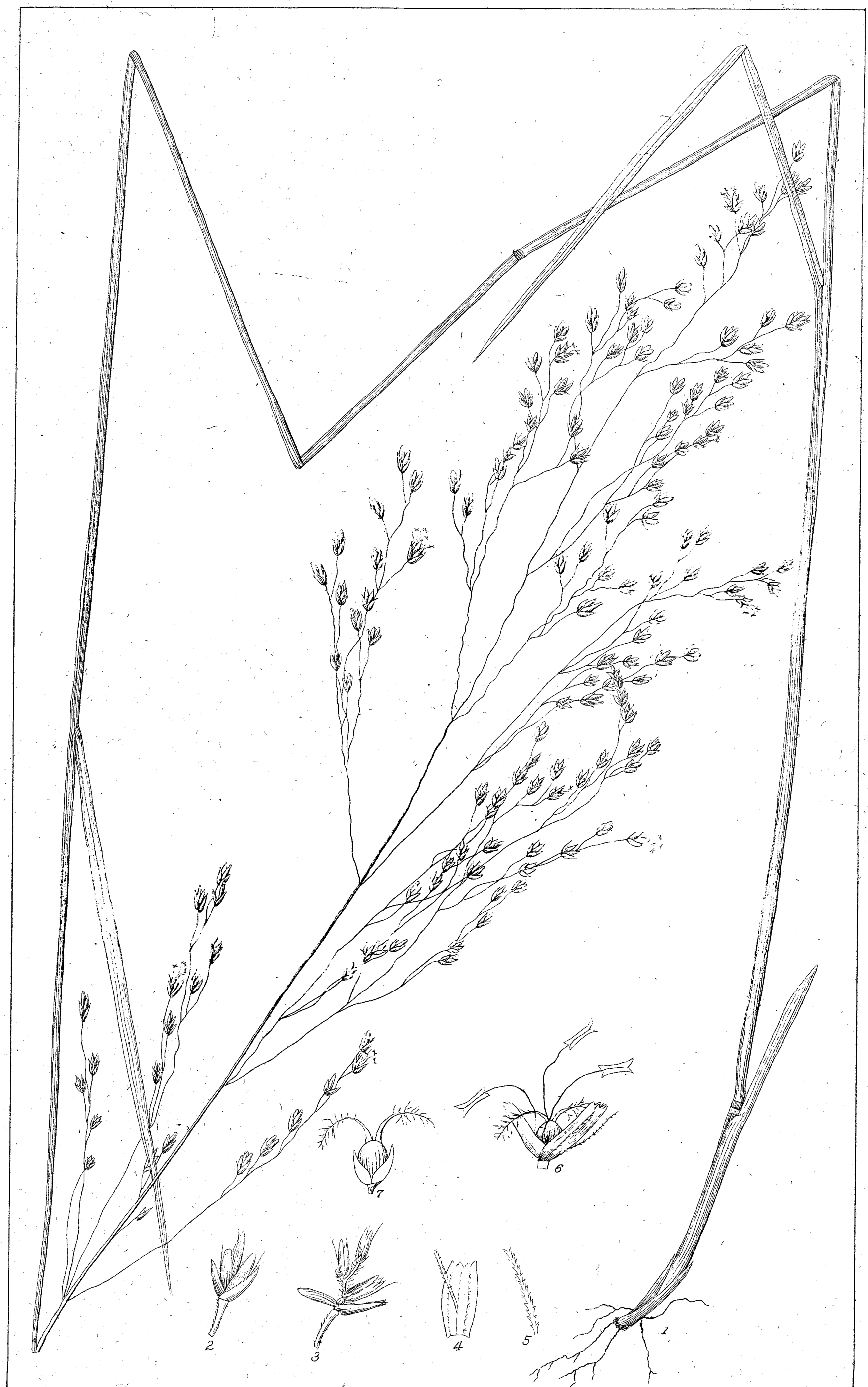
1 Nat. size.— 2 Spikelet.— 3 Glumes.— 4 Flower, the Glumes removed.



I. A. Lapham Del. Lith. of Endicott & Co. NY.

JUNE GRASS.

1. Nat. size. — 2 Spikelet. — 3. Flower — 4 Stigma, with the pollina.
highly magd

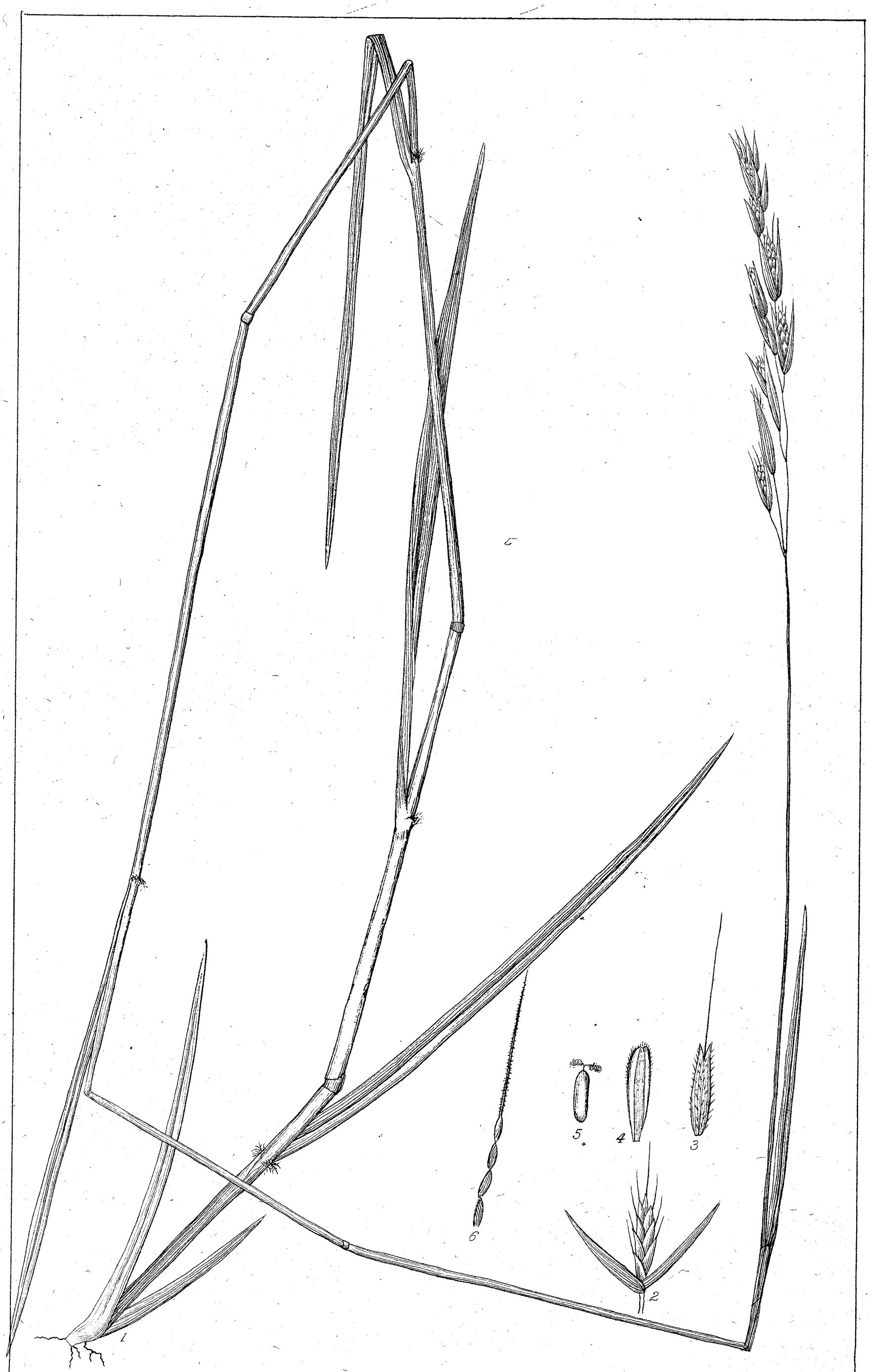


I. A. Lapham Del.

Lith. of Endicott & Co. N.Y.

TUFTED HAIR-GRASS.

1 Plant Nat. size.— 2 Spikelet (3 flowered.) — 3 Spikelet spread open. —
4 Outer palea. — 5 Awn. — 6 Flower. — 7 Germ, Scales &c.



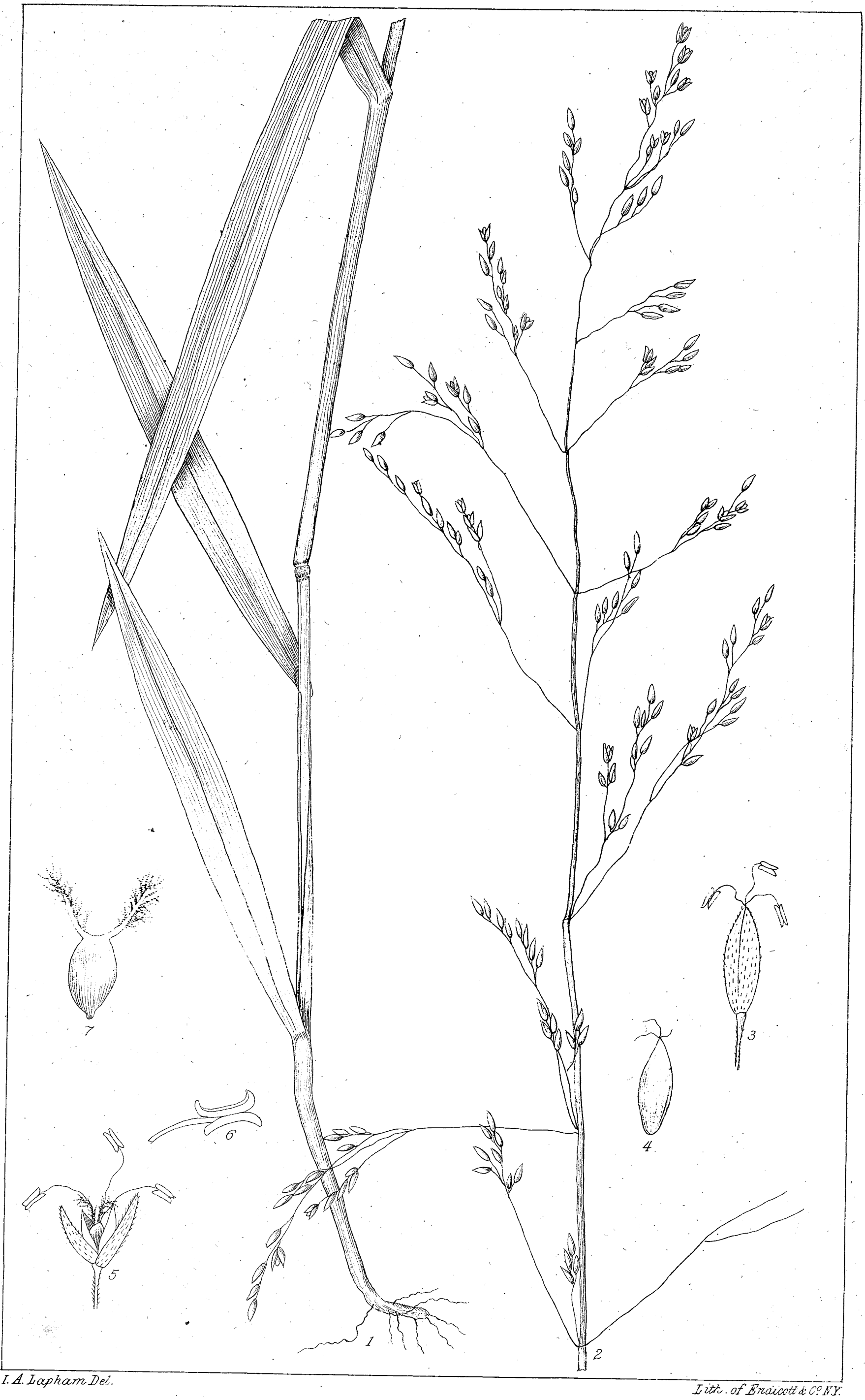
I. A. Lapham Del.

Lith. of Endicott & Co. N.Y.

1 Plant Nat. size. — 2 Spikelet enlarged. — 3 Outer palea. — 4 Inner palea.
5 Germ. — 6 Awn. —

MILIUM EFFUSUM

X



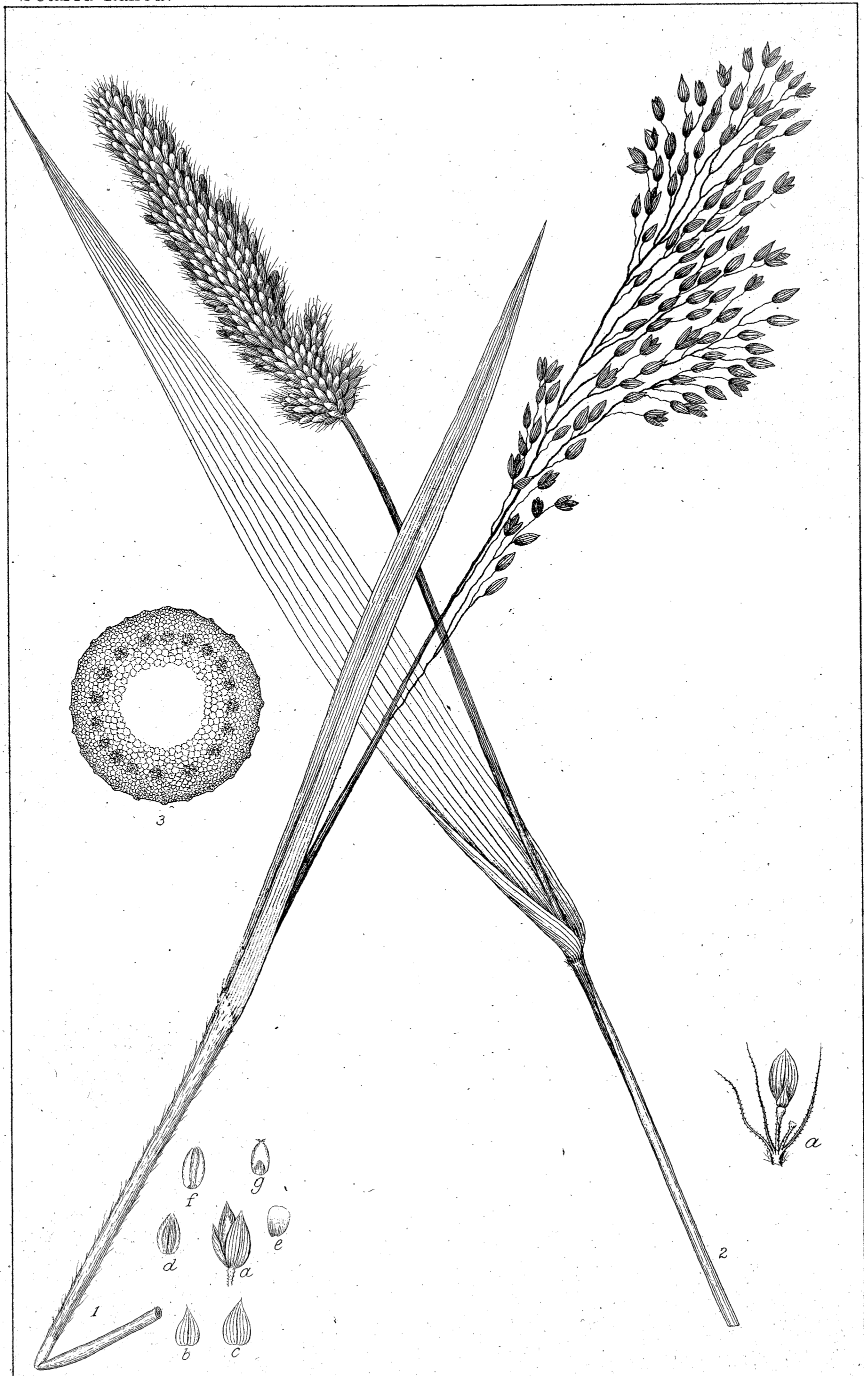
I. A. Lapham Del.

Lith. of Endicott & Co N.Y.

MILLET GRASS.

1 Culm, half size.— 2 Panicle, Nat. size — 3. Flower unopened — 4 Palea.—
5 Flower opened.— 6 Exp[illegible] — [illegible]

Setaria Italica. Panicum miliaceum.



I. A. Lapham Del. Lith. of Endicott & Co. N.Y.

MILLET.

a Spikelet. — b outer glume. — c inner glume. — d outer glume of nuteral flower. —
e inner glume water flower. — f palea of perfect fl. — g grain with remains of style. —
3 Section of the Stem of Grass.

I. A. Lapham Del. Lith. of H. Seifert, Milwaukee W.

1. A joint of the rachis.—2. The spikelets.—3. Lower palea & awn of fertile flower.
4. The germ.—5. anther.—6. ligule.