Public Documents of Maine:

BEING THE

ANNUAL REPORTS

OF THE VARIOUS

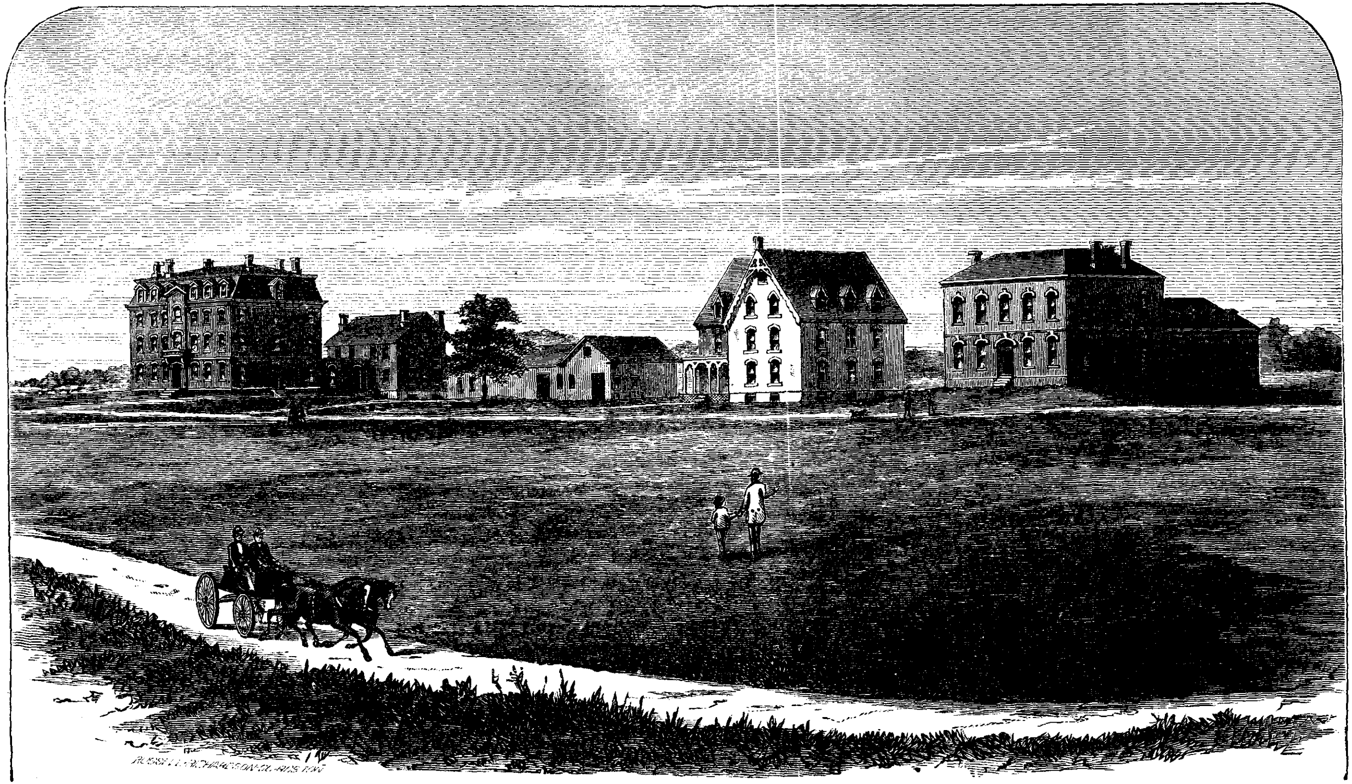
PUBLIC OFFICERS AND INSTITUTIONS

FOR THE YEAR

1875.

VOLUME II.

AUGUSTA:
SPRAGUE, OWEN & NASH, PRINTERS TO THE STATE.
1875.



Dormitory and Boarding House. White Hall. Laboratory.

PRINCIPAL BUILDINGS OF THE STATE COLLEGE OF AGRICULTURE AND THE MECHANIC ARTS, ORONO.

NINETEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

MAINE BOARD OF AGRICULTURE,

FOR THE YEAR

1874.

AUGUSTA:
SPRAGUE, OWEN & NASH, PRINTERS TO THE STATE.
1874.

MAINE BOARD OF AGRICULTURE.

Z. A. GILBERT, President.
J. W. LANG, Vice President.
S. L. BOARDMAN, Secretary.

Members at Large Appointed by Governor and Council.

Name.	P. O. Address.	Term Expires Dec. 31.
C. F. Allen	Orono	——
George E. Brackett	Belfast	1876
D. M. Dunham	Bangor	1876
M. C. Fernald	Orono	1877
Henry Carmichael	Brunswick	1877

Member chosen by State Agricultural Society.

B. M. Hight	Skowhegan	1877

Member chosen by State Pomological Society.

Hannibal Belcher	Farmington	1875

Members chosen by County Societies.

Name.	County.	P. O. Address.	
Ira C. Doe	York	Saco	1875
Geo. B. Barrows	Oxford	Fryeburg	1875
Edward Payson	Cumberland	Portland	1875
William D. Hayden	Somerset	Madison Centre	1875
Isaac E. Mallett	Sagadahoc	Topsham	1875
Samuel Wasson	Hancock	East Surry	1876
Joel E. Shaw	Penobscot	West Hampden	1876
A. L. Bradbury	Franklin	Phillips	1876
Lyman Lee	Piscataquis	Foxcroft	1876
Timothy Williams	Knox	Rockland	1876
Isaac Barker	Aroostook	Houlton	1876
Ira E. Getchell	Kennebec	N. Vassalboro'	1877
Z. A. Gilbert	Androscoggin	East Turner	1877
Lyman H. Winslow	Lincoln	Nobleboro'	1877
C. W. Hersey	Washington	Pembroke	1877
Peter W. Ayer	Waldo	Freedom	1877

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INTRODUCTION.

To the Honorable Senate
and House of Representatives:

I have the honor to transmit, herewith, the Annual Report of the Maine Board of Agriculture for the year 1874.

The annual meeting of the Board was held at the Court House in Wiscasset, and was very largely attended. The citizens of Lincoln county earnestly desired that the meeting of the Board be held in that county, in the hope that it might be productive of much good and be a means of awakening a new interest in the cause of agricultural improvement in that section of the State. From many evidences since received, it is believed that the desired results followed the holding of the winter session in that county. The semi-annual meeting, which the statute provides shall be held "at the State College, or near enough for the students to attend," was, in accordance with the unanimous expression of the members of the Board, and the earnest wish of the Faculty of the College, and leading citizens of Orono, held in that town. The attendance was very good, the students of the State College being present each day, and a large number of prominent farmers from different portions of the State also being in attendance. The holding of the session at Orono, also gave many an opportunity to visit the State College of Agriculture and Mechanic Arts, who had never done so: the first day of the session being wholly devoted to an examination of the college buildings, farm and stock, and to an attendance upon the recitations of the several classes. The practical workings of the Institution were closely examined; and the expressions of pleasure and satisfaction to which the members of the Board gave utterance, in the discussion reported on pages 364 and 368 of the Report, will show the opinion they entertain of this college for the people, and the work it is doing.

The papers and lectures given before the sessions of the Board, which are published in full in the volume now laid before you, contain a fund of scientific and practical information on leading subjects in agriculture, which it is believed will be eagerly sought and diligently studied by every intelligent farmer in the State—and that in consequence of this study, a more thoughtful brain will guide the work of the farm to better results. Aside from the many exceedingly valuable and suggestive papers presented by members of the Board, which cover a variety of subjects and embrace the results of much thought and practical experience—the lectures given by men who hold a high rank in agricultural science will be found full of important information on the subjects treated. The lecture of Hon. Harris Lewis of New York, on milk, is one the reading of which will furnish much useful knowledge on this most timely subject; while the elaborate and carefully prepared lecture of Prof. Atwater on the Science of Cattle Feeding, may be studied with profit by all. The lecture of Prof. James Law of Cornell University, N. Y., on the horse, and the lameness and injuries to which he is subject, is one which will possess a high value to a very large class of our farmers, inasmuch as the breeding of horses is now receiving considerable attention in our State, and also on account of the high reputation held by Prof. Law as the leading authority in this country on veterinary subjects. His lecture on Epizoötics is a valuable contribution to science; and the very able resume of the progress of American Agriculture during the past hundred years, by Hon. Charles L. Flint, Secretary of the Massachusetts Board of Agriculture, gives in a condensed form a complete history of agriculture from its earliest and rudest beginnings on the American continent, to the present day.

The treatise on the "Weeds of Maine," which appeared in the State Agricultural Report for 1869, having been received with so much favor by readers of that volume, I have felt justified in presenting another brief work on a similer subject, from the writer of that article. In the "Ornamental and Useful Plants of Maine," the author treats of a subject with which he is perfectly familiar, and it is one completely apposite to the objects and work of the Board. While its chief design is to furnish accurate descriptions of our native trees and plants, and especially to give prominence to the economical value and uses of the species described; it has also been an aim to present the information in a manner that would make it readable, and at the same time convey all the facts upon the subject which were deemed necessary to a full understanding of the same. It is believed that the essay will be gladly welcomed as a useful contribution to our agricultural literature, and lead many young farmers to study more closely and accurately the beautiful and useful trees and plants which form so large a part of our native flora.

The paper on the breeds of cattle introduced and kept in Maine, brings the subject down to the present date; and while it possesses an interest to a large class of readers, is also a contribution to our agricultural history which not inappropriately fills the space it occupies.

During the past year the State and local agricultural societies and farmers' clubs have held most successful exhibitions; and there has been great unanimity manifested on the part of all interested in carrying forward the work in which they are engaged. This Department is in correspondence with thirty-six Farmers' Clubs, a large number of which hold annual exhibitions and regular meetings for the discussion of matters pertaining to the advancement of the interests of the farmer. To these clubs I have in all cases, where it has been practicable, forwarded the reports of the Board—and in many instances have also transmitted to them, in answer to requests for the same, such back volumes, to complete sets for their libraries, as it has been in my power to furnish, deeming it wiser to send reports to these clubs where they will be read and appreciated, than to keep them on hand in this office.

Of the thirty-four cheese factory companies incorporated by the Legislature last winter, less than one half went into operation; making, with the twenty-four in operation in 1873, a total of thirty-six which were in operation during the past season. In February last a State Dairymen's Association was organized, the secretary of which has sent out blanks the past fall for the purpose of obtaining statistics of the work of the factories during 1874, and the results embodied in these replies will be presented in the annual report of the Association, which will be published in the abstract of returns from the agricultural societies to be put to press immediately. Dairying must still be regarded as one of our leading branches of agriculture, and it is an industry to which thought and attention must be given in the future as in the past, if the best results would be obtained.

The State College of Agriculture and the Mechanic Arts is meeting with good success. It now has over one hundred and twenty students, and a faculty of eight instructors. At this college tuition is furnished free, and by making provision for labor, practice is combined with theory, and manual labor with scientific culture—it being the design to make the labor as much as possible educational, so that every student may become familiar with all the forms of labor upon the farm and in the garden. In regard to the designs and aims of the college, it may be stated that the prominence given to the natural sciences and the practical element associated with nearly all departments of study, cannot fail to render the course especially valuable. The following features of the course, as given in the announcement of the faculty, are presented for the purpose of acquainting our young farmers and mechanics with the leading points in the course:

"Nearly a year is devoted to Botany and Horticulture, commencing early in the spring and continuing till late in autumn. This course embraces a thorough drill in Botanical Analysis; the study of plants, as to their relative importance and geographical distribution; the study of those having commercial or medical value; of those which are cultivated for ornament, and also those which are detrimental, as weeds and poisonous plants. The students learn practically the operations and processes in the department of Horticulture. A year and a half is devoted to Chemical Physics and Chemistry, commencing with the third term of the first year. The course in Chemistry proper will include general, analytical, and agricultural chemistry. Under Analytical Chemistry will be taken up general analysis, use of blow-pipe, analysis of minerals, alloys, fertilizers and farm products. All the students, while studying, devote two hours a day to analysis, under the direction of the Professor of Chemistry, thus acquiring facility in conducting experiments, and securing a practical knowledge of the methods employed in chemical investigations. Those in the course of Chemistry devote three hours a day to laboratory work. Under Agricultural Chemistry will be considered composition of soils, relations of air and moisture to vegetable growth, food of plants, chemical changes during vegetable growth, chemistry of farm processes, methods of improving soils, and various other topics which may properly be treated of under this department. Other departments of science are studied and taught, so far as may be, with special reference to their practical bearing, or their relations to Agriculture and Useful Arts. Especial attention is given to Mechanical and Civil Engineering, by which students may be thoroughly prepared to enter upon these professions with a thorough knowledge of the principles and practice in these departments of industry."

In order to carry out the requirements of the last Legislature, the Trustees have expended the past year something over one thousand dollars for thoroughbred stock; and the farm now possesses four Shorthorns, four Ayrshires and five Jerseys, all pure blood, and it is the design to obtain good representatives of the other breeds as soon as possible. An inventory of the live stock now shows that there is $4,388 worth on the college farm.

The new barn erected in 1873 has been completed the past year, and while being a credit to the State, is an honor to the college, and a building in which every intelligent farmer in the State may take great pride. A correct engraving of the barn, from a photograph, forms an appropriate frontispiece to this report, and the plan accompanying will be attentively studied by farmers everywhere. The Trustees in their report thus speak of this building: "The barn erected the past season occupies an elevated and central position, some sixty rods south of the college, and the same distance east of the farm house. It is one hundred feet long, fifty feet wide, twenty-four feet in height of post. Two large, well-proportioned ventilators upon the roof, ensure thorough ventilation to the body of the building, and provision for an ample supply of fresh air in the cellar and stables is made by means of eight ventilating tubes, opening under the roof. The main floor, fourteen feet wide, runs lengthwise through the center of the building. The space on either side of this floor is appropriated to floors and pens for stock, implement rooms, granary, &c. Means are provided, by which the entire space above the scaffold girts can be used for storing hay and grain. The roof of the building is slated." Mr. Farrington, the efficient Farm Superintendent has furnished the following detailed description of the barn, which in connection with the plan, will be studied with interest.

"The south side of the main floor is devoted to stock. Provision is made to tie twenty-six head of cattle in this division. The cattle are fastened with chains sliding upon an iron rod. The lower end of this rod enters the plank that forms the rear of the manger. The upper end is bent to an angle, and rests upon and is bolted to the stanchion post. The mangers are made of seasoned birch and maple. They are intended to be water tight. The partitions dividing the mangers are carried back between the animals two feet from the stanchion post, and firmly attached to a post of turned black ash six inches in diameter. This arrangement of the partitions cuts off all intercourse, and effectually prevents any worrying or hooking by quarrelsome animals.

The short floor on which the cattle stand is graduated in length to adapt it to the different sizes of animals. The lengths are five feet, four feet nine inches, and four feet six inches. This floor inclines one inch in the length from front to rear. Directly at the rear of this, and running the length of the building, is a trench twenty inches wide and four inches deep, which receives the droppings of the stock. The manure is passed to the cellar through trap doors, at convenient distances in the bottom of the trench. In the rear of the stock are movable pens for storing dry muck, sawdust or loam, to be used for litter; and pens for young calves.

A wide sliding door at the west end of the tie-up, allows the entrance of a cart from which the litter is thrown into the pens. Four ventilating tubes, each one foot by four, opening from this stable through a wire netting directly under the eaves, ensure sufficient ventilation. The water for the stock is drawn from the cistern in the cellar by a pump in the south end of this apartment. Means are provided to water the stock within doors or in the yard, as the weather allows.

The main floor is fourteen feet wide. In it are two trap doors, through which muck, loam or other absorbents, may be thrown into the manure cellar beneath. Situated along the north side of the main floor are pens for calves, and stalls for bulls, made substantial and secure. On this side, also, are a hospital room, stairways leading to the root cellar and to the ventilators at the top of the building; a room for the large farm machines; a granary provided with closet and conveniences for storing different kinds of feed, and a passage way designed to communicate with the future farm house.

The several divisions of the main floor are sheathed with spruce boards, planed, tongued and groved. This makes the apartments tight and warm, and secures the comfort of the stock in the coldest weather. The cattle are fed from the main floor. A portion of the sheathing in front of the cattle is cut into sections about eight feet long. These are again divided through the center horizontally, and hinged so as to form doors. When these doors are closed, the cattle are entirely shut from the main floor. To open them, the upper ones are turned up against the sheathing and fastened with a button; the lower ones turn out into the floor to an angle of thirty degrees, and are sustained in this position by chains fastened to the studding. This forms the manger front over which the cattle are fed.

In consequence of the neglect of the Legislature to appropriate money asked for by the Trustees to erect an ell to the barn, to furnish protection for stock and conveniences for water, it became necessary to provide some other means for a water supply. It was decided that the most available, and indeed, under the circumstances, the only way to accomplish this was to build a cistern for the reception of rain water under the barn. Although to do this would involve a large additional expense, and permanently occupy space in the cellar that was needed for other purposes, no other alternative offered. A cistern was constructed of brick and cement, capable of holding thirty thousand gallons. This is sunk into the ledge three and one-half feet below the level of the cellar bottom. The walls are twenty inches thick and eleven feet high. These walls are supported by abutments built up with the wall, and extending three feet into the cellar. The cistern is under the main floor of the barn, in the west end of the cellar. Forty thousand bricks were used in its construction. That part of the cellar between the cistern and the north side of the cellar is enclosed with a brick partition for the reception of roots and vegetables for stock. The capacity of this root cellar is four thousand bushels. The floor is of cement; two ventilating tubes, covered with planks perforated with numerous holes, permit the free passage of air from the main cellar through the piles of roots into one of the main ventilating tubes that passes from this cellar out under the eaves. The part of the cellar not occupied by cistern and root cellar is used for the storage and manufacture of manure. It is well secured against frost, and furnishes an excellent opportunity to employ same in the manufacture of farm fertilizers."

In August last, in accordance with a recommendation of the Board, I spent two weeks in visiting and inspecting the establishments along our coast where the fish known as menhaden (*Brevoortia menhaden*) are manufactured into oil. Commencing my investigations at Boothbay and Bristol, they were extended eastward to Lubec and Eastport, where the herring is the fish most largely used for oil, the residue of which is used to some extent as a feed for sheep and poultry. In a discussion on the value of the scrap or residue from the oil factories, as a fertilizer, in the the course of the discussion at the meeting of the Board at Wiscasset, it was suggested that this might be prepared in such a way as to be transported to the farms in the interior of the State; and one of the main points in my inquiries, was in reference to this particular. In Boothbay there are five companies or firms engaged in this business, and in Bristol and Bremen seven companies, while in the towns of Sedgwick, Bluehill, Surry, &c., are a number of companies doing a smaller amount of business. During the past season the Bristol companies made 381,000 bbls. of oil, and the Boothbay companies 174,000—a total of 555,000 bbls. From this 18,500 tons of scrap was made, for which $11 per ton is obtained at the works, giving a revenue of $203,500; the total product from both items being $631,475 for the year 1874.

Almost the entire amount of scrap produced is used in the manufacture of super-phosphate in this and other States, and a large portion of it finds a market in the Southern States. During my investigation of this subject, I obtained a large mass of facts in regard to the natural history and economy of the menhaden and herring, together with many statements from farmers who have used the scrap as a fertilizer, either in a direct manner or as a compost, and also as a provender for sheep. I also obtained some of the chum, the use of which as a feed for sheep has been so highly commended, and have forwarded the same to Prof. Farrington, Superintendent of the State College farm, who is now carrying on an experiment in feeding it in connection with Indian corn; and the fish scrap is being experimented with under my direction, as a fertilizer. I had hoped to complete my investigation of this subject in season to present the same in this report, but from the fact that the above results are not yet obtained, and that the publication of this matter would swell the size of this volume beyond its usual compass, I have deemed it best to withhold its publication until another year; and in the meantime obtain the full results of the experiments just alluded to.

The year has been one of general prosperity among farmers. Good crops have been harvested, and the farm stock, which was much reduced during the close years of 1871-72—when from drought and grasshoppers the hay and grain crops were almost a total failure—has largely increased upon the farms in the State, and it is a safe estimate to say that from 50 to 75 per cent. more stock is now kept by our farmers than was owned by them in 1872. A large increase has been noticeable in sheep, cows and young cattle. It is to be hoped that in the future as in the past, the great interest of agriculture will continue to receive the encouragement and fostering aid of the State; and that through this aid the several agencies at work for the advancement of agriculture, will perform better service in coming years than in the past, and prove the wisdom of the State in extending its fostering care over that industry which is the foundation and support of all its prosperity.

SAMUEL L. BOARDMAN,

Secretary of Board of Agriculture.

OFFICE OF THE MAINE BOARD OF AGRICULTURE,

Augusta, Dec. 15, 1874.

MAINE BOARD OF AGRICULTURE.

REPORT OF THE WINTER MEETING.

FIRST DAY.

The Annual Meeting of the Maine Board of Agriculture was held in the Court House at Wiscasset, on Tuesday, Wednesday and Thursday, February 10th, 11th and 12th, 1874, the attendance throughout the session being large, and the meeting one of great interest. The members assembled at 9 o'clock, A. M., and were called to order by the Secretary; when Messrs. Brackett, Dow and Colburn, were appointed a committee on credentials. The Board organized by the choice of the following officers:

President—Z. A. Gilbert, East Turner.
Vice President—J. W. Lang, Brooks.
Secretary—S. L. Boardman, Augusta.

Messrs. Lang, Colburn and Dunham were appointed a committee on the pay-roll; and the officers were appointed a business committee.

After the organization, a discussion was engaged in on

Porgy Chum as a Feed and Fertilizer.

Mr. Wasson gave his results of the use of porgy chum as a feed for sheep and poultry, he having had some five years' experience with it. It is the refuse of the porgy or menhaden which are caught in large numbers along the coast in Washington county, and in fact to a greater or less extent throughout the entire coast of Maine. The oil is expressed, and the residue used in the green state as a fertilizer. When used as food it is prepared by drying in the sun on elevated racks, for two days, by which process the water is expelled, and it will keep for an indefinitely long period—an open barrel containing it has been in his barn for at least five years, for the purpose of ascertaining how long it will keep. One barrel of it, costing $2.00, will be sufficient for three sheep during the entire winter. His sheep gave an average increase of 1¼ lbs. wool per head from the use of this chum, the sheep being fat all the time and bringing heavy lambs. Hens eat it with avidity. He believed it might be so prepared that it could be barrelled and transported into the interior of the State for purposes of feeding, thereby becoming a source of revenue to our State and a matter of direct benefit to farmers.

Mr. THOMAS BOYD of Boothbay, gave some interesting statements concering this material. The county of Lincoln produces annually hundreds of thousands of tons of chum, the towns of Bristol and Boothbay being more largely engaged in the work than any others. Formerly it was sold for about $9 per ton; last year it went up to $13 per ton. He believed it worth more for a fertilizer if dried as it comes from the press, as by so doing 50 per cent. of its value is saved, and it can then be sown on the land the same as grain. Sea-shore farmers generally use it green as a fertilizer, but he knew from actual trials that the best results in its use as a fertilizer were obtained where it was dried as it came from the press. If thus dried it may be shipped to any part of the State. Our sea-shore farmers can obtain abundance of marine fertilizers, hence they are not so particular about using the chum, although it is often composted with seven parts of dried muck or loam to one of chum in the green state, making a very valuable fertilizer. It is sent south by the thousand tons, and composted with plaster and loam forms a fertilizer that sells from $60 to $80 per ton. July and August are the months in which it is prepared. As to its value as a food for animals, he could only say that hens, ducks and turkeys prefer it to corn, in fact, will leave corn for it, and they become heavy and large when fed on it. They are taken off and fed on corn three or four weeks previous to being killed.

Prof. WHITE enquired its effects upon the quality and flavor of the meat of animals fed with it, as he thought it might be objectionable. Hogs fed in the acorn or mast regions of the west do not make so firm or sweet pork as those fed on corn. The answers to the inquiry were unsatisfactory, as those present had not made experience in the eating of animals fed on the chum.

Mr. PERCIVAL had experimented with it, having used one hundred barrels as a fertilizer one season. It had proved a valuable manure but he could not commend it as a food for hens or sheep from his experiments. He had not tried the thoroughly dried chum, however.

Mr. DOE thought the matter an important one, and the statements of some who had used it would certainly indicate that it was valuable as a food for sheep. The results of feeding it to this class of animals, as reported by Mr. Wasson, are better than can be obtained from corn. As a matter of importance to the State, in developing our resources, it was one that should be encouraged; but the matter should be carefully presented, and the Board should take no responsibility in the matter.

Mr. DUNHAM suggested that experiments in its use as a food for animals, and also as a fertilizer, should be undertaken by the State College at Orono.

Prof. FERNALD believed that more experiments should be made with it, and some arrangement should be perfected whereby a genuine article may be obtained for purposes of experiments. It should be prepared by responsible parties who will attend to the matter properly. If it can so be prepared that it may be used in Maine, and the money kept at home it will be an item of much importance to our State. Of course we must ultimately pay the value for it—for if a demand for the article occurs at home it will bring more in the market.

Other members made remarks and suggestions upon the subject, the means of making known its value to our farmers, and the methods of obtaining facts in regard to it. Subsequently, Mr. Luther Maddocks, of Boothbay, made some clear and satisfactory statements concerning the preparation of the chum. The season of taking the porgy and expressing the oil is crowded into a very few weeks, consequently the operations are carried on with much haste. When the chum comes from the press it contains about 50 per cent. of water. Of course decomposition takes place rapidly in the chum; but he thought if a demand for the article for animal food should occur, it could be so pressed as to retain but 25 per cent. of water, and in that form it could be transported. Drying by solar heat was subject to considerable expense and many contingencies as to weather, &c., and it would be cheaper to extract more water in pressing, and do away with drying.

Reports from Farmers' Clubs.

The remainder of the forenoon was devoted to hearing the reports of the members upon the condition of the Farmers' Clubs in their respective counties, with a view to the proper expenditure of that portion of the stipend heretofore extended for their formation and encouragement. Reports were received from nearly every county. In Androscoggin there are eight clubs, all in excellent condition; the provision as to their support has been faithfully carried out, and with good results. The cheese factory movement in Franklin county was traced directly to the influence of farmers' clubs, and the amount appropriated for their encouragement has been faithfully expended. Good returns from the Jefferson, Bristol, Edgecomb and Boothbay clubs, in Lincoln county, were received, and the same was true of clubs in Oxford, Penobscot and Sagadahoc counties. In Penobscot there are seven or eight clubs, and one county association, all in satisfactory standing; and in Sagadahoc libraries have been established which are doing a vast amount of good. From other counties reported upon, the results were not so satisfactory; and in Somerset and Piscataquis they have been indifferently sustained, and the members from those counties recommended that the sum heretofore given to clubs, be directed into other channels. This was also suggested by other members, even in counties where clubs are successful, on the ground that they will continue to go on with or without the small State aid heretofore appropriated. In some counties it was not clear that societies had fully complied with the requirements of the Board in this particular, and it might be better to leave the matter discretionary with the trustees of the several societies.

AFTERNOON SESSION.

The Convention assembled at 2 o'clock P. M., and was called to order by the President. Prayer was offered by Rev. Mr. Bolster of Wiscasset. Following this was an address of welcome to the Board to the county of Lincoln.

Address of Welcome.

BY GEORGE B. SAWYER, ESQ., OF WISCASSET,

Secretary of State Pomological Society.

Mr. President and Gentlemen:

Two hundred and fifty years ago, the Indian Sagamore Samoset, who reigned over the territory eastward from the Kennebec, known by its aboriginal name of Mavoosheen, where in his intercourse with the earlier English settlers in these parts, he had acquired a knowledge of the rudiments of their language,—journeying by sea from his dwelling place near Pemaquid (in the neighboring town of Bristol),—greeted the Pilgrims of Plymouth with the words "Much welcome Englishmen!"

And so, designated by the flattering judgment of my fellow citizens for the performance of this pleasing duty—because they seem to have thought me identified to some extent with the cause of agricultural improvement, and that by the force of circumstances I might have learned something of the elements of your dialect,—I have the honor to greet you to-day, assembled for the promotion of agricultural knowledge, for the first time within the limits of the County of Lincoln, and for the first time upon the seaboard of our State,—in the center of a region which in an agricultural point of view is to some of you a *terra incognita*—and to say Welcome Agriculturists! Thrice welcome, representative men of the great fundamental interest of the State and of the country.

And first, it is proper, in view of the relations of your Board, not only to the State, but to the subordinate agricultural societies which share its bounty through your intervention, (regulated by wise and liberal laws), that I should welcome you in behalf of the Lincoln Agricultural and Horticultural Society.

That society, organized in 1852, by a few gentlemen of this and neighboring towns, (some of whom are here present to-day and might speak for the society more properly than I)—who saw the low estate to which agriculture had fallen in the community, and appreciated its need of such encouragement as should enable it to keep pace with the progressive spirit of the age,—has maintained its existence, with varying fortunes, to the present day; has held its annual exhibitions and its various meetings for business, lectures, discussions and other purposes. It is not my purpose to tell you, in detail, what it has accomplished. Suffice it to say, that within its limited sphere it has labored in a persistent but unobtrusive manner for the promotion of that interest which *you* have especially in charge. It can point to improved farms and farm buildings scattered all over the county; to fields cleaner and broader and under better cultivation than formerly; to productive orchards and elegant gardens; to improved implements and stock; to eight farmers' clubs, some of them assuming the proportions of well organized societies, with enclosed grounds and valuable libraries, and holding successful annual fairs; and to a dairying association in profitable operation, as some of the results of its labors.

And yet we have but just begun the work of improvement. We have great need of further progress and higher development. Our agriculture is the most backward of all our material interests. And hence it is, that as a society we are glad of your coming among us; grateful that you have given us the opportunity to listen to your discussions and deliberations, and to the addresses of the distinguished gentlemen whom you have done us the honor to invite here from neighboring States, hoping that by a wise improvement of this rare opportunity we may learn the secret of success, and catch something of that faith and enthusiasm which makes success attainable.

But in a less formal manner and a less selfish spirit, in behalf of the citizens of the county of Lincoln and of the town of Wiscasset, without regard to our distinctive organizations, I bid you welcome on this occasion of your first meeting in our midst. And pardon me for trespassing a few moments on your valuable time, not boastingly, but by way of introduction, and that you may the better understand our present agricultural and social condition, who and what we are, have been, and hope to be.

The County of Lincoln, at the time of its organization in 1760, embraced about seven-eighths of the whole State, being all except the counties of York and Cumberland, which then included Oxford and a part of Franklin and Androscoggin. Its western boundary, starting at Small Point, the eastern point of Casco bay; thence running northwesterly on said bay to New Meadows creek or river;

up said river and across Stevens' carrying-place to Merrymeeting bay; thence up the Androscoggin river thirty miles, and thence by a straight line north, two degrees west, to the utmost northern limits of the Province; which limit formed its northern boundary. Its eastern, the Province of Nova Scotia, its front resting on the ocean! It was indeed a magnificent domain; an empire in itself; larger than all the rest of New England. The Kennebec and the Penobscot flowed from their head waters to the ocean within its territory. Its shire-town was Pownalborough, which was incorporated in the same year, and included the present towns of Wiscasset, Dresden, Alna and Perkins; the last named being Swan Island in the Kennebec river, and now a part of the County of Sagadahoc. And here, to this neck of land between the Kennebec and Sheepscot rivers, (though not to this precise spot), came the people from all the then settled portions of this vast territory, for the transaction of such business as they had before the several courts. Not as you have come to-day, by the comfortable appliances of modern travel, but by long and tedious journeys by land or voyages by sea. Here were contested, point by point, between rival proprietors and between proprietors and settlers, the titles to the lands which many of you now occupy, and here the records remain; here, also, are recorded the title deeds under which many of you hold your farms and homesteads.

During her corporate existence of more than a century, the County of Lincoln has witnessed a stupendous development within her original domain. She has seen a dozen counties spring up within her original territory; many of them outstripping her in population and material prosperity. And now venerable with age, shrunken and withered by the pangs of maternity, but still erect and vigorous, and struggling bravely to repair the wastes of time, she proudly points to three-fourths of the counties of the State as her fair daughters, the bright jewels in the crown of her old age! And through you gentlemen, as their representatives, she is pleased to-day to welcome them back to the old homestead.

This county, as now constituted, comprising sixteen towns and one plantation, exhibits a mixed and varied industry. Among the smallest of the counties in territorial extent and population, she stands, by the returns of the last census, as the tenth in the cash value of farms; the eleventh in value of farming implements and machinery, as well as of total agricultural productions, and in the various classes of live stock holds about the same relative position.

Its annual product of wheat is stated at 4,702 bushels; of corn 28,255 bushels, oats 21,766 bushels, barley 48,175 bushels, rye 1,545 bushels, buckwheat 682 bushels; of wool 48,820 pounds; of peas and beans 11,485 bushels, of potatoes 241,625 bushels; of wines 416 gallons; of butter 537,885 lbs., of cheese 2,165 lbs., (now largely increased by the product of the factory at Jefferson); of hay 44,185 tons. Five of its towns show each a total annual value of agricultural productions exceeding $100,000, viz: Boothbay, Jefferson, Newcastle, Waldoboro' and Whitefield. Ship building is carried on largely in Waldoboro', Damariscotta, Newcastle and Boothbay. Brick making is an important interest in Dresden, Wiscasset, Edgecomb and Newcastle. Fishing is the chief business of Bremen, Southport, Westport and Monhegan, and a leading interest in Boothbay and Bristol; a most important branch of which has grown up within the last ten years in the manufacturing of porgy oil and fertilizers. And just now we have the gratifying intelligence that the Cumberland Bone Company have finally decided to locate their works in the flourishing town of Boothbay.

Some of our towns are also considerably interested in the cutting of ice, and in lumbering operations.

The town of Wiscasset, settled in 1663 on the site of its present village, with its harbor broad and deep enough to accommodate vessels of the largest size, and in any number,—never disturbed by tempests or closed by ice,—early directed its attention to commerce and navigation. Presenting the nearest seaport to the capital of the State, with its climate ameliorated by the contiguity of the tide waters which nearly surround the village, with its inland water passage to the Kennebec, and its own tide waters flowing up ten miles to the north,—possesses natural advantages unsurpassed by any place on the coast of Maine. It is indeed "Beautiful for situation." A hundred years ago its commerce stretched out its arms to all quarters of the globe.

Of its early history, its conduct in the Revolution, and the other wars of our country, of its municipal enterprises and social organizations, its efforts for political distinction, its participation in the movements which led to the separation and the organization of our State government—of its prominent men in days past, of the prostration of its commerce by the war of 1812, of its great and frequent losses by shipwreck and by fire—of its initiatory action in the building of a railroad which now bisects the county (and makes your meeting here to-day possible)—of its present aspirations for increased railroad communications which shall put it in direct communication with the interior of the State, with the capital and with Quebec,—of its recent important enterprise in securing on a most eligible site, the construction of the most extensive lumbering mills in New England—of these and many other things which appeal to our pride or awaken our regrets, I have not time nor occasion to speak. They are the incidents which, entering into our municipal and social life, have developed a unity of interests among us and made us what we are, for better or worse, and have often constrained us to say, in the words of the Psalmist: "If I forget thee, O, Jerusalem, let my right hand forget her cunning. If I do not remember thee let my tongue cleave to the roof of my mouth."

And in behalf of this people, peculiar in many things, but having the same interests which affect every part of our noble State, wishing you a pleasant sojourn and a profitable session, I bid you God speed in your beneficent work. To such hospitality as we have, and such attentions as we can bestow, We welcome you.

To this address the President of the Board, Z. A. Gilbert, Esq., made a brief and appropriate response, thanking the people for their generous welcome, and the speaker for the graceful manner of conveying it.

Following this the question was taken up: "Is it desirable to extend Cheese Factories in our State; or devote more attention to the making of choice butter, either in the private dairy or by the association system?" the consideration of which was opened by the reading of a paper entitled,

Butter or Cheese—Which?

BY HORACE COLBURN, MEMBER FOR KENNEBEC COUNTY.

At the present time dairying seems to engross the mind of agriculturists as much, if not more, than any other subject upon which they converse; and well it may, for there is, probably, no one subject that so materially interests them. The time has been when the farmer could do as well, if not better, in raising stock for beef, or in sheep husbandry, or selling hay, or producing potatoes or oats, but this process has been carried on so long that our farms begin to fail to produce satisfactory returns. In producing the above-named crops we carry off too much of the substances that produce vegetation; so much so that there is too often a failure in some part of the crop, and, in some instances, the whole crop. Sometimes the oats will not fill,—sometimes the potatoes rot, and, after the above-named process of farming, of course we cannot raise much hay. If we cannot do something different we must sell our farms for what we can get, and go into some new country, and begin the skinning process once more, to leave our farms again,—a sorry legacy to our children.

But some one will say, if all go into dairying, where is the market for our dairy products? The only answer there is to that is, How have farmers found a market for their hay, oats and potatoes? There is one thing to comfort the dairymen in New England, that whenever they produce a good article in the dairy line the whole European market stands ready to pay a fair price for it. That being the case there seems to be no great danger of overstocking the market at present, at least.

But some one, by this time, would like to know how we are to make dairying pay the best? In my mind there is but one way, that is to produce the best article. But some will inquire, shall we make butter or cheese? By looking over the agricultural reports of several States, I see that one is advocated in one place and the other in another place. But we all know that cheese making, at the present time, in Maine, is thought to be, by a large majority, the most remunerative, especially when done by association. How that is I cannot tell by experience; but I shall beg leave to differ from that conclusion; and, to see how it is, let us compare cheese with butter-making: A cow that will make one pound of butter per day will make two pounds of cheese. Now, if cheese is worth fifteen cents per pound, and butter forty cents (for, a good, gilt-edged article need never be sold cheaper), we have fifteen cents per day in favor of butter, and then dairywomen tell me that it is not so much work to make butter as cheese. If it is equally as much labor to make one as the other, then we have, in making butter, the skim and butter-milk, which will pay for making butter, whereas the whey is nearly worthless. Then, again, in associated dairying, there are a great many things that will come up that will not be very pleasant. In the first place, the difference between cows, in regard to the quality of their milk, and then you know that the millenium has not come yet, and perhaps some farmers cows may be driven by some pump, and they may drink too much water, and some farmer's milk may not hold out as he thinks it ought, and he may be tempted to apply to the same pump. Then there are slovens about milking, and a thousand things too numerous to mention, coming up daily, to vex and perplex the operator. Whereas, if you make butter, you have your cows of your own choice, have them milked after your own rules and directions. But there are many objections in our day in regard to making butter. Some will ask, Who is to do the work in a butter dairy? Who have always done it; if not the men and women on the farm? Some will say it is too hard for females to milk, churn, and dress the butter. Well, I think so, too. Women need not milk, nor churn, nor had they ought to; nor carry down stairs or up, nor feed hogs or butcher; nor a great deal of drudgery that they are subjected to. But when does a woman, or lady, if you please, (for if she knows how to make good butter she is a lady of the first order), look more beautiful than when she is standing over a tray of nice yellow butter, with her arms bare to the elbows, manipulating and getting it ready for the market? A lady is no more to be excused from helping on the dairy now, than she was ten, fifteen, or fifty years ago. She is not to be a slave, by any means, but a helpmeet for man.

If we must keep a dairy, then let us use the milk in that way that will pay the best—and keep one we must, if we expect to bring our farms back to their former fertility—if in making butter, we can make one-third more dressing than by making cheese—that is an item too little thought of by too many of us. There can be seven or eight hogs kept to every twelve or fifteen cows, if we make butter, by feeding very little else beside the skim milk; whereas, if we make cheese, the whey, as I said before, is worth but very little.

In looking over the transactions of the Wisconsin State Agricultural Society, for the years 1872 and 1873, I find a paper read before the State Agricultural Convention by Mrs. Putman, in which she says dairying should be promoted to a greater extent; and while I would in no wise depreciate these extensive factory enterprises, I believe they cannot supercede the necessity, nor should their existence furnish any excuse, to avoid the trouble of farm dairying. If from any pretext our farmers should abandon the custom of producing a sufficient amount of butter and cheese for the consumption of their families, a short period of time must prove the fallacy of the scheme. Then why all this great cry about associated dairying? Why not something said about butter making? why not encourage butter makers? Some may say that every one knows how to make butter. Then why sell it for 20, 25 or 30 cents per pound? Let us see why this is so.

In looking over the report of the Michigan Board of Agriculture for 1871, I find some remarks in the report of the Secretary of the Board in regard to butter,—he tells what a good article is worth. There is a market in New York, Philadelphia, and other cities, for butter, at one dollar per pound; and that in the city of New York there are 5000 families that would be willing to pay 75 cents per pound, provided they could get a good article, and would not think it high at that; and that there are men that handle tons of what some call best butter, at 35 cents per pound, and yet they pay other men 75 cents, with promise of more soon. Now what does this prove? Simply this: that there are but few who make butter that know how, or will take pains to make a first-rate article. We do not hear anything said (or but little) about associated butter making; nor do I think it practicable, to any great extent. Many reasons might be given why it is not; for instance, the milk would have to be delivered twice in twenty-four hours. It would not do to let it stand over night before it was put into pans, and then take it and mix it with the morning's milk, and carry it to the factory; it must injure it some. Then the manner the cows are stabled—it is next to an impossibility to have the milking done with that neatness, it should be, to preserve the milk from filth, and keep the sweetness of it as it is in its purity. Then let us improve in home dairies. If we do not keep cows enough, so we can churn often enough, let us try to increase the number so we can; keep less fancy steers, and less sheep.

It would seem that dairying was carried on to a pretty large extent already, when we look over the statistics of our country. Looking over the report of the Secretary of the Board of Agriculture of Michigan, for 1871, he says the annual milk interest of the United States may be safely set down at $427,800,000; and after deducting all consumed on the farms, there are $400,000,000 worth left for marketing. These figures at first look large, but when we take into consideration the extent and productiveness of the United States we see this is but a small item to what could be done in the dairy line. In proof of this, let us cast around and see how many more cows might be kept than there are, within the circle of our acquaintance. In the report of the Commissioner of Agriculture for 1871, in speaking of the dairy interests, he says: No question connected with the dairy is more vital to the interests of producers and consumers than that of the best management of butter. The current expressions of dairymen, in different portions of the country, both east and west, show a thorough conviction of the necessity and practicability of a general application of the factory system to the manufacture of butter. But leaving these general remarks, he further says, in regard to making butter, that it cannot be carried on to an advantage unless the milk be supplied by patrons living within moderate distance from the establishment; that the milk would be more or less injured by conveyance over dusty roads, and in hot weather. All know that have had anything to do in making butter, that the sooner the milk is strained and set away the better. Then, if we must keep a dairy, to keep up the fertility of our farms, we must commence understandingly in that as in all other things, or we fail.

When we, as farmers, come together, is it not as well for us to give our own experience, in whatever subject on which we speak? I think that is the best way we can come directly to the point, and upon this suggestion I will take the liberty to give my experience in the dairy line, in 1862. That year I kept eight cows. I thought I should like to know if dairying paid. At a certain time in the spring I commenced to set down the amount of butter of each churning, and kept a strict account through the year; I had scales sitting handy, so it was not much trouble to weigh it after it was ready for market. I had hogs enough to eat the skim milk, and more, but kept a strict account of all I fed to them, besides the skim milk. At the year's end I made up my account of sale of butter, and pork, pigs and calves, and a family of twelve had all the milk they needed. The proceeds were almost thirteen hundred dollars, over $150 per cow. But we are to take into account that butter sold for fifty cents per pound, pork for nineteen cents per pound, pigs at $5.00, and calves at $10.00. The season at my place was good for grass; fed second crop. October and November fed refuse potatoes and pumpkins, and through the winter months fed freely on good hay, with provender. Cheese at that time was from 20 to 22 cents per pound, so it left from 8 to 10 cents in favor of butter; that is, if the same amount of milk that will make a pound of butter will make two pounds of cheese; and I am told by the best cheese maker that I am acquainted with, that the milk that it takes to make two pounds of cheese will make a pound of butter; and from what experience she has had, it is more and harder work to make cheese than butter—that it requires more time and trouble to cure the cheese than to make butter. You get through a churning of butter, it is out of the way. But put the price of butter 35 cents, and cheese 15 cents, the price for which they have sold the past season, and we have five cents in favor of butter.

Let me refer again to the Department of Agriculture for 1869. Under the subject of American Dairying, it says: The finest opening for profit in the conversion of milk, is found in the manufacture of a superior quality of butter, like the Philadelphia print, which will bring seventy-five cents to one dollar per pound, when furnished in all its freshness and purity to appreciating customers, able to pay for it; while a fair article of tub butter is selling at 35 to 50 cents. It is practicable for producers of butter in the United States, to increase its average price 10 per cent. a pound, and this enhancement would put in their purses seventy millions of dollars. This is too large a sum to pay for ignorance, carelessness, and lack of cleanliness. This increase of profit is the more noticeable, as it is fair to assume that one-half the butter at present produced is so poor as to yield no real profit in its production.

Now, if there is so little known about making butter, why not encourage an improvement in its manufacture? The rules for making good butter are few and simple. And here, Mr.President, with your permission, I will tell you what the rules are that I usually follow.

In the first place, be sure to obtain the best milkers; and what I mean by best milkers, are those that give a medium quantity of good rich milk, and give it three-fourths of the year; then feed liberally. In the summer they should have good high land pasture, with flush feed, with good water, so they can fill themselves in a short time, and have the most of the time to lie down and chew the cud. In winter, the best feed I ever fed is early cut hay. It does not matter much what kind of grass the hay is made of (wild grasses excepted) if it is cut early enough; with that, roots, shorts, and meal in small quantities. Then they should be well housed, where they can be kept clean, not only in winter but in summer. The old fashion of milking, in an out-door yard where the filth is five or six inches deep, and no place to set the pail, only in this filth, and the cow stepping from one place to another, with me is played out. My dairy cows are put into the stable every night in the year, and well littered with sawdust, spent tan or loam, (but I prefer sawdust to any other). At each milking, night and morning, have a pail with cold or warm water—if their teats are chapped be sure to have warm water—thoroughly wash the udder before milking; this keeps all dirt and filth out of the milk. Be sure and not change milkers. Let one person milk the same cows, with as little change as possible; have the milk carried to the cellar or place of sitting as soon as convenient, let it remain until the cream rises, after which the sooner you skim the better, and the sooner churned after skimming the better. The place where milk is put should be as far from all other materials as possible, especially from every vegetable substance. If the cream remains in the cream-pot after skimming, it should not be covered up, let it have the air as much as you can. The churning operation should be in a place perfectly clear from all unpleasant odors, where you can have good fresh, pure air, and if performed in one or two minutes. or fifteen, I am satisfied; but if it takes an hour or two, it makes me think of turning the grindstone when I was a boy. The churning should and may be done in thirty minutes. The butter should be taken out of the buttermilk as soon as churned, worked sufficiently to take the buttermilk out, and no more. Butter worked too much loses its grain, and becomes more like lard than butter. If a person's hands will permit, work it by hand, if not use paddles. The quantity of salt to the pound has to be varied according to peoples' fancy or taste. My customers, that I have furnished for twenty years, require about three-fourths of an ounce to the pound; but for my use I should like rather more than an ounce. And while we are performing all the operations, from milking to marketing, we must observe the most scrupulous neatness, from the milk pail to the packing tub or jar. There should not be the least sign of dirt about the package.

And here let me relate one incident that come under my observation. Being at a butter dealer's store, who I knew was out of butter, a customer drove up to the door and asked if he wished to buy some butter. The dealer stepped to the door, cast his eye at the packages, and said: "No, I believe I do not want any." The customer drove on. After he was out of hearing, I said to the dealer, "Why did you not buy the butter?" His answer was this: "If it looked as bad inside as it did out, I do not want it." Perhaps the butter looked neater than the tub; so a little more neatness with the tub, he could have sold his butter to a good advantage.

Mr. President, it was with some reluctance that I undertook to write on the subject of butter-making, being fully aware of my inability to do the subject justice; but being requested by our Secretary, I consented to try, but am perfectly aware that I have only touched the subject, and that slightly; hoping what I have said will be the means of drawing from the Board and farmers generally a more thorough and perfect system of dairying, which will be beneficial to every farmer in the country. For, as I have said, if we wish to keep up the fertility of our farms, we must keep a dairy. If I was a young man, I would go into the Aroostook, take up a lot, clear it off, and go to dairying. Any young, enterprising man, would be sure to make his pile quicker than by going to California,—it would be almost a sure operation; and as we cannot get rich in a day, or a month, let us begin where there is a certainty about getting something. For some years past our young men have been almost crazy to go away out of the State to get rich, but how few return as well off as when they went away; and this mania for leaving the State, has raged to such an extent, that it has been almost the ruin of the Atlantic States. It has taken so much more money to get away, than has ever returned, that there has not been enough left to do business with. And those that have gone, where are they? But a very few have ever returned as well off as when they went away; when for a mere trifle they could have had land enough to make them an endurable home of unsurpassed fertility, where they could produce all the crops of New England, (corn excepted,) for an indefinite length of time, and one of the best country's for dairying ever found yet.

But I hope the tide has ebbed, and that the young flood will set the other way, and that ere many years we shall be receiving butter and cheese from Aroostook by hundreds of tons, and of course it will be of the gilt-edged quantity of which we have spoken that will bring the price for which it sells in New York and Philadelphia.

After the paper of Mr. Colburn, the President, in accordance with the announcement of the programme, spoke upon the other side of the question,—not for the purpose of argument, but to accomplish the same object as that which the opening speaker had in view, viz:—the practical consideration of the question for the purpose of drawing out facts.

Remarks of Z. A. Gilbert, Esq.

In commencing, Mr. Gilbert made the proposition that farm dairying has not, and cannot flourish. The reasons for this were well stated by the speaker, and are such as those familiar with the subject are conversant with. The changes that the times have brought about in our agriculture are felt here; from the poor condition of our old farms but little stock is kept, and the scarcity of help for the making of butter and cheese in families renders it quite impossible for private dairying to be conducted with success. Associated dairying removes all these objections; therefore, it will be of great advantage to our State at large, and especially to those localities where the conditions to its success are found in largest number. But the associated system does not apply so well to butter making as to the making of cheese; in fact, in this State associated butter making is not practical. Again, cheese dairying is more profitable than butter dairying, and this is a strong point in favor of its adoption.

In considering this subject, it is safe to deal with *averages* only —the extremes will not do; and the average of milk production for the making of butter is, that it requires twenty-four pounds of milk to make one of butter. There have, it is true, been instances where more was required, and in a few cases a less quantity has made it. Now, the returns from all cheese factories in the country show that on an average one pound of cheese is made from 9.76 pounds of milk—our own State, it is true, does a little better than this, a matter which renders Maine well adapted for cheese manufacture. In his own dairy, Mr. Gilbert said it had taken from 8½ to 9 pounds of milk to make one of cheese. From these averages it is clear that 2⅝ pounds of cheese will be produced from the milk required for one of butter—but to be generous, and leave a wide margin for contingencies, it may be set down with safety at 2½ pounds. Now, as to the prices of the two products. It is pretty hard averaging the price of butter, it is so variable in quality—but it may be called 30 cents, though this is too high. Good cheese the country over, is sold at 14 cents. Of that manufactured in this State, none has sold less than 15 cents, while some has sold at 16 cents at the factory, and at the stores it retails at 20 cents. Thus the milk required for a pound of butter, selling for 30 cents, made into cheese will actually sell for 40 cents on an average—the lowest estimate giving 37½ cents. This difference may be offset with the value of skimmed milk over whey. Much is said about the value of skimmed milk; and we would think, to hear some people extol its value, it paid to run a dairy for the skimmed milk alone. This, said the speaker, reminded him of the old lady who wanted to burn all the wood she could, so as to get the ashes. As to its value for pigs, he had made a careful estimate, and was satisfied the skimmed milk of a dozen cows did not possess value enough to pay for the shoe leather worn out in carrying the milk to the pigs. "Gilt-edged" butter, it is true, bears a better price; but few can make it, as its manufacture depends upon many nice conditions, not only to make it, but to sell it for the tall price obtained—and these conditions are under the control of but very few. The first requisite is, that the producer must be in easy reach of the consumer; therefore, the manufacture of this class of butter is not practicable for the masses.

In conclusion Mr. Gilbert said that cheese factories should be multiplied in our State, as scores more are needed to supply our own wants. By their establishment, too, the butter product will be stimulated, and prosperity to our dairy interests follow.

A brief discussion followed the remarks of Mr. Gilbert, after which the following committees, preliminary to the organization of a State Dairymen's Association, were announced:

On nomination of officers—H. Colburn of Windsor, B. M. Hight of Skowhegan, L. M. Kennedy of East Jefferson.

On Constitution—T. P. Batchelder, Kenduskeag, J. W. North, Jr., East Jefferson, J. W. Lang, Brooks.

The Convention then adjourned.

EVENING.

The Convention assembled at 7½ o'clock, the President in the chair. The paper of the evening was entitled:

Conditions Requisite for the Elevation of Farming.

BY HON. SAMUEL WASSON, MEMBER FOR HANCOCK COUNTY.

"Every man sooner or later finds his level," is an aphorism as true of States as it is of men.

Looking for the present status of Maine, in the rank of farming States, and it is found well down towards the foot of the list. Is this her proper place, where in the constellation of States she is to become a *fixed* star? Or have combined causes removed her out of orbit in the planetary system of American agriculture?

Is the existing low rank of Maine as a farming State fixed and unchangeable? The answer will be dictated by the point of vision occupied, by whomsoever may choose to reply. As a wheat or corn, beef, pork, or wool *exporting* State, the present and the prospective *are* fixed at a low point in the scale of rank, and every year's attempt to bolster up unequal and inferior advantages serves to prompt the growth of new and stronger tap-roots to fix and fasten her more securely there.

For the growth of beef—the uninclosed commons of the prairie West, where beeves elephantine in bulk can feed and fatten at trifling cost, becomes a competitor in the market, where the costly stall-fed beef of the frosty hill-sides of Maine, as a revenue-bearing product must be the underling in the contest. Forage ground and not skill, is the fulcrum in this matter.

In the product of pork—it is cheap corn which turns the scale to our disadvatage; and such as are outside of the cheap corn ranges, attempting to compete in the market with those within, will exhibit more folly than pork.

With wool—What is the lowest living figure at which it can be Maine grown? Foot up on the debit side the summer and winter keeping, taxes, dog risks, disease risks, and tariff fluctuations, with cash sales at forty cents a pound, on the credit side, and a balance sheet shows nothing "left over" to carry to net gain. Ready sales, at forty cents, may save us agriculturally; but at a less figure it is a fictitious salvation, which cripples the Eastern wool-grower. Even those "sleeping in deep content," can dream of no brighter wool-growing future for Maine, so long as a salary-stealing Congress opens our ports to the convict grown wools of Australia, and those of the half-civilized shepherds of South America, who subsist so cheaply that they can deliver their wools at ports of shipment at from thirteen to sixteen cents a pound. But, with a tariff sufficiently exacting to shut out foreign wools, or to counterbalance superior advantages, there are a hundred million of acres —clad in ever during verdure—in the valleys and grassy slopes of the Rocky Mountain system, so admirably adapted to its growth, as to produce it at seven cents a pound, against forty cents a pound in the "I lead" motto State.

With wheat and corn—Why do, by far the greater number of our farmers, "wrapped in a labyrinth of affairs and worn with care," feed their own families with western-grown bread, paying the first cost of growing, cost of transportation, fees of middle-men, waste, damage, adulteration, and "short weight," unless the sum of these several outs is less than the actual cost of home-grown? Even in good wheat years, and with prices for flour ranging enormously high, our farmers grew but one-eleventh of the State consumed bread.

An admission that we can buy our bread, beef, and stocking yarn at less cost than we can grow them, may be regarded as a painful portrait of "Down East" farming; but, with this view of the case, it is wiser to paint the fact in truthful colors than to whitewash the growing of passports to the poor-house.

That there are local or climatic causes which have put us at a great disadvantage in these productions, is a truth which calls not for argument, but statement; and unbidden as it may appear, in so far as the farming of Maine is devoted to the growth of any of these commodities for an *outside* market, it is labor given to retrieve a "lost cause." The "Western march of empire" has made them unnatural, or out-of-the-day products, the growth of which nature permitted while the *way* to the "granary of the world" was being opened; but with that way opened, and the "iron horse steamed into swiftness,"

> "Speeds the long train for lapsing mile and mile, bearing the riches of the Western prairie,"

the Eastern farmer who wears out his muscular manhood in the culture of such products, with an expectation of making them pay in a competitive market, is as wanting in a well balanced sagacity as George Francis Train.

Whether Maine can, or cannot, grow her bread and meat for home consumption, is not the question, but it is: Can her farmers afford to grow them for market at "going prices?" Can they grow wool advantageously, when the convicts of Van Diemans Land are the appraisers of its value? Can they farm it to profit with crops in which they have no voice in naming the cost to themselves, or the value to consumers? It is a kind of farming which eats like a cancer. In so far as the growing of export beef, pork, corn, wheat, and wool is concerned, such is the low level which the giant West has graded for us, and nearly every effort to extricate ourselves therefrom has ended like one stuck in the mire, the more he flounders the deeper he goes.

That our method of farming, following its well worn grooves, is only deepening the ruts, is evinced by the demand for some specific to restore fertility; which demand has thrown on the market a glut of patent manures, most of which are as unreliable in their promises of restoration as is anything short of *extermination* to make peace with treacherous Indians. A very safe rule for all kinds of fertilizers—except those "two good old staunch friends, barn-yard manure and a green crop turned under"—is, *the louder in promises the smaller in value.*

So long as our farming keeps in the "good old way," with crops growing

"Small by degrees and beautifully less,"

so long will the out-going trains be freighted with our "kith and kin," seeking nearer the western sun for a better land. So long as our farmers do not avoid competition in a market with those who have the advantages of location, soil and climate over them, so long will deserted buildings and abandoned farms speck the landscape. So long as the same causes of depletion and embarrassment exist, and are perpetuated, so long do we slumber over the realization that *our* farming is confronted by failure—for all such the sunshine saves no expense of "gas and coal oil."

There is a link uniting cause and effect, which cannot be broken like marriage vows, when either are taken with an "affinity" to be "sealed" to a fresh victim. For the weakly, *epizootic* condition of our agriculture there are many causes, many conditions requisite for its elevation, for which neither prayer nor powder are specifics, and to substitute or supply the mass of farmers imitate the conduct of the men in the fable, when it was proposed that all the world shout together, and all kept silent to hear the shout.

The first cause or condition has been indicated. Our farmers have not deciphered the new departure which the opening of the Central and Pacific States, with their fresh competitors, and the spirit-of-the-age style of living, have thrust upon them.

When the advertising columns of the newspapers—not excepting our own *Maine Farmer*—are dazzling the eyes of our young men with the "magnificent lands in the West" as the "most desirable in America," it is as natural as life that farmers' sons bestride the waves of emigration which surge over New England, depopulating its rural districts, and more natural than life that the girls follow the "fellows," and that when their "honey-moons" have sobered them down to life's stern realities, their home-learned, New England ideas of energy and industry have taken root in Western soil, that they should ripen into our hardest competitors.

The present style of living, its cost and extravagance, have sadly "thrown out of gear" our smoothly going system of farm economy. Even in the domestic atmosphere of the most inartistic farmer, a disposition to live above the means is as detectable as the fumes of sulphur in "brimstoned" honey. The monomania to covet the funds of other parties has become as catching as the "army itch." The coming to pass, where one must "steal or starve," (and no one starves); suspended companies, because liabilities have outgrown the assets; subsidized officials, because their salaries are insufficient to feed the rage for finery; pickpockets who come in possession of portmonnaies not their own, or pickpockets who "grab-game back pay"—a precious set of candidates, trembling before the future—to keep up to their standard of sham, and show, and glitter, must *steal* to keep their means up to *their* level of living; the frayed and dirty-skirted ambition, to cope with those higher up in the income list—the published column of "solid men," paying a one hundred dollar tax and upwards, when, in instances not a few, such *advertised solidity* is purposely to secure a borrowed plumage—the "irregularities" large and little, the imitation, brass jewelry, and fictitious splendor which dangle before the eyes,—all servè to enhance the disquiet of farm life, and the cost of farm living. There's a long train of evil-doers, like Jeremiah's figs, "evil, *very* evil," among the "followers of fashion." O! Fashion! upon thy shrine how many a man has wrecked his integrity, and good name. To what a pitch of frightfulness has it carried us, in the matter of dress. It has "*hip-roofed*" the "angelic half" of our humanity, and "panniered" them like pack-mules, and is so shaping *our* course, that what others may say or think of our style of living, "sits upon us like a nightmare."

There are certain conditions which underlie the science of success in farming, as well as the science of success in everything else. It matters not how few the "hills to the bushel," or many the bushels to the acre, for unless the aggregate market value produced is equal to the sum total cost, the result is disastrous to the producer. If fifty cents be the real cost of growing a bushel of potatoes, and the market price is but forty-eight cents, the producer is as many times two cents the poorer as he may have bushels to sell.

Upon the distance between the farm and the market rests one of the conditions requisite for the elevation of farming, for here comes the first "tribute to Cæsar," the tax for transportation. If it costs three dozen of eggs to send a fourth dozen to market, unless that one will sell at a price covering the cost of the four, the producer, unless his wits are of such dead metal that poverty can't sharpen them, will no longer compete for the egg supply of that market. Or, if the market be an eligible one, who are to compete, that when "cornered" by inactive demand, or a glut of supply, which of the competitors can withstand the "pressure" is a consideration of no mean magnitude, for to "break a jam" in the market without being mulcted, is quite as improbable as is *civility* in a petty "red-tape" official.

Let there be a demand for twenty tons of hay, at $20 per ton. A and B deliver each fifteen tons. A's hay stands him at $19, and B's at $15. Each has five tons to be sold at a competitive price. A can fall but one dollar and hold his own, while B can "go four better." Each sells at $15. B makes nothing, and loses nothing, while A goes home $20 out of pocket; yet, among the fathomless things about us is, why so many farmers keep good an *appetite* for just A's luck. How many have gone into the market, and through tiresome hours have seen middle-men hold the sales, 'till like the sons of slave-owners, when driven to work, as they watch the slowly wheeling sun, wish that "night or nigger would come."

Another condition which lifts or lowers the level of farming, is the relation of a farmer to a citizen. "He is nothing but a farmer," repeated ten times to the Lord's prayer once, is expressively suggestive of a broad demarkation line between a farmer and a full-fledged citizen. It is a recognition of caste in society, or that the standard of citizenship is not character, but occupation. Because one man digs potatoes, and another eats them, is the digger of coarser material, or the eater of finer polish? How *any* farmer can so "fix himself up," or so *soft-rot* his intellect as to regard his occupation as degrading to his manhood, is a problem reserved for solution for a "weaker and wiser generation." That some *milk-sop* with his waxen mustache, whose utterances are no more weighty than the gibberish of an ape in determining questions of law, should charactize the occupation of a farmer as a "servile one," is to be expected, since *his* little brains were planted in a shallow and sterile soil.

The occupation of a farmer, in the nature of the case, is set out somewhat from the fret and friction which agitate and sharpen in other of life's activities. This isolation, inherent to the occupation, forms a circle of association around the farmer, and with its peculiar *flora* of aims and ends "lends enchantment to the view," which the glitter and garnish of other zones of industry present, and thus unconsciously to himself germinates a feeling that his is an inferior grade in the rank of social citizenship. This idea, that the pursuits of agriculture are not as high and honorable as other callings, forgetful that

"Honor and fame from *no* condition rise,"

has brought the business of farming into disrepute, and cast over it a darkened shade.

It is time, in the world's history, that artificial and invidious distinctions, caste and rank, should cease, at least in this land of boasted democracy, and that all those who labor in honest and useful avocations should be recognized as worthy of equal culture and regard. Yet the circumstances of our life will conquer us, unless we are stronger than circumstances.

A farmer abuses his manhood when he works himself down to the dead mettle of a knee-sprung and spavined truck-horse, or buries his *intellectuality* in his plow furrow till his head only is above the surface, like that of a frog's in the slime of a mud-hole. Social position is not rightly determined by the "shine" of the boots, unless the wearer makes them a receptacle for his brains, nor by the shoddy mix of his garb, unless it covers a shoddy and shabby morality. Something besides the unfashionable cut and fit of one's suit, or whether his surroundings are all finished, painted and fenced in, directs "who shall carry the dirt out," and divides men into classes in individual and social life. If a farmer finds himself in a lower scale of social classification, it is not because of his lot in the net-work of life's duties, but that either he is lacking in worthy ambition, or has buried his aspirations in the subsoil of his potato patch.

It will not be denied that farmers have been, perhaps unwittingly, instrumental in disparaging their calling, when, ever since Adam quit "Paradise for plowing" it has been ordained as the first and chief of occupations, and when those who are to "subdue the earth" come to possess and cherish a better and a higher public spirit, there will be an upheaval of the farming of Maine, to a more elevated and more appropriate plane, where no distinctions can be tolerated, save those which flow from merit, and ability, and where none will imagine that "distinction goes by destiny."

The farmer as a politician.—As a politician, one versed in that part of ethics which consists in conducting the various affairs of State, not one who simply turns the grind-stone to sharpen another's chance, or lets himself down into the "slum" of partizan pollution beyond the efficacy of soap and sand to *scour* him clean again.

In the matter of political conventions—that *farcical* part of politics—where nominations are *supposed* to be made, farmers have been blindly negligent in securing nominees to represent agriculture as well, for there is an intimate relation between politics and potatoes.

Various theories have been adduced for the reason of high taxes and hard times, for why "genteel" industries are lavishly subsidized, while government protection to agriculture and manufactures, the creators of useful materials and finished products, is so "ticklish of balance." The first great, controling cause is planted out by the political conventions, and here the corrective must be applied, to so shape affairs that elevation of labor would be the result.

A farmer immuring himself within the boundary lines of his individual domain, loses sight of the fact that he thereby *girdles* his influence, and to this may be chargeable why our agriculture in political *moves* is being "passed" from a "silent" to a *silenced* partner. The elements of rain and sunshine may determine the fruitfulness of cultivated areas, but the elements which give political character decide their market value. Successful farming is not the offspring of yield, but the child of market. The par value of its investments is told more by the selling price, than by what there may be to be sold.

The more a farmer can sell, the more will he produce, and what he may produce and what he may sell, whether farm products shall bear a just relation in price to the products of other labor, whether those who live by farming shall stand upon an equal footing with those who live by traffic, or whether monopolists shall harvest the fruits of their industry, are nothing more nor less than political questions; questions of too great an intrinsic importance to be determined by mere scrambles for government pap.

To end right, start right—and the "start right" is when nominations are made. No matter whether candidates spell their party name with an R or a D, "halter breaking" will be wholesome for either, for when delegated to say what we shall grow, where we shall sell, and with whom divide the profits, we have conferred an elastic Power of Attorney, which can be *stretched* equal to a "Credit Mobilier" bribe-taker's conscience.

No one, without doing violence to truth, can deny that the vairous subdivisions of industry, such as trades, pursuits and professions, have been the special objects of political sympathy and protection; while the claims of agriculture, that agriculture which furnishes the products that "beget the lucrative dimes of the national treasury, pays three-fourths of all the taxes, and employs three-fifths of all the voters," have been ignored, misunderstood, or passed with a merely tolerant exclamation of good will.

See the National Directory, showing but *two* farmers in the Congress of the nation; with more than three-fourths of the officers, State and National, appropriated to non-producers and middlemen; and he must be "blinder than a bat" who cannot see why so much legislation is against the interests of the laboring and producing classes, and in favor of the sharks and drones of society. The selecting of men for places of honor and trust, as a reward for fealty to party, in lieu of fitness to care for the elevation of farming, has become a chronic evil, against which every "brother Aaron" in the ranks of the tillers of the soil should raise a voice.

One of the great "needfuls" to make the husbandry of Maine a reasonable success, is a HOME MARKET; one within the limits of quickly perishable products, one where transit does not eat out the profits, and one which does not "bar" the producer in the competition. And, why are we without home markets, without a more inviting opening for manufactures, with their artizans and operatives, than can be found within the geographical limits of any other State? No sister State of equal area, can show such an inexhaustible, never-failing water power. That of the Saco, Androscoggin, Kennebec and Penobscot river systems, is equivalent to the working energy of a million of population, or to a home market which at army ration rates would demand a yearly twenty-three-million-dollar-food-supply.

Why this vast source of wealth has not been utilized, and why capitalists have passed it by, is because in the earlier age of the State, when capital had an *eastern drift,* our political *economists* saw in corporations only a "consolidated monster to devour the liberties of the people." Massachusetts seeing the mistake, got her "spindle and distaff" ready, and is spinning threads of prosperity, while Maine clad herself in habliaments of adversity.

A recent "opinion" of the courts, that "it is not constitutional for towns to offer incentives to enterprise," shows that the "Bench" when *fuddled* with technical monstrosities, holds to its "weaving a tangled web of mingled yarn."

Our present State policy shows an encouraging spirit of liberality, in contrast with former years, but in proof that the old *virus* of "dangerous usurpation" is not fully eradicated from the political system, and as showing how

"Slowly moves *its* march of ages,"

let a proposition come before the Legislature for funds in completion of a geological survey, or for State aid in developing our mineral wealth, stimulating industry and diffusing agricultural intelligence, and legislators, like a timid horse, see a *fright* in every new object.

It is said that the persistently hostile legislators are those whose names are found in the farmers' column of the Legislative Register. That a plurality of those registered as "farmers," when aid is asked vote among the "Nays," as their ideal of

"Striving to act well their part,"

is not to be denied; but it is true as well, that that "farmers' column" is a miscellaneous collection of every grade of farmers, from "prime" to "poor fours," an *omnium gatherum,* from him who cultivates by the hundreds of acres, down, down to him who "hays at the halves" to winter a goat.

Such farmers there are, pity 'tis, 'tis true, who have been moored in a torpid stream so long as to become barnicle blinded to the progress which makes it a wise State policy to foster waiting-at the-door industries, when all such are for the stall-feeding of agriculture. So long as those installed in office, wearing the appellation of farmer, can be manœuvred into official negatives, willingly, or duped to sacrifice the public good for private gain, or personal spleen, or be deluded by false ideals, so long will agricultural elevation be a "century plant," requiring a hundred years to spot a step in its advance.

Not many moons since, when a scientist proposed the creating of an office of "Industrial Statistician," both branches of the "Legislative Wisdom" made it a "butt" to "rally round" and ridicule. When an "Enactment" was desired for the protection of insect-eating birds, it was made a "fun-fool" for how many to demonstrate their littleness for an office they no more could fill than the feet of a toddling boy the boots of his sire. But put in the plea of a "military necessity" and the "bulldogs of the treasury" immediately "smell the blood of an Englishman," and vote the public lands away; but ask for a *stipend* to help display our industrial products, and the response, less choice than expressive, is "to get up and get."

If ever our agriculture is to assume an inviting aspect, manufacturing industry must pave the way, cultivation of the soil following in its wake, as a subordinate pursuit. Then to our legislators we say,

> Give State aid to such, "we pray,
>   In their sunshine and their sorrow,
> And the prize we've lost to-day
>   May become our own to-morrow."

It is automatic art which must elevate the farming of Maine to a higher level. Nature has so decreed. Wire-pullers and tricksters may play "blindman's buff" till their wits are as unsettled as the mud in a pool of polywogs. Lecturers of the *un*-soiled linen sort may begin and end with the joys and rhapsodies of the farmer, and with rhetorical dash portray his "glad day of Arcadian bliss 'mid fields of living green." Still, stands the immutable decree as unmoved as our own Katahdin.

There is another condition requisite for the elevation of farming, and it is, that it shall no longer be wholly individualized, prostrating it at the feet of every occupation which is organized. This question of association, at the present time, is awakening a deep interest among farmers. The principle it involes is one of vast power. It constitutes all the difference between the rill and the river. Isolated, there are many things the farmer cannot do, but combine his power with that of others, and no work, however grand, he may not accomplish. All other industries, as well as all classes of laborers, except farmers, have their Unions, and compacts of self-protection ; and thus while the individualized farmer is weak, these having the power of association are strong. Farmers, this work is yours. Apply this animating principle of association with energy and wisdom, and the next twenty years will witness an elevation of farming which otherwise a century would not secure.

There is a Spanish proverb, which saith: "tell me with whom you live, and I will tell you who you are." So you may safely judge any man by his surroundings. If you see his crops, you can guess at his barn, or seeing the barn, can guess at the crops. In the looks of the house may be seen his social standing, while the dooryard may bespeak the style of hat, or the width of skirt. The farm surroundings add to or take from individual position and influence, vastly more than most farmers have been accustomed to suppose. If they permit their surroundings to wear a "don't-me-care" look, representing their occupation as forbidding them to fill the *warp* of agriculture with those things which give an air of neatness to their homesteads,

> "A seat where gods might dwell,
> Or wander with delight,"

they cultivate a parasitic economy which .keep them down in the substratum of society. No one can over-estimate the *repelling* influence which many a well to do farmer allows a careworn, poverty-pinched farm appearance to give to his social standing; or how appearances give birth and growth to an idea, that the only needful qualification to be a successful farmer is that he can swing the scythe and shovel manure without fatigue, and hence that their sons of less muscular power must be put to a means of living which involves less physical labors, and their daughters must be kept like fine ribbons in a showcase, or like birds "in silver cases hung."

As a rule, those who farm cannot afford the luxury of costly fixtures. Their incomes are moderate, and their expenditures must be like in character. But because one is not liberally endowed with this world's goods, must he commit social suicide, or mate and mess with the great "unwashed," or put on a badge of servitude?

Were it ours to see our own surroundings, as others see them, how many a dooryard would be seen as if

> "They were given
> A whirlwind blast from heaven;"

its general *scatteration* of farm implements presenting as sorry appearance as "Falstaff's ragged regiment," embellishments without beauty or utility, which afford no gratification to the eye or mind, and which to an observer carries an impression that the business of farming, its distinguishing feature, its aim and spirit is "booty *vs.* beauty;" and that naked utilitarianism is the "higher law" of a farmer's life.

On the other hand—a little care in so arranging the farm buildings that they may be comfortable, convenient, and pleasant, a trifling expense in making them express in the vines ready to wreathe their graceful tracery over every point and projection; in the shrubs and trees well disposed around them, in that indefinable atmosphere which can never be seized and appropriated, can never be added to an ugly and tasteless place, but which breathes from every tree and shrub, catches up and intensifies the colors and fragrance of the flowers, gives comfort to the simple farm buildings, and makes the whole farm radient with a *something* which all can recognize and desire.

> "Home's not merely roof and room,
> It needs something to endear it;
> Home is where the heart can bloom,
> Where there's some *good look* to cheer it."

To elevate our farming to a higher level, to ensure the substantial kindnesses of life, to provide for and guard the social faculties, 'tis not the farm that needs cultivation and improvement, but the farmer. The end of tillage is not dust and drudgery, dimes and dollars, not merely to improve the fields and flocks, but the men and women. The essential requisites of farming are not to plan and plant, and display its rugged features, but to rear the cultivators of the soil for grander utilities, where his occupation cannot crush or cramp his manhood, but where he can cultivate his intellect 'till

> "The precious poetry of life shall gild
> Its leaden cares."

SECOND DAY.

The opening exercise of the Morning Session was a paper

On Irrigation.

BY D. M. DUNHAM, MEMBER AT LARGE.

There is no agricultural question of more importance than the improvement of the soil, and guarding against the evils of drouths by means of irrigation. As New England becomes stripped of her forests, the atmosphere becomes dryer, the streams are reduced in size, until many that were once valuable as mill privileges are entirely dry by the middle of June; and the question is everywhere being asked, What shall we do to escape the scorching drouths which have become such a scourge to the farmers? You will hear some farmers say, as they finish putting their seed into the ground, "Well, I have done all that I can, if God does not send rain it is no fault of mine." And in the fall you will hear them say, "The drouth or God spoiled my crop." But if God has given us a faculty to harness the wind to force the water over our fields, and we neglect to do it, have we any more right to expect a crop than if we neglect to plant our seed? Though a Paul may plant never so wisely, and no Apollos water, can we expect that God will give the increase?

At a farmers' club, not long since, in discussing the best way to renovate worn out grass lands, a remark was made, that irrigation might be a help; and it was made a matter of ridicule. They claimed that this was too cold a country for cold water farming.

But is it not a fact, that in the long hot days in June, when, if there is a sufficient amount of moisture the crops grow faster than at any other time, that the crops too often stand still for want of water that might be easily supplied? One man of the club said that he turned the water from a spring on to a field that cut but half a ton to the acre, and increased it to one and a half tons to the acre; and that he had become enthusiastic on the subject of irrigation, and he believed that at no distant day irrigation would be largely practised by the farmers of Maine.

It has been argued by some, that irrigation, though it may be beneficial, is so expensive that it cannot be practised in Maine. But we learn that in Egypt, with a very primitive pump, a mule will pump enough water to water from thirty to fifty acres, which then produces enormous crops. If one mule will pump enough water to irrigate thirty acres so as to double the crop, as is claimed it will by many agricultural writers, it would seem that the mule was very well employed.

Hon. George Barstow of California, says that next to railroads, we want canals for irrigation. He says: "Could we moisten the earth during the dry season, the productiveness of the State would be absolutely without limit." Many rich mines have been opened in California, and their harvest of gold, by lubricating the machinery of manufacturing and commercial industry, has enriched the world. There yet remains one mine, however, richer than Ophir, exhaustless as the sea, the treasures of which are in store for the people of California whenever they choose to appropriate them. I mean the melting snows of the Sierra Nevada mountains, which the suns of summer send down in fertilizing streams upon the arid plains. When they are utilized they will be a source of boundless wealth to the farmers of that State. The science of hydraulic engineering, which has been stimulated to its highest perfection in the mineral regions, will be turned into the more legitimate and permanent channels of agriculture. With the exhaustion of the gold placers, the ditch and flume will find a richer placer in the vineyards and fields of her prolific valleys. The water congealed in the mountains will be trained to enrich the husbandman more than it has ever done the miner. An instance is mentioned which occurred near Stockton, where irrigation applied to grass land paid the enterprising proprietors, in one season, more than forty times the cost of opening the canal.

In 1872, the fall of rain in this State was only five inches more than in 1871, and yet the crop was nearly double in 1872, as you are all aware. When I have stated this as an argument in favor of irrigation, I have been told that only rain water was food for plants, and that water from springs or brooks would have a very different effect; but Dr. Woodward of England tells us that a plant of common spearmint increased 17 grains in weight in 77 days, and yet had no other food than pure rain water; but then he found that it increased more in weight when it lived in spring water, and still more when its food was water from the Thames. We are too apt to adopt theories and stick to them as fixed facts, when a little careful experimenting would add largely to our store of useful knowledge.

The famine in British India induced the government to undertake the construction of a system of irrigating canals. The great

Ganges canal, the principal of these works, is nearly one thousand miles long, and takes from the sacred river 8000 cubic feet of water per second. This enterprise has received an ample reward in the civilization of the people, the improvement of their sanitary condition, and the immensely increased revenues of the government from land and water rents. The canal and its branches form an internal net-work of water-carriage, and the production stimulated by the enlightened enterprise which has brought more than eleven millions acres of waste and malarious land under cultivation. The cost of opening the canal was £1,500,000 sterling, and the pecuniary returns after deducting expenses, yield a net revenue from the investment, of 23½ per cent. annually. In India the law directs that on both sides of the canal trees of every description, both for shade and fruit, be planted; so as to make it like the canal under the trees in Paradise, that the sweet flavor of rare fruits may reach the mouth of every one.

Artificial watering of the earth, chiefly to produce increased crops of grass, has been in use from a very early period. In oriental countries, in fact, the heat of the climate is such that in many situations the now productive soil would be absolutely sterile were it not that the cultivator enriched his ground with a copious supply of water. The simile employed by Isaiah to indicate barrenness and desolation, is "a garden that hath no water." That in patriarchal times they labored hard to supply their grounds with water by means of various hydraulic machines, some of which resembled the water-wheels of the few districts of England, and were worked by the feet of men, something after the style of the modern tread-mill, is certain. Moses alluded to this practice, when he reminded the Israelites of their sowing their corn in Egypt and watering it with their feet; and in the sandy soils of Arabia the same system is still continued. In the Celestial Empire irrigation has, according to their various historians, been employed for a period long before that assigned to the flood. We cannot afford to despise the teachings of the Chinese, a people who were far in advance of Europe in the invention of printing, of gunpowder, of the mariner's compass, and of vessels adapted to navigation. We may learn a lesson in agriculture from the patient and industrious laborers in this most primitive and important occupation of man, who have made a network of irrigating canals through their extensive and populous empire, for stimulating the soil and bearing their products to market. The grand canal from Pekin to Canton is nearly one thousand miles in length, and bears a vast commerce upon its bosom, and this is only one in a thousand of the arteries of this interesting and prolific empire. Japan has been so nearly sealed to the outside world so long that very little knowledge of her agricultural improvements has gone abroad; but Prof. Blake of California, who was employed by the government to make a survey of its mineral resources, informs us that the art of irrigation has been brought to great perfection in that country. In Italy the practice of hydraulic engineering is taught as a science. The principal university where this science is taught is at Turin, in the vicinity of which city is an extensive system of irrigation, which gives ample opportunity for practical education. In the reign of Theodoric I., an hydraulic engineer was brought from Africa to teach the manner of obtaining and regulating supplies of water from rivers. The modern Italians have devoted their energies more to the irrigation of arable lands, and have by far the most perfect system of irrigation in Europe.

The great canal in Lombardy, was constructed in the twelfth century, and has for more than six hundred years carried a volume of water equal to 1,800 cubic feet per second. This great mass of water has been spread over the surface of the country through a thousand channels, stimulating the productiveness of the soil to such an extent as to make the country through which it passes one of the richest and most densly populated which the world has ever seen.

The greatest success which irrigation has achieved in this country, is in the territory of Utah, where the patient industry of the Mormons has literally made "the desert blossom as the rose." The value of the agricultural production of Utah, by the system of irrigation, is estimated at $4,500.000 for the year 1866.

Some degree of knowledge of what constitutes the food of plants seems indispensable to any well conducted system of producing them in the greatest perfection; and such knowledge seems most likely to be obtained by minutely examining their structure, and carefully observing the manner of their growth. The indispensable agency of water in the growth of plants has been universally acknowledged, and could not be overlooked by the most careless observer, while he saw innumerable instances in which plants wither and die for want of water. But while this universal agency has been acknowledged, it is believed that a very inferior office has been assigned to it from that which it really performs. It has been considered as the mere vehicle which carried the nutritious particles of other substances, while it in reality was contributing much the largest portion of the actual nourishment to the plants which annually clothe our earth in living green. In proof of the principle that water constitutes a large portion of the food of plants, many experiments have been tried, among which are the following:

A quantity of earth proper for vegetation was dried in an oven, and after being carefully weighed the seed of a gourd was planted in it; it was watered with pure rain water, and produced a gourd which weighed 14 pounds, though the earth producing it had suffered no perceptible loss. A willow tree was planted by Van Helmont, in a pot containing one thousand pounds of earth. This plant was watered with distilled water or pure rain water, and the vessel so covered as to exclude all solid matter. At the end of five years, upon taking out the plant, he found it had increased in weight 119 pounds, though the earth had lost but two ounces of its original weight.

With so favorable a history of irrigation for so many centuries and from so many countries, it seems wonderfully strange, that situated as favorably as we are for trying the experiment upon our own soil, and suffering as we do from drouth, that so little is actually known, and that so few experiments have been tried. It may be that from some condition of our soil or climate, that irrigation may not be as successful here as in some other countries, but from what few facts I can gather the success is such as to warrant a very general experiment in every part of our State; and I would earnestly recommend that an appropriation be in some way secured to the State college sufficient to make a succession of experiments in irrigation, and the results given to the farmers of Maine. And here let me say, that the various experiments at the college are tried so carefully, and the results given so correctly, that every farmer should keep himself informed of its doings, and in this way the appropriations made by the State for its support will be annually returned fourfold into the pockets of the farmers of Maine.

After the reading of the paper, Prof. W. O. Atwater, who had travelled extensively in Germany and other European States, was invited to address the convention. He did so, in a very agreeable manner, giving an interesting account of his observations while in

England and on the continent. In Italy and Lombardy the water from the Alps, which brings down with it a fine rich sediment, is conducted into canals which have branches and sub-branches, through which the water is distributed over the farms. The main canal is probably ten feet wide, and this, as well as the smaller canals, are provided with dams for controling the water. The dams are closed when the water rises, flows over the fields to the depth of from three to six inches, and when it has remained on the fields long enough, the dams are opened and the water conducted to the next field below. The fields are graded in such a way that a bank forms the outer borders, so that they hold water very much like a shoal tank. This embankment is from one foot to eighteen inches high. The soil here is sandy and pebbly, one of the chief crops being hay, as the region about it is one famous for dairying. From three to nine crops per year are cut, although four is about the average. Irrigation is also largely practiced in Germany and England. In the former country undershot wheels with buckets attached are used to raise water for purposes of irrigation. When these buckets come up loaded with water, they are discharged into a large trough, and from thence conducted over fields, and a great deal of the irrigation in Germany is done by this means. In fact, in that country irrigation is a science, several journals devoted to it are published regularly, many books about it are printed, and there are large numbers of engineers who do nothing else but practice this science. Steam engines are also used somewhat for pumping water for irrigation.' The speaker then gave a detailed account of a system of combined irrigation and drainage, practiced in Germany, and known as Peterson's system. It is so arranged that one set of fields is irrigated by the drainage of another; or, in other words, water is let upon a field which soaks down through the soil into the drains, from whence it is conducted upon other fields where the same course is followed. If the weather is dry the fields are irrigated, if wet the drains carry off the surplus moisture. Near Rumford in England, is a sewage farm of 130 acres, which is irrigated by the sewage of the city. The soil is a loose, gravelly one, and the sewage is carried out through large pipes, and delivered in elevated tanks. From these tanks it is distributed through canals, large and small, to the fields; the fields being formed into ridges, sloping off ten feet each way, the sewage being delivered at the highest point and flowing gradually over each side. One of the chief crops grown is the Italian rye grass, which is cut green, and yields at the rate of 80 to 90 tons (green) per acre. This grass is used for soiling, and is cut six times per year.

President GILBERT spoke of a farmer in his vicinity who had practiced irrigation with the best results.

J. E. SHAW, member from Penobscot county, spoke of an irrigated field in Massachusetts, where the good results of irrigation were very apparent. Sandy and gravelly soils are the most benefitted by such treatment.

J. M. CARPENTER of Pittston, alluded to a field bordering on a canal in Rhode Island, that was arranged to be irrigated with water from the canal. The irrigation made a great increase in the yield of the hay crop upon it.

GEO. B. BARROWS, member from Oxford county, spoke of bringing water into villages. It could be used for household purposes and also for irrigation. The waste water from the house would be very useful for the latter purpose.

Hon. HARRIS LEWIS of New York, said he had a pasture so situated, that in the spring of the year a large brook formed by the melting snows from the woods situated above it flowed out over the pasture, bringing with it a rich deposit of leaf mould from the woodland. It was very easy to distinguish the line, all summer, to which the water had flowed out. And he believed many farms were so situated that brooks running across them upon the higher parts of the farm could be contracted by inexpensive dams, and the water made to flow over fields most needed. This would be better for the land than a coat of manure, and he believed the water could be thus managed and let on, at an expense that would be less than the cost of spreading a coat of manure, after it had been left in piles upon the field. He also spoke of the valuable results of mixing soils; as sand on clay and *vice versa*, and said this was a system of manuring for a life time.

The next paper of the forenoon was on

ASSOCIATED DAIRYING IN MAINE.

BY GEORGE E. BRACKETT, MEMBER AT LARGE.

Associated dairying in Maine is no longer an experiment, it is a fact—a successful reality—and now, and hereafter, it must rank among the leading branches of agriculture in our State. Its growth and progress has been rapid, and smacks somewhat of the marvellous, being more like the operation of events among our Western cousins than what is usual in old conservative slow-plodding down east. The little cheese factory of two years ago, located away up in the Sandy river valley, has grown to a score in operation last year, and another twelve-month will witness more than three score associated dairies scattered throughout our State, so deep is the interest of our farmers in this question. Truly the seed has not fallen upon poor soil, for the harvest already is many fold. And this is only the beginning. The little spark is kindling a strong fire, for the fuel is plenty and there are willing hands to supply it. There is room enough in Maine for over two hundred of these farmers manufactories without fear of crowding, and still be no danger of glutting the market.

Some years since I read, before this body, a paper entitled, "What shall we do to be saved?" agriculturally; and, although the points there made were specially intended for my own county of Waldo, yet the arguments were applicable to the greater part of our State. I therein took the position that our system of farming was not sufficiently well adapted to our needs, and not in accordance with the spirit of progress of the age; that we were running the machine too much in the old ruts, and becoming not only poorer in purse but also poorer in soil. We had been raising a little of everything and not much of anything—had played Jack at all trades, as it were, and consequently were good at none—in fact had pursued a decidedly mixed course of husbandry, which, however necessary to our former condition, is not adapted to the wants of to-day. And, not as a panacea, but as an improvement upon our system, I recommended specialties in farming—the growing of some one or more crops, or the following of some special branch of husbandry suited to the circumstances of the case, to the exclusion of others, and for my own county, associated dairying, sheep husbandry, and apple growing.

I well remember the doubt and incredulity with which my recommendations were received by many of the then older and more conservative members of the Board, which, had I been less sanguine, would have been decidedly embarrassing. But how stands the matter to-day? Hardly two years have elapsed, and specialty farming is obtaining all over the State to a much greater extent than ever before, and success seems to follow in nearly every instance.

Prominent, and taking the lead as a specialty, is associated dairying, which now includes only the manufacture of cheese. These companies are organized all over the State, and their unpretentious little factories adorn many a quiet cross-road corner, while one can hardly take up a copy of a newspaper published in Maine without seeing accounts of new cheese factory companies organized, or of discussions which usually lead to the same result.

Let me refer to my own county, as an example: Two years ago the subject of cheese factories was almost unknown. Our farmers had heard of such operations being carried on in New York, but that they were adapted to the wants of Waldo county farmers was not taken into consideration. It was also rumored that there was such a factory in operation in some part of Maine, but how, or even where, was somewhat a question of doubt. But some of our earnest farmers, feeling that something must be done for self-preservation, and thinking, here, perhaps, was an opportunity, looked into the matter a little,—read, investigated and labored practically, and the result has been that four factories were in successful operation the past milk season; seven more are organized and ready for work next spring, and several others are in process of incubation. The factories in operation last season are located at Northport, Monroe, Montville, and Searsmont, and those expected to be ready for operation next spring, are at Freedom, Brooks, Montville, Unity, Winterport, Waldo, and Palermo.

NOTE.—Nine factories are in operation this summer, (1874) a follows: Monroe, Searsmont, Northport, Montville, Freedom, Unity, Waldo, Brooks, and McFarland's Corner in Montville. G. E. B.

The following table will give full particulars of the condition and operations of these companies in operation last year:

NAME.	Located.	Organized.	Shares.	President.	Secretary.	Superintendent.
Union	Northport	June 15, 1872	$50	Jason Hills	D. A. Wadlin	M Moody.
Monroe	Monroe	January, 1873	10	Willard Cates	E. H. Nealley	J. Ostrander.
Center Montville	Montville Center	March 1, 1873	25	I. B. Thompson	John L. Bean	J. Q. Murray.
Searsmont and Montville	Searsmont	May 10, 1873	25	N. Smart	– –	E. W. Wiley.

	Opened.	Closed.	Size of Factory.	Cost of Factory.	Vats.	Wages of Superintendent.
Union	May 12	August 31	30 × 50	$600	Ralphs	$65 per month and board.
Monroe	July 17	September 30	30 × 50, two stories	800	Ralphs	75 " "
Center Montville	July 3	September 4	27 × 50	1,100	Miller & Son	60 " "
Searsmont and Montville	June 19	September 14	30 × 50	1,500	Miller & Son	64 " "

	Amount of Cheese manufactured.	Pounds of Milk to lb. of Cheese.	Size and Weight of Cheese.	Cost of manufacture per lb.	Price per lb. obtained in market.
Union	1,260 pounds	9 55-100	12 to 15 inches	3 1-2 cents	15 cents.
Monroe	18,862 "	9 9-10	30 to 6 lbs.; 12 to 15 inches	4 cents	15 cents.
Center Montville	8,580 "	9 65-100	14 to 17 inches; 40 to 75 lbs. weight	2 7-10 cents	15 and 16 cents.
Searsmont and Montville	13,400 "	9 5-10	28 to 63 lbs	3 1-2 cents	16 cents.

An examination of these tables shows the following facts:—Whole amount of cheese manufactured last season 42,040 pounds, or over 21 tons. Average price obtained, $15\frac{1}{2}$ cents per pound. Total value of cheese in market, $6,616.30. Average cost of manufacture, $3\frac{1}{2}$ cents per pound. Average number of pounds of milk to a pound of cheese 9 6-10, or a fraction over $9\frac{1}{2}$ pounds. Average price of shares $25; extremes $10 and $50. The number of cows furnishing milk to these factories ranged from 80 to 200 to each. The work in a factory manufacturing the milk of 200 or 300 cows is but little more than in one of 100.

So we have accepted this specialty in farming in Waldo county, and so far the members of different companies are entirely satisfied with the results. We claim to be one of the foremost, if not the leading county in the State, in the business of associated dairying. On the 20th of last December, the Waldo County Dairymen's Association, the first and only society of the kind in Maine, was organized at Belfast. It has been duly incorporated, with a capital stock of $10,000. The following are its officers:—President, D. A. Wadlin of Northport; Secretary, Geo. E. Brackett of Belfast; Treasurer, Jason Hills of Lincolnville. During the coming milk season the society will hold its regular meeting at the different factories. We expect much good will result from this association.

Let us consider, briefly, the subject of associated dairying, in some of its most important bearings. It is a fact and a crying evil that a majority of the farms in Maine are deteriorating—growing poorer and less valuable year by year. And why? Because the original richness and fertility of our soils have been wholly or partly exhausted by our farming system, which has taken from them, year by year, more than has been returned. We extract and sell off raw material—hay, potatoes and grain, neglecting to make corresponding returns; hence we are constantly impoverishing the soil. Associated dairying put in practice would be a step towards stopping this drain from the farm. Cheese factories require milk; more milk means more cows; the keeping of more cows requires the consumption of the hay and grain, or the farm products upon the farm, all of which means more manure, which must be returned to the soil, so that every season a cheese factory operates in a neighborhood, the farms supplying milk are growing just so much richer and more valuable.

This, in my opinion, is the strongest argument yet adduced in favor of cheese factories,—this gradual and sure, though small, increase in the fertility of our farms.

Then it is, no doubt, a fact that the more condensed the form in which we can market our farm products the better it pays. An old saying is, that a successful farmer will market his crops on four legs, meaning that he will sell it in the form of live stock which have been used as machines to concentrate the raw products, but if we market them in the form of cheese or butter we have reached a step higher and are still nearer success.

As to competition: Some will say we cannot compete with the middle and western States in the production of cheese. Why not? We have several advantages. In the first place, land is not so valuable here as in the cheese-producing sections further west. Stock is cheaper here. Help can be obtained at less rates, and certainly our prices are far in advance. That we can produce as good quality of cheese has certainly been demonstrated beyond a doubt. Waldo county factory cheese, placed side by side with western, in our retail stores, have been preferred by consumers in nine cases out of ten. Ninety-five per cent. of our factory cheese have proved to be first quality, and this too in our inexperience.

Cheese making by the factory system is not an injury to the general dairy interests of the State. It is just otherwise. The market for butter and milk is better. Said one of the leading dairymen in my town, at our dairymen's meeting, "I believe in cheese factories, though I cannot furnish milk for them; but they make a better market for my butter. I have sold seven hundred dollars' worth of butter and milk from six cows during the year 1873." So it is. Of course dairymen living near cities and large villages, which give them a sure market for milk at from six to eight cents per quart, and butter from thirty-three to forty-five cents per lb., cannot afford to support cheese factories, but the great mass of our farmers are not thus luckily situated, and it is for them that cheese factories are especially desirable.

One word as to the social bearing of the question. It is almost impossible to procure suitable female help on the farm, and farmers' wives are proverbially an overworked class. To them a cheese factory, consuming the milk from the farm is a perfect godsend, as it relieves them from the drudgery of the dairy during the hot summer months, and especially during the haying season when household duties weigh most heavily upon delicate shoulders.

Then there is the transportation question, that problem which our Western friends are grappling with so persistently, and we hope successfully. Take my section of the State as an example. The cost of hauling or transporting a ton of farm products to market at Belfast, from most of the towns in Waldo county, where cheese factories are organized, is about two dollars. Thus it costs two dollars to market a ton of pressed hay, which is one of our principal farm products, and two dollars to market a ton of cheese. In one case the value of the product is $16; in the other $320. In other words, it costs $40 to market $320 worth of hay, and only $2.00 to market $320 worth of cheese. This is an item not to be overlooked; and when we take into consideration the fact that cheese factories can just as well be operated in localities so far from market that hay and coarse products are of small marketable value on account of the cost of transportation, the subject becomes of the greatest importance.

There are several other important points connected with the subject, such as the desirability and practicability of combining the manufacture of both cheese and butter in the same factory, so as to consume the milk during most of the year, the necessity of breeding dairy stock combining certain qualities, &c., &c., which I have not time to refer to in this paper, but which no doubt will be fully discussed at this or some subsequent meeting of this Board or the State Dairymen's Association.

Do not understand me as saying that in associated dairying our farmers have found a short cut to prosperity, a panacea for farming ills, nor that by engaging in it they will become suddenly rich, but as a means of renovating our old and worn out farms; as a help to careworn, over-worked farmers' wives; as a safe and fair paying investment, and as a step in the direction of agricultural progress, I think it would be well for every farming community in the State, favorably situated, to give the subject careful consideration.

The remainder of the forenoon was taken up with the preliminary organization of the State Dairymen's Association.

AFTERNOON

The afternoon was occupied with a lecture on

THE SCIENCE OF CATTLE FEEDING.

BY PROF. W. O. ATWATER, PH.D., OF WESLEYAN UNIVERSITY, MIDDLETOWN, CONN.

Mr. President and Gentlemen:

The subject to which your attention is invited at this time is the Science of Cattle Feeding. Perhaps the expression, Chemistry of Cattle Feeding, would be more proper, or the Chemistry of the Nutrition of Cattle, since it is chiefly of the results of experiments in chemistry as applied to the discovery of the laws of nutrition, and of the ways in which the knowledge of these may be profitably applied in practice, that I shall address you.

During the last two decades, and especially during the last fifteen years, a great deal of labor has been devoted to the study of the laws of animal nutrition. The most of this work, as far as it applies to the nutrition of domestic animals, has been done in the European, and particularly in the German Agricultural Experiment Stations. These experiment stations are chemical or physiological laboratories, generally in more or less direct connection with a farm, garden or stable, or all of these together, where men of the highest scientific skill are engaged in studying, by actual experiment, the effects of different manures or modes of culture on the growth of crops, or the effects of various kinds of fodder upon domestic animals, and more especially in the study of the more abstruse laws of nutrition in animals and plants.

The experiments in cattle feeding are conducted by feeding animals with certain rations, and noting accurately the effects. The essential difference between them and ordinary farm experiments, rests in the means used to secure accuracy and definiteness. The food is accurately measured, and its composition determined by chemical analysis. In experiments upon milk production the milk is also measured and analyzed, so that by comparing the different rations with the corresponding yield of milk, the effect of various kinds and amount of fodder upon the amount and quality of the milk becomes known.

The determination of the proportion of different foods that are digested by different animals, has been the subject of a large number of experiments of a second class. In these, not only the food, but also the excrement, is measured, and its composition determined by analysis. Of the food consumed by the animal, a portion is digested, while the rest passes off as excrement. If, then, the total amount of the food and of its several ingredients be known, and the same factors of the excrement, the undigested portion, be determined, we have only to subtract the latter from the former to find the amounts actually digested.

Experiments such as these, however, give us data for determining directly the ways in which the various constituents of the food are assimilated and used in the animal body. To know exactly how best to mix and deal out rations in order to have all the constituents most economically utilized, we must know what is the office of these various constituents in the animal economy; what part the albuminoids and the carbo-hydrates, the gluten, starch, fat and woody fibre of the plant play in forming flesh and fat and supplying the material for respiration, and for producing animal heat and muscular force. If we could watch the processes of digestion, assimilation, and consumption of materials as they go on in the body, these problems might, perhaps, be readily solved. Since this is impossible, however, no course is left but to examine the food which the animal consumes, and the final products of the transformation of the food, as they are given off in the forms of excrement, urine and gaseous products of respiration through the lungs and skin. A partial solution of these problems, the discovery of the laws of flesh-building, is sought in feeding experiments of a third class, to wit:

Those in which, in addition to the food and excrement, the urine is also measured and analyzed, with a view to learning the laws of flesh building. The great importance of these experiments depends upon the fact that the nitrogen in the urine comes from the transformation of the albuminoids (flesh) of the body, and that, under normal circumstances, the amount of nitrogen in the urine is a measure of the amount of transformation of these substances. The albuminoid (nitrogenous) substances of the food are worked over in the body into the flesh and other nitrogenous constituents of the body. In fulfilling their offices in the animal economy, these substances are subjected to various chemical changes, and, finally, all the nitrogen which they contained passes off in the urine. If, therefore, by comparisons from day to day, we find the amount of nitrogen in the urine to be less than that in the food digested, we infer that the lacking portion has been retained in the body, or, in other words, that the amount of albuminoid matters of the food that has been stored away as flesh is greater than the amount of flesh consumed, and that the amount of flesh in the body is increasing. If, on the other hand, the amount of nitrogen in the urine is more than was digested from the food, the inference is that the store of flesh in the body is decreasing. We have thus a means of comparing the effects of different food materials on the building of flesh in the body.

An important and much-vexed question at present is, of what constituents of the food is the fat in the body built up? The solution of this, as well as of the more general question, as to what are the functions of the different constituents of the food, albuminoids, fats, carbo-hydrates, and crude fiber and mineral matters in the animal economy, is sought in a fourth class of experiments, namely, those which give as results complete data for computing the amount of transformation of these different substances in the animal body, in that measurements and analyses are not confined to the food consumed on the one hand, and the excrement and urine produced therefrom on the other, but also, by means of a respiration apparatus, are extended to the remaining and otherwise undetermined products of these transformations, to wit, the gases given off by respiration through the lungs and skin.

The first successful respiration apparatus was that devised by Pettenkofer, in Munich. A second one, constructed on the same plan, but large enough for an ox to live in while being experimented upon, was put up some nine years ago in the station at Weende. A third was added in 1870 to the equipments of the station in Halle; and a fourth was put in operation about a year since at the station in Leipsic.

The apparatus consists essentially of a large chest or compartment with air-tight walls, in which is placed an animal, for instance an ox. The interior is furnished with arrangements for supplying food and water and collecting the excrement and urine. By appropriate machinery a current of fresh air is introduced through openings provided for the purpose, and after it has supplied the wants of the animal for respiration, is conducted out, bringing with it the gaseous products of respiration, into a gasometer, where it is measured. It is then analyzed, and a comparison of its composition with that before it had passed through the apparatus shows what material has been added to it by the respiration of the animal.

We have thus from the analysis of the food, and of all the ultimate products of its transformation, a means of following out the processes of the transformation of the food in the body of the living animal, and can infer what parts the different food-ingredients play in building up the different tissues as flesh and fat, and what materials of the food and body contribute to the supply of animal heat and muscular force.

The last three classes of experiments belong almost exclusively to the last decade. The researches of the last class are, it may be said, only begun, and thus far the results have not assumed so definite a form as is the case with others. The experiments are extremely laborious and complicated. One of the experimenters at Weende remarked to me once while I was there, that after several years of work with the respiration apparatus, they had only learned how to manage the apparatus, the animals, and the food, and were just ready to commence a series of researches, which gave promise of success.

But I fear that these general descriptions of experiments may seem too abstruse, and their practical bearing not sufficiently manifest to make it best to continue them farther. If there were time, it would be interesting to explain how they are carried on, to describe the stables where the animals are kept, the treatment they receive, and the laboratories where the analyses are made. Suffice it to say, that it is within the past fifteen years that nearly all of this work has been done; that hundreds of such experiments have been made, that at present numbers of them are in progress, and that, independently of their high theoretical value, the practical results have proved so useful that they are coming to be supported to a large extent by voluntary contributions from farmers. Let us then notice some of the ways in which these researches are of practical interest to the cattle raisers where they are performed. By a study of them we may find some things which will be of use to us also. And to do this let us notice first some general principles.

The advanced agriculture of the present day looks upon the farm, or better, the stable, as a kind of manufacturing establishment. Domestic animals are the machines, food in the form of hay, grain, root crops, commercial food materials, &c., &c., are the raw materials, and meat, milk, wool, labor and progeny the products.

In cattle feeding, then, it becomes an important question, *How to get the largest amount of product, meat, milk, work, &c., from a given amount of raw material, of fodder?* These products are obtained from the working over of this material by the animal, in the animal's body. How the food is transformed in the body we learn from the science of physiological chemistry. In order that we may feed our cattle rationally and economically, we must learn and apply the principles which experiments in this science will teach us.

Prof. Henneberg, director of the Experiment Station at Weende, near Gottingen in Hanover, one of the leaders in this science, and to whose experiments we shall have occasion to refer, says: "As regards the doctrine of farm foddering, it is necessary to find, first, What are the nutritive elements in the food, and what part each one plays in the digestion and building up of the different parts of the animal body. Next, we must find what must be the proportions of these in the fodder used for a given purpose, and what quantity of nutritive materials is necessary in order with the least outlay of food to get the largest amount of yield in the form of meat, milk, or work, &c."

Perhaps the subject is not quite clear. Let us look at it from another standpoint.

I have in my stable an ox; it is standing idle, doing no work, and requires only food enough to supply the wastes resulting from the changes that are continually taking place in its internal organism, the continual building over and renewal of all parts of its body. For this purpose a certain amount of food of a certain quality will be necessary.

But I cannot afford to let the ox stand idle in the stable the whole year. I demand of it production, say in the form of work. For this it needs means; work means use of force strength. By the transformation of food in the animal body force is produced. For this more food will be required. I must feed my working ox a different ration, and, as indeed everybody knows, economy will require this ration to be different, not only in quantity but also in quality, from that appropriate to the ox at rest.

The food which our animals consume has then two classes of demands to meet. The demands for sustenance and the demands for production. To meet these demands the various chemical ingredients of the food, as albuminoids, starch, fat, &c., are necessary. For different demands, as different proportions of these ingredients are required. The ox at rest in the stable requires only food for sustenance, and we shall find that a small amount of food with a small proportion of albuminoid matter will suffice. But when he is set to work, he must have, in addition to this *sustenance fodder*, an extra amount for the production of muscular force, and this *production fodder* must be richer in albuminoids.

Suppose, however, that instead of working my ox I wish to fatten him and sell him to the butcher. I require in this case production, but of another sort. He must have the amounts and proportions of the food ingredients needful for sustenance, and for the production of flesh and fat besides. The quantities and proportions needed in this case will be different from those in the other. Economy requires that the proportions of the food ingredients fed out correspond to the wants of the animal. Experiments have shown that for the production of flesh and fat, different proportions of the nutritive ingredients are wanted from those required for the production of force, and I must deal out the fodder accordingly, if my foddering is to be rational. In short, young cattle, cows, oxen, working cattle and fattening cattle, and, indeed all classes of domestic animals, have different requirements as regards food.

If I have good hay and plenty of it, and if my farm produces corn, potatoes and root crops in abundance, I may, by the use of good sense and the results of experience, be able to feed my cattle well and make my farming pay without troubling myself about food-mixtures, physiology and rational foddering. But in many farming districts hay and clover are dear, and often scarce. The conditions of soil, stall and market require the feeding of root crops and cereals. It becomes necessary to use oil cakes, refuse from breweries and distilleries, corn fodder, esparsette, beans, peas, different grasses, and various other of the less common plants for fodder. The utilization of straw and other less valuable materials becomes necessary. In general, the simpler methods of feeding of necessity give way to more complicated ones. It becomes, then, very important to know what proportions of these substances we must mix together in the rations to be fed to different animals from which different products are required, in order to get the largest product with the least waste of materials.

Now, bearing in mind that only that portion of the fodder which is digested contributes to the supply of material for the demands

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for sustenance and production, and that this digested food consists of different kinds of ingredients, and that for sustenance and for production different kinds and proportions of these ingredients are requisite, we may ask—

1st. What is the composition of the different materials of which the fodder is composed?

2d. What proportions of the ingredients of the fodder are actually digested?

3d. What part does each of these ingredients play in the animal economy; which ones serve for the formation of flesh; what ones may be transformed into fat; what ones contribute to respiration and the production of muscular force?

4th. What are the demands of different animals for the sustenance of life, and for the furnishing of various products as flesh, fat, milk, or muscular force?

Suppose now, that these principles are well understood; that I know, for instance, on the one hand, how much of the different food ingredients my cow requires to keep her in good condition, and at the same time to enable her to give a full yield of milk, and on the other, how much of these nutritive substances is contained in a bushel of turnips, a hundred weight of hay, or a pound of meal. I can calculate very easily what proportion of these food materials I shall mix together in order to make up an appropriate ration for my cow.

Let us take up some of the above points and examine them more closely.

First, the *chemical composition* of different food materials.

Until within a comparatively few years, the methods for analyzing plants, for estimating the so called proximate constituents, albuminoids, starch, sugar, fibre, &c., have been very imperfect. But within the last two or three decades a great deal of attention has been paid to this kind of work, and the chemists of to-day have become very expert in the matter. A few American chemists, a large number of English and French, and, more especially, German investigators, have busied themselves with vegetable analysis until there is hardly a common form of plant or a kind of food whose chemical composition is not known.

The following is, for instance, an analysis of wheat (grain):

Water	13.5	per cent.
Albuminoids or Proteine substances (containing nitrogen)	13.2	" "
Fat (containing no nitrogen)	1.6	" "

Starch........................	(containing no nitrogen)..			59.5	per cent.	
Sugar........................	"	"	"	2.4	"	"
Gum and other extractive matter ..	"	"	"	4.7	"	"
Fibre (cellulose)................	"	"	"	3.0	"	"
Mineral matter (ash)................................				2.1	"	"
				100 0		

Here, then, we have a list of chemical ingredients of wheat. If we were to analyze corn or hay, or potatoes, we should find essentially the same list of ingredients in each of them, though the proportions would be quite different.*

With starch and sugar we are all familiar, and know how they are obtained from vegetables. Woody fibre, which is composed largely of cellulose, we are also familiar with. The gluten of wheat, the "wheat gum" we used to chew when we were boys, is an albuminoid substance; in chewing the wheat grain, the starch, sugar and gum, and cellulose, are removed, and the more tenacious gluten remains.

For our present purpose we will leave the water and mineral matter out of account, and consider the rest, the organic matters, as the chemists call them.

A strictly accurate treatment of our subject would require us to consider the starch, sugar, gum and fibre separately. But it will be much simpler to group them together, and we can the better do so since they are quite similar to each other in composition, and differ from the albuminoids in that the latter, the albuminoids, contain nitrogen, while the former, the sugar, starch, gum and cellulose, contain no nitrogen. As we shall see, this distinction between the nutritive ingredients which contain nitrogen and those which contain none is a very important one for our purpose. So we will divide the organic ingredients of the plant into *nitrogenous* nutritive substances and *non-nitrogenous* nutritive substances. In order to avoid such long expressions, it may be convenient to speak of the former as *albuminoids* and of the latter (except the fats) as *carbo-hydrates*.

As our time is limited, we will not speak at much length of the third of the topics above referred to, that of the functions of these substances in the animal economy. And we may omit this discussion with so much the more reason, since our knowledge of the question is at present in a rather unsettled condition; and so much

* A tabular statement of the composition of the most common fodder materials, is given at the end of this article.

as will be needful for our purpose will be brought in in connection with the experiments we shall describe.

Let us, then, direct our attention to the second question: What is the digestibility of hay, straw, turnips, oilcakes, meal and other kinds of food by different animals, as oxen, cows, sheep and horses? Of a given ration, consisting of one of these materials or of several mixed together, what per cent. of the albuminoids of the starch, the sugar, the fat and the crude fibre, will be digested by these different animals; how much will be utilized, and how much wasted?

A large number of experiments for determining the proportions of different foods that are digested by different animals, have been made in the German stations. They were commenced by two chemists, named Henneberg and Stohmann, in the station at Weende, in 1868, and have since been continued by them and others, particularly Kuehn, Schultze, Wolff, Hoffmeister, Hellriegel, Lehmann, Maercker, and others at Weende, Moeckern, Hohenheim, Dresden, Halle, Leipsic, and elsewhere.

Let me give you some illustrations. In the stables of the station at Weende, under the direction of Prof. Henneberg, two full grown oxen were fed during one period with oat straw, during another with bean straw, a third with clover hay, a fourth with meadow hay, and so on. During some of these periods a small amount of bean meal was added. The ration was at all times such as to keep the animals in fair and uniform condition. Careful weighings and analyses were made of fodder and excrement, that is to say, of the total and the undigested material, and from these the digestibility of the food was calculated. For instance, in one of the experiments of this series the ox consumed daily 16.9 lbs. of meadow hay, or what is called here "English grasses."

There was contained in	Organic dry substance.	Consisting of		
		Albuminoids.	Crude fibre.	Other Carbo-hydrates.
16.9 pounds Meadow Hay.............	14.27 lbs.	2.12	3.80	6.48
Excrement from same.................	6 33	.77	1.63	2.06
There was, then, digested..............	7.94	1.35	2.17	4.42

In another experiment the daily ration consisted of 17.87 lbs. of oat straw, and 1.82 lbs. bean meal.

There was contained in	Organic dry substance.	Consisting of		
		Albuminoids.	Crude fibre.	Other Carbo-hydrates.
17.87 pounds oat straw................	14.27	1.12	6.41	6.74
Of this was digested..................	7.10	.58	3.64	2 88

The following tabular statements represent the mean results of sixty-six experiments made with eleven different oxen at Weende. The figures represent the average percentage of the different food ingredients actually digested from different food materials.

Kind of food.	Amounts digested in 100 parts.				
	Total organic substance.	Albuminoids.	Crude fibre.	Fat.	Carbo-hydrates.
Clover hay................	56	51	41	45	69
Meadow hay...............	63	63	63	39	63
Bean straw................	50	50	36	55	65
Oat straw.................	52	47	59	34	44
Rye straw.................	53	49	60	?	?
Wheat straw	45	26 ?	52	27	40

It appears, therefore, that on the average the oxen digested 63 per cent. of the organic substance of meadow hay, and from 45 to 53 per cent. of the different kinds of straw.

Hay, straw, and similar food materials, are however not as digestible as potatoes, turnips, grains, oil cakes, &c. The Germans give to the former, the hay and straw, the name of "Crude fodder materials," and to the latter the name "Concentrated fodder materials." The digestibility of these latter has also been investigated, though the number of experiments up to the present time is much less than those with hay, straw, and other crude fodder materials. The following are mean results:

Kind of food.	Amounts digested in 100 parts.				
	Total organic substance.	Albuminoids.	Crude fibre.	Fat.	Other Carbo-hydrates.
Potatoes..................	89	64. 9	....	....	94. 9
Turnips...................	90	76. 8	....	....	97. 7
Bean-meal, (unbolted)......	93	94. 6	70	99.7	94
Bran (of spelt. bearded wheat	84. 8	72. 5	69.1	88.2	90. 8
Rape-cakes...............	58. 8	77. 9	?	69.8	79. 6
Cotton-seed cakes..........	49. 7	73. 8	22.7	90.8	46. 2

It is to be remarked, however, that in some of the experiments of which the above figures represent average results, the amount digested was made smaller by the presence of other food materials in the ration. When so mixed as to secure the most complete digestion, nearly all of the organic substance of the root fruits and cereal grains is digested. From the experiments made up to this time, it is to be inferred that of the grains of the cereals, as wheat, and rye, and the seeds of the leguminous plants, as beans and peas, about 95 per cent. of the organic matter is digested. Oats have been found to be digested to the extent of 70 or 71 per cent. only, owing to the hulls. The bran of wheat and other grains would be probably similar to that of spelt, in which somewhat over 70 per cent. of the albuminoids and considerable more of the carbo-hydrates are digestible.

There is a popular belief, that the digestive powers of different kinds of domestic animals is quite different; that sheep are the best digestors; that next to sheep come cows, and that horses will digest less of the crude fodder materials than either. From a large number of experiments, which we have not space to give here in detail, it seems that the different ruminant animals digest meadow hay in about the same proportions, neat cattle digesting a little more than sheep and goats. The opinion of the best experimentors, as Wolff, Stohmann, Schulze and Märcker, seems to be, that the different classes of ruminants do not vary essentially in this respect. On the other hand, the very few experiments made with horses indicate that their digestive capacity is considerably less than that of the ruminants. It must be borne in mind, however, that different animals may vary greatly in their utilization of a given food, that is, in the amount of yield derived therefrom in the form of sustenance or production, even though they may digest the same amounts. For instance, it is a familiar fact that cows of different breeds, or different individuals of the same breed, will vary greatly in the amounts of milk they yield from the same amount of fodder. This may be due, not so much to the difference in the quantity of the fodder they digest, as to the difference in their utilizing of the digested material.

Fodder materials of the same kind vary considerably in their digestibility. Of the fine stemmed, leafy hay of upland meadows and of that from very young grass, like aftermath, from 65 to 70 per cent. of the organic substance may be reckoned as digestible by ruminants. Of the ordinary hay of lowland meadows, in which long-stemmed grasses, the finer undergrowth, and leafy plants are mixed, from 50 to 60 per cent. is digestible. Of the hay from damp, sour meadows, or that from grass of the better sort which has been allowed to ripen before cutting, or which has been injured by rain in curing, from 40 to 50 per cent. is digestible.

When properly harvested and cured, hay does not become less digestible in drying. Clover hay, however, is generally less digestible than green clover. This comes from the fact that in harvesting there is always more or less loss by the leaves and fine stems which are the most digestible part of the plant; and further, the clover hay is apt to be cut riper than green fodder, and as the plant increases in age it becomes less digestible.

The digestibility of clover at different periods of growth has been the subject of a number of experiments. The following are results of experiments by Wolff, sheep being the animals used:

Period of growth of clover when cut.	Digested in 100 parts of organic substances.
Just before blossom	73.9
In beginning of blossom	68
In full blossom	63.9
Toward end of blossom	58.3

But does it follow from this that clover should be cut before the blossom, or early in the period of blossom? Will not the increase in bulk more than compensate for the loss in digestibility? Unfortunately, we have not many experiments to decide this question. One, however, was performed last year by a German named Wagner, which throws some light on the problem.

In a clover field, three plots of equal size and like and uniform stand of clover were selected, the clover cut at different times and the crops weighed and analyzed. The digestibility was not tested by feeding experiments, but the nutritive value was estimated from the amounts of nutritive ingredients, the albuminoids and carbohydrates being reckoned at certain prices per pound, in accordance with rates current in Germany.

We might calculate the relative values of the crops from the amount of digestible material they contained, supposing the digestibility to be the same as that of the crops cut at corresponding times in Wolff's experiments, above mentioned.

The table below gives results :

Time of harvesting.	Weight of hay.	Organic substance in hay.	Amount of organic substance calculated to be digestible.		Value as calculated by Wagner.
Just before blossom, May 22...	85	64.2	74 pr. ct	47.5 lbs.	72 cts.
In full blossom, June 13......	114	90.5	68 "	61.6 "	105 "
Toward end of blossom, July 1.	128	102.2	58 "	59.3 "	94 "

Calculations of this sort cannot of course be absolutely accurate, but still they show it is most probable that the clover has its greatest nutritive value when in full blossom. The same is doubtless true of the grasses, though we lack definite experiments on this point. Clover and grasses when very young are nearly as digestible as potatoes, but as they grow older their digestibility decreases. Timothy that has ripened and gone to seed before it is mowed, is probably but little if any more digestible than straw. And it is certain that many farmers lose very much of the nutritive value of their hay by letting it stand too long before cutting.

If clover is raised for fodder, it may be, as suggested by Wagner, the author of the experiments above alluded to, that just before blossom is the better time to mow, since the nutritive value is not very much less than when cut three weeks later, and the intervening time would be saved for a next crop. On the other hand, when clover is grown for a fertilizer to prepare the ground for another crop, it would be better to let the clover stand. Some experiments of Prof. Voelcker, chemist of the Royal Agricultural Society of England, "On clover as a preparatory crop for wheat," a very valuable account of which was published in the report of the Secretary of your Board of Agriculture for 1869, show that when clover is fed off by sheep there is less development of roots than when it is mown for hay, and that the clover roots are less strong and numerous when it is mown for hay than when it is grown for seed. The enriching power of clover is due to the matter stored up in the roots, and to that which is left on the ground as leaves and fine stems, when it is mown, or which is ploughed under. Hence the propriety of letting it stand rather than to cut early when it is grown as preparatory for another crop.

A large number of experiments on the digestibility of different kinds of straw have been made, and the results, as given in the table on opposite page, show very conclusively that the straw contains a much more nutritive material than has been supposed.

	Amounts digested in 100 parts of				
	Organic substance.	Albuminoids.	Crude fibre.	Fat.	Other Carbo-hydrates.
Rye straw	45.6	25.4	58.8	37.9	37.6
Wheat straw	46.7	26	52.	27.0	40.
Oat straw	44.2	46.2	55.	44.5	53.9
Bean straw	49.2	54	39.	50.	64.0

These experiments show that of the straw of cereals, from 44 to 47 per cent. of the organic substance, and a larger per centage than this of the crude fibre is digested.

We have noticed in all these experiments that the fibre is quite digestible. It has been commonly believed that the woody fibre or cellulose of fodder plants was indigestible. But this is incorrect. Strange as it may seem, sheep have been found to digest from 37 to 50 per cent. of the organic matter of sawdust. It has been found that the woody fibre is made up of cellulose, which has the same composition as starch, and some other substances richer in carbon (so called lignin, cutin, &c.), and that the cellulose constitutes the digestible portion of this crude fibre.

The effect of boiling, steaming, fermenting, or otherwise preparing fodder upon its nutritive value, has also been studied by experiment. Contrary to what might be expected, the digestibility does not appear to be increased by these means; still, the food is made more palatable, and further, in cold weather warm food and drink are excellent. The nutritive effect may, therefore, be sometimes increased by boiling and steaming. This is especially true of potatoes, which are said, upon good authority, to be adapted to fattening purposes when boiled or steamed, but to be better fed raw for milk production.

The conclusions here given, as to the relative nutritive value of cooked and uncooked food, accord with the results of experiments made by Mr. Farrington of your State College of Agriculture and Mechanic Arts on cooked and uncooked meal as fodder for pigs. The report of the college for the year 1872, contains accounts of these experiments, showing that the increase in live weight was greater, and the cost per pound less, with the raw than with the cooked food.

The figures and statements that have been made above concerning the digestibility of fodder materials, are founded upon experiments in which the fodder has been such as to secure the complete digestion of its digestible ingredients. Very often, however, the digestible portions of the food are not all digested. And whether this complete digestion takes place or not, depends upon the proportions of the ingredients it contains.

In many cases fodder is dealt out to cattle in such a way that much of the digestible material is wasted. It is very easy, for instance, to mix meal, bran, or potatoes, with hay in such proportions that the animals will digest much less of the hay than if the other ingredients were added in proper proportions. It becomes important, then, to learn what is the influence of various nutritive materials, as albuminoids, starch, sugar and fat, or of easily digestible materials, as bran meal, which is rich in albuminoids, or corn meal, or potatoes, which are rich in starch, upon the digestion of the crude fodder materials, as hay and straw, with which they may be mixed. To find an answer to these questions, a large number of experiments have been performed. The general plan is to feed the animals, as cows or sheep, for a certain period with some crude fodder, as hay alone, and then for another period, with hay mixed with some easily digestible food, and note the result on the digestion of the hay.

The general results of these experiments are:

1st. That the addition of even considerable quantities of easily digestible substances rich in nitrogen to crude fodder materials, causes no change in the digestion of the latter. As large a percentage of both albuminoids and carbo-hydrates of hay was digested by oxen, cows, and sheep, when the hay was mixed with gluten, bran meal, rape and linseed cake, &c., as when the hay was fed alone.

2d. As to the effect of easily digestible carbo-hydrates, starch, sugar, and materials rich in these substances, as potatoes. The general effect of these substances when added in considerable quantities is to decrease the digestion of crude fodder-materials. For instance, in a series of experiments performed by Wolff, at Hohenheim, in which sheep were fed with clover hay alone, 63.7 per cent. of the albuminoids and 51.2 per cent. of the crude fibre were digested. In succeeding periods mixed rations of clover hay and potatoes were given, the proportion of the potatoes being increased in successive periods. The proportion of albuminoids digested from the hay in these successive periods was gradually reduced from 63.7 to 45.7 per cent., and that of the crude fibre from 51.2 to 43.3 per cent.

This decrease of the digestion of crude fodder by adding easily digestible carbo-hydrates, is very marked in the case of straw and chaff. These contain relatively small percentages of albuminoids and large percentages of carbo-hydrates, and when more carbo-hydrates are added the excess is of course made larger, and the digestion of both crude fibre and albuminoids made smaller.

The proportion of albuminoids and carbo-hydrates in an easily digestible food material, decides in a very large degree its influence upon the digestion of less digestible food with which it may be mixed. If it contain no more than four or five parts of carbo-hydrates to one of albuminoids, this influence will be slight, but if the proportion of carbo-hydrates be larger the general effect is to decrease the digestion of the albuminoids of the crude fodder. And in general, when the amount of digestible carbo-hydrates is more than seven or eight times that of the digestible albuminoids in a ration, a portion of the carbo-hydrates will fail to be digested.

Let us now turn our attention to another part of our subject, one indeed which we have already touched upon, the relation of the nitrogenous to the non-nitrogenous constituents of food.

In the beginning of our discussion of the digestibility of fodder materials, we noticed some experiments of Prof. Henneberg on the digestion of meadow hay and oat straw by oxen.

From the ration of 16.9 lbs. of meadow hay the ox digested 7.94 lbs. of organic substance. From the ration of 17.87 lbs. of straw the ox digested 7.10 lbs. of organic substance. At this rate from 17 lbs. of meadow hay and from 20 lbs. of oat straw the same amount of nutritive material, about 8 lbs., would be digested.

But it is contrary to all practical experience that 20 lbs. of straw should have the same nutritive value as the 17 lbs. of good hay. Yet both furnish the same amounts of nutritive material to the animal. Such is the testimony of the animals themselves, as shown by accurate experiment.

Here then is a problem. What is the solution? In the light of the chemical and physiological science of to-day the answer is perfectly clear. There is a difference in the quality of the food contained in the straw and the hay. The quantity of the nutritive material and its value are two different things. Our ox digests from his 17.87 lbs. of straw 7.10 lbs. of organic dry matter, consisting of .58 lbs. of albuminoids and 6.52 carbo-hydrates, and from his 16.9 lbs. of hay 7.94 lbs. of organic dry matter, consisting of 1.35 lbs. of albuminoids and 6.59 lbs. of carbo-hydrates.

At this rate we should have in our

	Digestible material.	Consisting of	
		Albuminoids.	Carbo-hydrates.
Twenty pounds of straw..............	8 lbs.	.65	7 35
Seventeen pounds of meadow hay.......	8 "	1.37	6.63

In other words, from the meadow hay the animal digests a little less carbo-hydrates and more than twice as much albuminoids, as from the oat straw. The meadow hay is a richer food than straw, richer in albuminoids. The hay furnishes twice as much digestible albuminoids as the straw; it is a more valuable fodder. What other reason can there be for its greater value than its richness in albuminoids? Straw is rich in non-nitrogenous but poor in nitrogenous nutritive material. It is, however, a very valuable fodder when fed so as to secure the utilization of the digestible material which it contains. To make it an appropriate fodder, fit for the ordinary demands of our domestic animals, we must mix with it some other substance rich in nitrogen. In fact, in the experiments referred to the straw was mixed with bean meal, which contains a large proportion of albuminoids; in this way the fullest utilization of both is secured.

This matter of the proportions of different chemical ingredients of food materials, which are necessary to secure their most economical use, is so important that it will be worth our while to pursue it farther.

There is a series of experiments, made some fourteen years ago in the station at Weende, near Göttingen, the results of which were such brilliant and conclusive disprovals of old theories and confirmations of new ones, that they have become classic in the history of agricultural science. They belong to the earlier of that long series of systematic investigations which are giving us some of the foundation principles of this department of knowledge. The aim of such investigations has been to find what rations, what proportions and amounts of different food materials, will give the greatest amount of production with the least amount of waste.

Two oxen, in good, moderately fat condition, were fed with rations such as were found to keep them in the same uniform condition, as shown by the scales. A certain ration was fed for a certain period, the weight of the animals and the amount and composition of food and excrement determined by accurate weighings and analysis. At the end of the period the ration was changed, and another experiment begun, and so on through a long series. During the whole time the rations were such that the animals were kept in uniform condition, the weights remaining nearly constant. The duration of the whole series was some six months, the number of experiments eight.

I append a number of the rations fed out during the series, giving the amount per 1000 lbs. live weight, and adding to the general description of the ration the amount of nitrogenous and non-nitrogenous materials, and the ratio of the one to the other, designating nitrogenous material by N, and non-nitrogenous by N-N.

Daily ration per 1000 pounds, live weight.	Containing lbs. of N.	N-N.	Ratio of N to N-N.
(I) 19.5 lbs. clover hay..........................	1.95	7.39	1: 3.8
(II) 12.7 lbs. oat straw, 47.8 lbs. turnips..............	.87	9.13	1: 10.5
(III) 12.6 lbs. oat straw, 25.6 lbs. turnips, 1 lb. rape cakes	.91	7.77	1: 8.5
(IV) 3.7 lbs. clover hay, 13 lbs. oat straw, .56 lb. rape cakes	.99	7.16	1: 7.2
(V) 2.6 lbs. clover hay, 14.2 lbs. oat straw, .52 rape cakes.	.91	7.20	1: 7.9
(VI) 3.8 lbs. clover hay, 13.3 lbs. rye straw, .57 rape cakes.	.99	6.82	1: 6.8

Now how shall we interpret this? We have fed our oxen with these different rations, and with each they have held their own. There was, it is true, a slight gain in weight, but this was even more marked with the other rations than with I and II. Either of the above rations, the 20 lbs. of clover hay alone, or the 2½ lbs. of clover hay with 14 lbs. of oat straw, and half a pound of rape cakes, suffices to supply the animal's wants while it is at rest in the stable, but neither is sufficient to fatten it.

If we look along down the column of figures N, we notice that the ration (I) contained nearly 2 lbs.—1.95 lbs.—of nitrogenous substance, while the others contained generally about .9 lbs. The .9 lbs. of albuminoids in the other rations was sufficient. The clover hay ration served the animal no better than the others, and the extra pound of nitrogenous material was then superfluous. So in ration (II) we have the other extreme; an appropriate amount of nitrogenous material, but as the column shows, 9.13 lbs. of non-nitrogenous material. The other figures in the column N-N, indicate that the other rations contained on the average about 7¼ lbs. of carbo-hydrates, and the oxen showed by their keeping in good condition that this was enough. Here, again, are nearly two pounds of non-nitrogenous matters not utilized, that is, wasted. We find, then, that about .9 lbs. of albuminoids and 7¼ lbs. of carbo-hydrates suffice to keep our oxen in good condition. This would make a ratio of albuminoids to carbo-hydrates of 1 : 8.

Could anything be more convincing than this? Our oxen are in good condition, and hold their own as well with their rations of straw, to which a little clover hay and oil cakes are added—No. (III)-(VI)—as when clear clover hay, No. (I), or oat straw and half a cwt., No. (II), of turnips are fed.

From the fact that this excess either of albuminoids or carbohydrates has been without effect upon the production which in this case could, to be sure, be nothing but increase of flesh, we infer that a proportion of N to N-N of 1 : 8, is an appropriate one for an ox at rest in the stall, and that in the ration of clover hay the extra pound of albuminoids was not utilized. These conclusions and other similar ones are founded not merely upon the experiments just mentioned, but on a very large number of experiments and observations made both in the stalls and laboratories of the experiment stations and in the practical farming experience.

We may illustrate this principle by some experiments made by Dr. Kuehn at the station at Moeckern with milch cows.

It has been believed that a ratio containing one part of nitrogenous to 4.5 or 5 of non-nitrogenous substances, or with a nitrogen ratio of 1 : 4.5 or 5 is appropriate for milch cows. The custom of feeding milch cows on clover was common about Moeckern. But clover, as we have said, is very rich in nitrogen, the ratio being 1 : 2.5 or 3. Straw is poor in nitrogen. How would it do to mix the two?

Further, the question of ad libitum foddering, giving the animals all they will eat, was much discussed. Some saying that the cows were the best judges of their wants, and others that they would eat more of such palatable food, as clover, than they would profitably utilize.

To test these questions, four cows were fed for one period of several weeks with rations of green clover and straw, and then for another period with green clover ad libitum. The rations in the two periods were as given in the table below:

	Dry substance contained.		Ratio of N to N-N.
	Albuminoids.	Carbo-hydrates.	
87 lbs. green clover and 67 lbs. barley straw	3.8 lbs.	17.8 lbs.	1 : 4.7
123 lbs. green clover....................	5.6 "	15 "	1 : 2.7

The milk was carefully weighed and analyzed. The result was that the cows gave just as much milk with the smaller ration, a part of which was straw, as with the larger ration of clover alone, while the composition of the milk in both cases was the same. The cows gave just as much milk, and as rich milk, with the 3.8 lbs. of albuminoids as with the 5.6 lbs. The ration with 1 part albuminoids to 2.7 carbo-hydrates was no better than that with the ratio 1 : 4.7. The former was over rich in albuminoids, and hence a waste of valuable material. In this especial case a part of this waste was due to the fact that the cows were fed *ad libitum*, and ate more than they could well utilize. Aside from this, however, it is evident that as long as straw is cheaper than clover hay, or in other words, as long as non-nitrogenous food material is cheaper than nitrogenous, carbo-hydrates cheaper than albuminoids, the feeding of material unnecessarily rich in albuminoids will involve waste. Or, to speak more generally, the nutritive material of the fodder will be more or less completely utilized, in proportion as the composition of the ration approaches more or less nearly to that most naturally adapted to the special demands of the animal. But even if these proportions of albuminoids and carbo-hydrates are not observed so closely, will it make so great a difference in the cost of the fodder? Does not the matter after all look a bit more important when measured by chemical and physiological formulas than when reckoned in dollars and cents?

Prof. Henneberg, of Göttingen, under whose supervision the experiments with oxen referred to were performed, and Dr. Kühn, of Möeckern, by whom the experiments with the milch cows were made, have reckoned the actual money value of the rations used in their experiments, assuming the ordinary market prices as basis.

The Göttingen prices at the time of Prof. H.'s experiments would make clover hay about \$8.50, oat and rye straw \$5.50, turnips \$2.15 gold per ton, and rape cakes \$1.07 per cwt.

At these rates, the cost of the rations, I–VI, fed to the oxen would be as follows: I, 9¾ cts.; II, 10¼ cts.; III, 8½ cts.; IV, 7 cts.; V, 6¾ cts.; VI, 7 cts. The ration of straw and turnips, I, contains a large excess of carbo-hydrates, and costs 10¼ cts. per day; that of clover, I, contains an excess very much smaller to be sure of albuminoids, and costs 9¾ cts. In the others a large amount of the clover hay is replaced by a cheaper material, straw; the proper proportions of albuminoids and carbo-hydrates are made up by proper admixtures of oil cakes, which contain very large percentages of albuminoids, and the ration costs from $6\frac{3}{4}$ to 7 cts., 40 or 50 per cent. less than the others.

At the time of Dr. Kühn's experiments clover hay was worth in Möeckern $13.00, and barley straw $4.33 per ton; and cost of the milk yielded, reckoned from the value of the fodder, averaged just about 50 per cent. more with the ad libitum foddering of clover hay than with the fixed ration of hay and straw.

After all these details you will ask, How are we going to apply these principles to our actual practice? How are we going to know in just what proportions to mix and deal out our fodder so as to secure the best utilization of all its nutritive ingredients?

I might answer this question by giving rules and directions for calculating the proportions of different food materials appropriate for rations for various animals from their chemical composition. But I presume you would be better pleased with the calculations already prepared. I have here a little book, a farmer's pocket dairy—a German work—which many thousands of the best German farmers carry in their pockets. In this are tables giving the chemical composition of different fodder plants, followed by a series of tables of fodder rations. These tables are prepared by Prof. Wolff, of the Agricultural School and Experiment Station at Hohenheim, in Germany. Several such series of fodder tables are in vogue in Germany, but those of Wolff are most used. Each ration is calculated to contain such an amount of organic substance, and such proportions of nitrogenous and non-nitrogenous ingredients as will make it the most economical mixture for the purpose specified. (A number of these fodder rations are given in the appendix at the end of the lecture.)

It must be remembered, however, that the chemists who make these experiments and prepare these tables would not have them blindly followed in practice. Such things are not intended to be used as receipts. They are rather indications which along with good sense and the teachings of experience may afford great aid in economical cattle feeding.

The saving and using of waste products, the cultivation of such plants as those referred to in the tables, and the economical and rational utilization of all the products of farm and factory, constitute some of the most important features of the advanced agriculture of the present day. But each step forward, from the simpler toward the more advanced forms of agriculture, brings us into more intricate relations, and demands a deeper and broader knowledge of the principles, the laws by which the growth of the plant and the animals is governed. The new settler on the western prairies, whose chief care is to get to market the fruits which nature yields so lavishly and without return, or the farmer of a hundred acres of meadow and pasture among the hills of New England, with a nearer market and less fertile soil, may get on in his simple, industrious way without all the theories and teachings of modern science. But even these men and their children would do better and be happier, if to the fruits of their earnest, honest labor were added more of the rich gifts that science offers. And that state of things which already prevails in Europe is rapidly coming upon us at home, in which exhausted soil and increased population make the discovery and use of scientific principles in agriculture as necessary as the food and raiment to whose highest production the use of these principles is indispensable.

We have tried to explain some of the ways in which men of science are working in agriculture, and some of the results of their labors. In Germany, in France, in England, and in our own country, in the experiment stations, on the farm, in the market, the laboratory, the lecture-room, and the study, thinkers are working for thinkers. Science and practice are joining hands to improve the products of the soil, and thus promote the welfare of mankind. But thinkers alone receive the full benefit of their labor. It is not the blind copying of fodder tables that makes economical foddering, but the learning and application of the principles upon which these tables are founded.

And may we not hope, that to the wonderful practical skill in which the whole world acknowledges that we Americans take the lead, may be added a better appreciation of science, a deeper study of its laws, and a more rational application of its principles to our every day life?

APPENDIX.

The analyses of fodder materials here given are selected from a large table compiled by Wolff. Different samples of materials of the same sort will vary considerably in composition. The figures here given represent general averages:

I—Hay.

KINDS OF FODDER.	Water.	Organic substance.	Ash.	Nitrogenous nutritive ingredients, or Albuminoids.	Non-nitrogenous nutritive ingredients or Carbo-hydrates.	Ratio of nitrogenous to non-nitrogenous.	Crude fibre.	Fatty matters.
Meadow hay, medium quality	14.3	79.5	6.2	8.2	41.3	1: 5.04	30.0	2.0
Aftermath	14.3	79.2	6.5	9.5	45.7	1: 4.81	24.0	2.4
Red clover in full blossom	16.7	77.1	6.2	13.4	29.9	1: 2.23	33.8	3.2
Red clover, ripe	16.7	77.7	5.6	9.4	20.3	1: 2.16	48.0	2.0
White clover in full blossom	16.7	74.8	8.5	14.9	34.3	1: 2.30	25.6	3.5
Lucern in blossom	16.7	76.9	6.4	14.4	22.5	1: 1.56	40.	2.5
Esparsette in blossom	16.7	77.1	6.2	13.3	36.7	1: 2.76	27.1	2.5
Seradella after blossom	16.7	77.7	5.6	14.6	29.2	1: 2.00	33.9	1.5
Italian rye grass	14.3	77.9	7.8	8.7	52.3	1: 6.01	16.9	2.8
Timothy	14.3	81.2	4.5	9.7	48.8	1: 5.01	22.7	3.0
Average of all grasses	14.3	79.9	5.8	9.5	41.7	1: 4.39	28.7	2.6

II—Straw.

KINDS OF FODDER.	Water.	Organic substance.	Ash.	Nitrogenous nutritive ingredients, or Albuminoids.	Non-nitrogenous nutritive ingredients or Carbo-hydrates.	Ratio of nitrogenous to non-nitrogenous.	Crude fibre.	Fatty matters.
Winter wheat	14.3	80.2	5.5	2.0	30.2	1: 15.10	48.0	1.5
Winter rye	14.3	82.5	3.2	1.5	27.0	1: 18.00	54.0	1.3
Winter barley	14.3	80.2	5.5	2.0	29.0	1: 14.90	48.4	1.4
Summer barley	14.3	78.7	7.0	3.0	32.7	1: 10.90	43.0	1.4
Oats	14.3	80.7	5.0	2.0	38.2	1: 15.28	40.0	2.0

III—Chaff and Hulls.

KINDS OF FODDER.	Water.	Organic substance.	Ash.	Nitrogenous nutritive ingredients, or Albuminoids.	Non-nitrogenous nutritive ingredients or Carbo-hydrates.	Ratio of nitrogenous to non-nitrogenous.	Crude fibre.	Fatty matters.
Wheat	14.3	73.7	12.0	4.5	33.2	1: 7.38	36.0	1.4
Rye	14.3	78.2	7.5	3.5	28.2	1: 8.06	46.5	1.2
Oats	14.3	67.7	18.0	4.0	29.7	1: 7.34	34.0	1.5

IV—Green Fodder.

KINDS OF FODDER.	Water.	Organic substance.	Ash.	Nitrogenous nutritive ingredients, or Albuminoids.	Non-nitrogenous nutritive ingredients or Carbo-hydrates.	Ratio of nitrogenous to non-nitrogenous.	Crude fibre.	Fatty matters.
Grass before blossom	75.0	22.9	2.1	3.0	12.9	1: 4.30	7.0	0.8
Grass after blossom	69.0	29.0	2.0	2.5	15.0	1: 6.00	11.5	0.7
Red clover before blossom	83.0	15.5	1.5	3.3	7.7	1: 2.33	4.5	0.7
Red clover in full blossom	78.0	20.3	1.7	3.7	8.6	1: 2.33	4.5	0.7
Lucern in blossom	74.0	24.0	2.0	4.5	7.0	1: 1.56	12.5	0.7
Esparsette in blossom	80.0	18.5	1.5	3.2	8.8	1: 2.75	6.5	0.6
Seradella in blossom	80.0	18.7	1.3	3.6	7.0	1: 1.95	8.1	0.4
Maize, late, end of August	84.3	14.6	1.1	0.9	8.7	1: 9.67	5.0	0.5
Cabbage	89.0	9.8	1.2	1.5	6.3	1: 4.20	2.0	0.4
Beet leaves	90.5	7.7	1.8	1.9	4.5	1: 2.37	1.3	0.5

V—Roots and Tubers.

KINDS OF FODDER.	Water.	Organic substance.	Ash.	Nitrogenous nutritive ingredients, or Albuminoids.	Non-nitrogenous nutritive ingredients or Carbo-hydrates.	Ratio of nitrogenous to non-nitrogenous.	Crude fibre.	Fatty matters.
Potatoes	75.0	24.1	0.9	20.0	20.0	1: 10.50	1.1	0.3
Sugar beets	81.5	17.7	0.8	1.0	15.4	1: 15.40	1.3	0.1
Rutabagas	87.0	12.0	1.0	1.6	9.3	1: 5.81	1.1	0.1
Carrots	85.0	14.0	1.0	1.5	10.8	1: 7.13	1.7	0.2
Turnips	92.0	17.2	0.8	0.8	5.9	1: 7.38	1.0	0.1
Pumpkins	92.5	6.5	1.0	1.3	4.2	1: 3.25	1.0	0.1

VI—Grains and Seeds.

KINDS OF FODDER.	Water.	Organic substance.	Ash.	Nitrogenous nutritive ingredients, or Albuminoids.	Non-nitrogenous nutritive ingredients or Carbo-hydrates.	Ratio of nitrogenous to non-nitrogenous.	Crude fibre.	Fatty matters.
Winter wheat	14.4	83.1	2.0	13.0	67.6	1: 5.20	3.0	1.5
Wheat flour	12.6	86.7	0.7	11.8	64.2	1: 6.28	0.7	1.2
Winter rye	14.3	83.7	2.0	11.0	69.2	1: 6.29	2.0	1.0
Winter barley	14.3	83.4	2.3	9.0	65.9	1: 7.32	8.5	2.5
Summer barley	14.3	83.1	2.6	9.5	66.6	1: 7.01	7.0	2.5
Oats	14.3	82.7	3.0	12.0	60.4	1: 5.03	10.3	6.0
Maize	14.4	83.5	2.1	10.0	68.0	1: 6.80	5.5	7.0
Buckwheat	14.0	83.6	2.4	9.0	59.6	1: 6.62	15.0	2.5

VI—GRAINS AND SEEDS, (Concluded).

KINDS OF FODDER.	Water.	Organic substance.	Ash.	Nitrogenous nutritive ingredients, or Albuminoids.	Non-nitrogenous nutritive ingredients or Carbo-hydrates	Ratio of nitrogenous to non-nitrogenous.	Crude fibre.	Fatty matters.
Vetches	14.3	83.4	2.3	27.5	49.2	1: 1.79	6.7	3.0
Beans, field	14 5	82.0	3.5	25.5	45.0	1: 1.76	11.5	2.0
Peas	14.2	83.2	2 5	22.4	51.6	1: 2.30	9.2	2.5
Flaxseed	12.3	82.7	5.0	20 5	55.0	1: 2.68	7.2	37.0
Rape seed	11.0	85.1	3.9	19 4	55.4	1: 2.85	10.3	40.0
Hemp seed	12 2	83.6	4.2	16.3	55.2	1: 3.30	12.1	33.6
Cotton seed	8.7	85.5	7.8	22.8	44.7	1: 1.96	16.0	30.3
VII—REFUSE.								
Potato stump	94.8	4.6	0.6	1.0	3.0	1: 3.00	0.6	0.1
Rye stump	89 0	10.5	0.5	2.1	6.8	1: 3.24	1 6	0.4
Malt sprouts	8.0	85.2	6 8	23.0	44.7	1: 1.94	17.5	2.5
Wheat bran	13.1	81.8	5.1	14 0	50 0	1: 3.57	17.8	3.8
Rye bran	12.5	83.0	4.5	14.5	53.5	1: 3 69	15.0	3.5
Rape cake	15.0	77.6	7.4	28 3	33 3	1: 1.18	15 8	9.0
Linseed cake	11.5	80.6	7.9	28.3	41.3	1: 1.46	11.0	10.0
Cotton seed cake	11.5	82.2	6.3	24 6	36.8	1: 1.20	20.8	6 2

According to Wolff, the proportions of ingredients of fodder, given in the subjoined table, are appropriate for daily rations for the purposes specified. The rations are calculated for 1000 lbs. live weight. The object of the crude fibre, is to give proper bulk or ballast to the ration.

	Organic substance.	Containing		In the ratio to each other of	Fat.	Crude fibre.
		Albuminoids.	Carbo-hydrates.			
Full grown ox, at rest in stall	14.1 lbs.	0 9 lbs.	7.2 lbs.	1: 8	....	6.0
" " with moderate work	21.0	1.85	10.15	1: 5.5	....	9 0
" " " severe work	25 0	2.8	12 4	1: 4.4	....	10.0
Winter fodder for milch cows	24.0	2.5	12.5	1: 5	....	9 0
Ration richer in nitrogen	25.0	3.0	12	1: 4	....	10.0
Fodder for fattening cattle	23.5	3.2	14 3	1: 4.5	1.2	6.0
Fodder for sheep	24 0	1.96	11.8	1: 6	....	10 3
Fodder for fattening sheep	23 0	3 6	14.4	1: 4	1.0	5.0

The following rations are calculated to contain nutritive materials in the proportions above given. They are selected from a very large number given by Wolff. The materials are such as are in most common use in Germany. Many of the mixtures will be too complicated for use here. They are interesting, however, as showing some of the phases of that intensive system of agriculture which has become necessary in Europe, and toward which we are surely tending.

The beets referred to, are the field beet, *beta rapacea alba*; they have about the same composition as turnips, and the one could be substituted for the other. The potato slump is the residue left in making spirituous liquors from potatoes. The sugar-beet cake is the residue which remains after pressing out the juice from the sugar beet for the manufacture of sugar; 10 lbs. of beet cake contains about the same proportions of nutritive material as 9 lbs. of potatoes. By pea meal, bean meal, rye meal, crushed rye, &c., are to be understood the coarsely ground, unbolted meals which are staple articles of fodder in Germany.

Aftermath is counted somewhat richer than common meadow hay, and about equal to Timothy. Fodder material of similar composition could be substituted, the one for the other; such as beans, peas and vetcher, or clover, lucern and esparsette, or the different kinds of straw of cereals. That is to say, beans may be used in the place of peas, or lucern in the place of clover, in equal quantities, without affecting essentially the nutritive effect of the ration.

It must be borne in mind, that no one is expected to copy these fodder mixtures exactly, nor to weigh out to his cattle the exact proportions here given. Their object is, rather to indicate in what proportions foods may be mixed so as to secure the fullest utilization of all their ingredients.

Sustenance fodder for full grown, labor-free oxen.

1½ lbs. Clover hay,	10 lbs. Barley straw,	3 lbs. Clover hay,	5 lbs. Meadow hay.
13 lbs. Barley straw,	5 lbs Wheat chaff,	13 lbs. Oat straw,	7 lbs. Oat straw.
25 lbs. Beets,	25 lbs. Beets,	20 lbs. Beets,	5 lbs. Wheat chaff.
½ lb. Rape cakes,	½ lb. Rape cakes,		5 lbs. Potatoes.

Fodder for full grown oxen with moderate work.

14 lbs. Oat straw,	7 lbs. Rye straw,	13 lbs. Oat straw,	10 lbs. Rye straw.
7 lbs. Pea straw,	12 lbs. Meadow hay,	12 lbs. Meadow hay,	9 lbs. Clover hay.
10 lbs. Beets,	8 lbs. Potatoes,	2 lbs. Rape cakes,	22 lbs. Potatoes.
3½ lbs. Malt sprouts,	2 lb. crushed Vetches,		

10 lbs. Clover hay,	8 lbs. Aftermath,	9 lbs. Clover hay,
14 lbs. Oat straw,	4 lbs. Clover hay,	12 lbs. Oat straw.
20 lbs. Beets,	13 lbs. Rye straw,	17 lbs. Sugar beet cakes.
	2 lbs. Rye and Oat meal,	

Fodder for full grown oxen with severe work.

12 lbs. Meadow hay,	14 lbs. Meadow hay,	15 lbs. Meadow hay,
12 lbs. Barley straw,	7 lbs. Clover hay,	8 lbs. Clover hay,
4 lbs. Clover hay,	9 lbs. Oat straw,	6 lbs. Oat straw,
4 lbs. Bean meal,	2 lbs. Rape cakes,	3 lbs. Wheat bran.

Winter fodder for milch cows.

12 lbs. Meadow hay,	15 lbs. Meadow hay,	10 lbs. Meadow hay,	10 lbs. Clover hay,
11 lbs. Barley straw,	9 lbs. Barley straw,	12 lbs. Oat straw,	10 lbs Barley straw,
15 lbs. Potatoes,	30 lbs. Beets,	50 lbs. Beets,	23 lbs. Potatoes,
3 lbs. Rape cake,	$2\frac{1}{4}$ lbs. Rape cakes,	3 lbs. Malt sprouts,	3 lbs. Wheat bran.

5 lbs. Clover hay,	10 lbs. Meadow hay,	16 lbs. Meadow hay,
8 lbs. Oat Straw,	5 lbs. Clover hay,	8 lbs. Wheat chaff,
6 lbs. Wheat chaff,	9 lbs. Oat straw,	50 lbs. Potato slump,
25 lbs. Potatoes,	15 lbs. Sugar beet cake,	$2\frac{1}{2}$ lbs. crushed Rye.
3 lbs. Rape cakes,	2 lbs. Rape cake,	

9 lbs. Lucern hay,	10 lbs. Meadow hay,	8 lbs. Meadow hay,
7 lbs. Oat straw,	15 lbs. Pea straw,	8 lbs. Clover hay,
6 lbs. Wheat chaff,	12 lbs. Potatoes,	8 lbs. Oat straw,
40 lbs. Beets,	$1\frac{1}{2}$ lbs. Pea meal,	13 lbs. Potatoes,
3 lbs. Maize meal,		2 lbs. Wheat bran.

Mixed green and dry fodder for milch cows with same proportions as in the preceding.

15 lbs. Young green Clover,	50 lbs. Green Clover,
12 lbs. Meadow hay,	6 lbs. Meadow hay,
11 lbs. Oat straw,	13 lbs. Oat straw,
20 lbs. Beets,	15 lbs. Beets.
2 lbs Rape cakes.	

50 lbs. Green Clover,	35 lbs. Green Lucern,
60 lbs. Green Maize,	80 lbs. Green Maize,
8 lbs. Barley straw.	7 lbs. Rye straw.

Richer fodder (in nitrogen) for milch cows.

10 lbs. Clover hay,	12 lbs. Clover hay,	12 lbs. Esparsette hay.
10 lbs. Oat straw,	10 lbs. Oat straw,	10 lbs. Barley straw,
5 lbs. Barley chaff,	4 lbs. Rape seed hulls,	5 lbs. Wheat chaff,
30 lbs. Beets,	100 lbs. Potato slump.	20 lbs. Beets,
3 lbs Rape cakes.		2 lbs. Bran meal.

Fodder for fattening oxen and cows. A comparison of the above with the preceding will show that the amount of organic substance is nearly the same, but that the latter contains much less crude fibre and more nutritives, albuminoids and carbo-hydrates, especially more fats; in other words, a smaller amount of crude and a larger amount of concentrated materials. In preparing the animals for fattening, a more voluminous quantity would be given them than the above, say a larger quantity of good hay and less of concentrated fodder. In the transition to the main period of fattening, a portion of the hay would be gradually displaced by rape cakes, meal, roots, &c., until the above mentioned proportions are reached. These are retained until toward the end of the fattening, when the rape cakes and beans and peas may be replaced by the more palatable and digestible cereals, rye, maize, &c.

5 lbs. Meadow hay,	6 lbs. Meadow hay,	8 lbs. Timothy hay,
8 lbs. Oat straw,	7 lbs. Oat straw,	2 lbs. Barley straw,
125 lbs. Potato stump,	55 lbs. Beets,	42 lbs. Sugar beet cakes,
2½ lbs. Rape cakes,	5 lbs. Rape cakes,	5 lbs. Rape cakes,
7 lbs. Maize meal.	1 lb. Linseed,	1 lb. Linseed.
	3 lbs. Unbolted Barley.	

6 lbs. Clover hay,	8 lbs. Clover hay,
7 lbs. Barley straw,	43 lbs. Potatoes,
70 lbs. Beets,	5 lbs. Bran meal,
2 lbs. Linseed,	¾ lb. Rape seed oil.
3 lbs. Bran meal,	
2 lbs. Unbolted Rye.	

Sustenance fodder for sheep. The following fodder mixtures apply directly to the smaller, finer-wooled breeds of sheep, which in the full grown, but not in the fattened condition weigh from 75 to 100 lbs. The larger breeds, which have a live weight of 100 to 135 or more pounds per head, in the store condition, will be kept in good condition with from one-seventh to one-tenth less per thousand pounds live weight. Of the straw, which plays so important a part in the nourishment of sheep, it is well to lay, say double the quantity here given in the ricks, and leave it for the animals to consume at will.

15 lbs. Barley straw,	9 lbs. Clover hay,	9 lbs. Clover hay,	17 lbs. Oat straw,
9 lbs. Wheat chaff,	12 lbs. Barley straw,	14 lbs. Wheat straw,	9 lbs. Clover hay,
13 lbs. Potatoes,	24 lbs. Potatoes.	23 lbs. Potatoes,	28 lbs. Beets.
3 lbs. Rape cakes,			

22 lbs. Pea straw,	15 lbs. Meadow hay,	12 lbs. Aftermath,
4 lbs. Meadow hay,	3½ lbs. Clover hay,	10 lbs. Pea straw,
11 lbs. Potatoes.	12 lbs. Oat straw,	7½ lbs. Wheat straw.

Fodder for fattening seeep. In the preparation for fattening, and the ending of the same, the same measures are to be observed as in the fattening of oxen. The larger breeds of sheep, as well as the English breeds raised for slaughter, can be fattened on the same rations as those here given. Such rations, however, will have a better effect upon these than upon the smaller, fine-wooled and less easily fattened breeds.

6 lbs. Timothy hay,	7 lbs. Meadow hay,	15 lbs. Esparsette hay,
4 lbs. Clover hay,	5 lbs. Clover hay,	30 lbs. Turnips,
23 lbs. Potatoes,	40 lbs. Beets,	4 lbs. Rye bran,
3½ lbs. Rape cakes,	1 lb. Rape seed,	1 lb. Linseed,
6 lbs. Crushed Maize,	4 lbs. Bean meal,	5 lbs. Crushed Barley.
2 lbs. Bean meal.	6 lbs. Crushed Barley.	

After the lecture of Prof. Atwater, Mr. HALL C. BURLEIGH of Fairfield, the noted breeder of Herefords, was called for. In a brief speech he gave some practical advice, and the results of his own experience in feeding; and his remarks met the approval of the entire audience. He believed in practice with theory, in this matter of feeding stock, and in all other subjects pertaining to farming. His own interest in it had led him to examine carefully into more than one hundred published experiments of feeding, but few of which he regarded of any value. He believed in plenty of good hay for feeding, in science as well as practice in farming, in brains as well as muscle. From his own trials he was satisfied 18½ bushels of corn or oat meal was equal to one ton of first quality hay, for feeding to farm stock. A pair of two year old steers which he once owned, gained 14½ inches in girth in six months by feeding them with good early cut hay, and two quarts per day of corn, barley and bean meal mixed in equal parts.

Hon. HARRIS LEWIS said the experiments reported by Prof. Atwater were very elaborate, and he feared we should underrate them—and yet, they were not of the slighest value to our farmers. It is true that science is founded on experiments—but these German experiments are worthless to us, because their crops, soil and climate are so different from our own. We never know at what state in the growth of the straw or grass the experiment is made —and straw as they have it in Germany is so valuable as to even produce fat on animals to which it is fed. But fast as we are, our straw and grass both get over-ripe before they are cut, and our straw, as compared with that used to feed domestic animals in Germany, is of very little value. To feed straw to a profit, we should cut it green and leave the grain on. Then, again, the German system of feeding is unpracticable here. We have not a chemist at every barn door, as they have in Germany, to tell our farmers how to feed, and they don't need one. Our farmers cannot have every foddering of hay or straw analyzed, to see how much flesh, fat or milk-forming elements it contains—but they know there is nothing better than good grass to feed an animal; for when a cow is in a pasture of rich, sweet, abundant food, that is a cow heaven to her. Nothing that can be given can add to the quality of this food, for grass is the perfection of cattle food, and he was satisfied if farmers feed anything less than grass they are feeding at a loss. Straw is largely used in Germany to sop up the water within the cow, caused by eating so much fresh cut hay; in fact, the poor creature is almost drowned. He related an instance in his own experience to illustrate this. His cows had for a long time been fed on fodder corn, and he found they would struggle and strain after a single lock of hay. They wanted it to "sop up" the water, for he proved by a simple trial that in every hundred pounds of fodder corn which they ate, ninety-two pounds of it was water. The real fact is, that there is but little value to the corn fodder grown on an acre, after the water is expelled. From the twenty tons grown, there is certainly not more than $3\frac{1}{2}$ tons which is of value as food; but dried corn fodder is not a bad feed for cows. Early cut hay, that cut in the first blossom, makes the very best winter food for cattle; and he would not advise any farmer to grow grain and sell it for the sole purpose of getting the straw to feed out to his stock. This early cut hay, if simply dried, so as to render it as much like dried grass as possible, is the perfection of winter food; and to render hay as much like it as possible he would recommend mangold wurtzels to be used with dry forage, to the quantity of one peck to each full grown animal. In his own herd he had fed no grain for twenty years, but he had fed largely of mangolds; his cows seemed satisfied with the results, and he certainly was. An ox fed by him, who had not known what grain was, reached a live weight at six years old of 2300 pounds. He presumed he would have been feeding fodder corn to this day if he had not found out that his cows knew more than he did.

After some remarks by Hon. S. F. PERLEY of Naples, and Mr. PERCIVAL of the Board, the Convention adjourned.

EVENING.

The Convention assembled at 7 o'clock, when a lecture was delivered on

MILK: ITS TAINTS, ODORS AND ADULTERATIONS.

BY HON. HARRIS LEWIS, PRESIDENT OF THE NEW YORK STATE AGRICULTURAL SOCIETY.

In view of the rapid increase in the number of cheese factories in this State, and the vast amount of capital soon to be invested in the dairy business, I would suggest a change in your coat of arms, or State seal. While I would leave the anchor at the right hand, and the scythe at the left, although we now have improved machines for cutting grass, with less side draft than the old scythe, yet this is still a necessity, and I would leave it. But the deer in the centre should be replaced by a cow and good looking dairy-maid, and the pine tree by a cheese factory in the background. Your motto I would also leave as it is, for if you do not now direct, you may hereafter guide us in dairy farming.

Associated dairying is now making such mighty strides in the State of Maine, that I believe the subject of "Milk" will be as important to your people as any one I can present, and have therefore chosen it for consideration this evening. Although milk has been my study for many years, I confess that I do not know much about it, and may not be able to present anything new in regard to it to this intelligent audience. But, perhaps some things in regard to milk have been, by chance or accident, presented to me in a different light from that in which they may have been observed by any one of you here present.

It is my design in speaking to you of milk, to speak of its value as food, its taints, its odors, and its adulterations, and to what extent these taints, odors and adulterations affect the keeping qualities and market value of milk, of butter, and of cheese. The money value of the milk produced annually in the United States, is now about 500,000,000 dollars. Vast as this sum is, I believe the value of milk may be doubled within a short time if all produced can be pure and good. The demand for milk, and its products, could not be supplied three years hence, if all the milk furnished as food and that manufactured into butter and cheese could be pure, as it should be, and as it is in our power to produce it.

As an article of human food, milk stands pre-eminent, and is, in fact, the only article of animal food capable of sustaining life, from the cradle to the grave, however long that period may be. In childhood milk will build up the system, supplying every bone, every muscle, every tissue, yea, every anatomical element of which our organism is composed, and in the most perfect manner, with mathematical accuracy in all its countless divisions and subdivisions through the frame, each part receiving its necessary nourishment in exact proportion to its requirements. The same food that will build up the anatomical organism will sustain it in after life, and supply all the natural waste with the same exactness and certainty. It is a self-evident fact, that milk was designed by an all-wise Creator as the food for the young of all that class of animals known as the mammalian class.

Although milk has so great an actual value when compared with other kinds of food, its market value is less than most other kinds, and less than half the market value of some kinds of animal food of which large quantities are purchased and used in this country, from long continued habits into which our people have gradually fallen, without regard to the healthfulness or cost of the two kinds of food. The great disparity between the actual value of milk and its market value, as compared with other kinds of animal food, will not always continue as it is at present. The first step in the right direction must be taken by the dairymen, in furnishing milk, and its products, to customers in perfect condition. The next step will soon follow from an enlightened and appreciative community, desiring the most heathful and economical kind of food.

TAINTS AND ODORS OF MILK.

Milk, when drawn from the cow, always contains a taint known as animal odor, or the cowy taste and smell. This new milk smell and taste is found in the new milk of all cows, and that in the milk of cows sick with fever is usually very offensive, and sometimes nauseating. Whether this animal odor is a volatile oil, or gaseous matter, I have not yet been able to prove, but Mr. L. B. Arnold declares it to be a volatile oil. It is very light, and easily driven out of milk by heating up to 140° Fahr., and agitating the milk for a short time; but is always retained in the milk when suddenly cooled down to a low temperature without agitation, or exposure to the atmosphere before cooling.

Milk, when drawn from the cow often contains taints and odors introduced by the cow, from an impure atmosphere she has been compelled to breathe, from impure or filthy water she has drank, and from improper food she has eaten. These taints and odors may be called natural taints and odors; the three last may always be avoided by proper care in furnishing the cow pure air to breathe, pure water water to drink, and suitable food to eat; but the first (the animal odor) is always present whenever the milk is drawn from the cow, but always varied in intensity or degree of offensiveness by the condition of the atmosphere, the temperature of the atmosphere, the condition of the cow in regard to sickness or health, the food she eats, the water she drinks, the air she breathes, and last, but not least, by the treatment she receives. Nearly, if not all, these natural taints and odors may be expelled from the milk by heating it to 140° as soon as it is drawn from the cow, and then aerating it while warm.

While we have no convenient contrivance for heating milk, (which is to be regretted), we have an admirable one for aerating it, invented by A. P. Bussey of Westernville, Oneida county, N.Y. This aerator is cheap, easy to keep clean, convenient to use, and should be used during hot weather by every butter and cheese factory patron. This aerator consists of a simple tin pail, with one or two rows of holes around near the outside of the bottom, suspended over and above the top of the can, with a cloth strainer over the top, held in place by the arm in which the pail is placed. The arm in which the strainer is held is passed into a wooden standard, which is attached to the can, and held in an upright position by passing it down through a loop on the can to the handle at the outside of the milk can. The milk is turned into the strainer, through which it passes to the bottom of the pail, and then through the small holes in the bottom in fine streams, but separates into drops in falling a distance of 12 or 15 inches, exposing it all, drop by drop, to the purifying influences of the atmosphere. This aeration alone will rid the milk of its cowy odor, and most of the others before mentioned, and if done in a pure atmosphere will keep sweet more than twice as long as that not aerated, but alike in other respects. But using this aerator in a foul stable, or foul atmosphere, would be likely to add taint to taint, and odor to odor, as it would be an attempt to banish filthiness by an addition of more nastiness. These natural taints and odors when left in the milk, enclosed in our common carrying can two or three hours, exposed to the hot sun while on the way to the cheese or butter factory, three, four five miles distant, are productive of a vast amount of mischief.

There is one other natural taint of milk to which I will call your attention. It is the milk from sick or unhealthy cows. I do not believe that a sick cow can produce pure, or untainted milk. There is abundant evidence, furnished by the medical profession, showing that the milk of sick cows is often tainted with the disease from which the cow is suffering, to a dangerous, and sometimes fatal degree. Hence, selling the milk of a sick cow to customers as food, or delivering it at the cheese or butter factory, is in my opinion a crime. It is not safe food for hogs, and should be thrown on the manure or compost heap.

We will now consider another class of taints of milk, so far from being natural that I will call them artificial taints. One class of these taints is communicated to the milk through the agency of the milk vessels in which it is kept, and with which it is handled. Wooden milking pails may well be regarded as the most prolific source of putrefactive taints of milk, which is carried to cheese and butter factories during hot weather. A wooden pail is unfit for use in a dairy during hot weather, for the very reason that a neat, particular dairy-woman will soon scour off the paint from the inside of the pail, leaving the wood exposed to direct contact with the milk, and when the pails are washed and dried in the sun checks will open in the wood and between the staves wide enough to admit milk globules. With the aid of a good magnifier I have found one thousand of the checks within an inch. When these pails are used the checks and seams fill with milk, and the action of the milk on the wood will close up every check in the wood, and every open seam, enclosing millions of milk globules as in a vice, secure from the contact and purifying influence of boiling hot water, and beyond the sight or reach of the neatest dairymaid living. When the pails are again dried, the same check and seams open, exposing the milk to the action of the first new milk drawn into the pail. The milk confined in the checks of the wood soon becomes putrefactive, and as the process is repeated day after day putrefactive taints of the milk to a greater or less extent is the inevitable consequence. All milk vessels should be made of tin, and those with the least numbers of seams and sharp angles will be found the most valuable in practice.

There is another class of artificial taints for which the dairymen are alone responsible, and I regard them as the most common, and at the same time the least excusable of all this class of taints of milk. The taints to which I refer we will call cow-stable taints. The fact is too well known, that some dairymen, after a long experience in the dairy business, become careless in regard to cleanliness, and mix all their milk with a certain portion of cow manure. Another class of dairymen are found who never possessed any notions of cleanliness whatever, and always mix milk and cow manure together, without much regard to the relative proportions of the two ingredients. Some dairymen are known to dip their hands in the milk while milking, for the purpose of wetting the cow's teats, and allowing the drippings to fall back into the pail, "that nothing be lost." But the filthy drippings from the filthy hands of a filthy milker are as near the perfection of filth as the most filthy person might desire, and I venture the opinion, that such milkers ought to milk no more milk than they require for their own consumption. But this very class of dairymen, after delivering milk to the butter or cheese factory containing cow manure in the liquid form, and in the lump, a vile compound fit for a fertilizer only, expect first-class butter and cheese from it, or somebody else is to blame. However filthy the milk furnished, they expect clean money in return.

There are factories in New York where milk delivered pure would become tainted before it could be manufactured into butter or cheese. The faucet of the weighing can, the conductors from the weighing can to the vats, are too often fruitful sources from which proceed putrefactive ferments.

Some of the New York cheese factories were located in such a way that good drainage could not be secured, and after a few years the accumulated filth under the floors renders the production of first class cheese at such factories very difficult, if not impossible during hot weather. Milk, and especially cream, has an absorbing power that is truly wonderful, and will always become tainted with all the foul odors within its reach. Hence, milk standing on a cheese factory floor, through which milk, whey and slops of all kinds have fallen, will not keep sweet through a warm night. Millions of putrefactive spores will arise from these beds of filth and pools of rottenness, take possession of the milk and defeat the efforts of the best cheese makers living to produce good cheese.

Again, milk when drawn from the cow in its purest condition, contains within itself the elements of its own destruction, like any other animal substance. But the elements of decay in milk may be kept in a dormant condition for a long time, or rendered exceedingly active by the various influences to which milk is subjected.

Five or six years ago I conducted a great many experiments to ascertain how long milk would keep sweet and good, at various degrees of temperature, and also subjected to influences favorable to its long keeping as well as early decay. On a hot morning in July I took a quantity of the mixed milk from my whole dairy, and divided it into three equal parts by weight. No. 1 was thoroughly aired by passing it through a common colander several times, and then cooled down to fifty-one degrees, and kept at that temperature without much variation, by placing it in a pan on ice, with a little sawdust between. No. 2 was put in a tin pail, with a tight fitting cover, without airing or cooling, and exposed to the rays of the sun, precisely as most milk is treated while on the way to the factory or to market. No. 3 was taken also without airing or cooling, put in an open dish by the side of a rapidly decaying animal substance, and exposed to the direct rays of the sun. Forty minutes after, No. 3 showed unmistakable evidence of putrefactive fermentation, and seventy minutes from the time it was separated from the other two messes, No. 1 and 2, was rotten, smelling as offensive as rotten eggs, and was as unfit for food. No. 2 required seven hours to reach the same degree of putrefaction, from the action of its own elements of decay, that No. 3 attained in seventy minutes by the action of the same elements, quickened by the putrefactive germs absorbed from the rotten carcass by its side. No. 1 remained sweet and good one hundred and twenty hours; yet these three samples of milk were all taken from the same mess, and were all alike when these experiments were commenced. The difference in their keeping, from 120 to 1, was from the different conditions in which the samples were placed and the different influences to which they were subjected. No. 2 and 3 must have been at about the same degree of temperature, ranging from about 100° to 88° during the experiment, a temperature favorable for the action of taints and odors of milk.

Every taint of milk, and every odor, whether introduced into the milk by natural causes, by artificial means, or by the absorbing power of the milk itself, all tend in the same direction, all do this work with the same absolute certainty, the difference being only a question of time. Extra care of tainted milk on the part of the dealer, and extra skill and care on the part of the manufacturer of butter and cheese from such milk, will delay or retard the final work of these taints and odors of milk. We cannot, however, either evade or avoid the action of taints in milk, any more than we can the approaching end of time to each one of us. The results are alike inevitable; and the certain end and finality of tainted milk, is early decay; in butter, swift rancidity, and in cheese early rottenness.

Milk is furnished by the dairy cow at even periods of time, and in equal quantities, so that constant attention on the part of the dairyman in regard to the drink, food, care of the cow, and care of the milk cannot be remitted.

An article of food so perishable as milk, should be handled with the greatest care, and by the bestowment of the requisite care to rid it of all impurities, taints and odors, its value as an article of food may be enhanced one hundred per cent., and its consumption increased to an equal extent. We always determine the value of milk and its products by the last impression left on the organs of taste. If that impression is agreeable as it fades away, we always desire more of it. Our desire for, or aversion to medicine is always determined by the sensation created on the organs of taste; and like milk and its products, if the last impression is agreeable we desire more. If, on the other hand, the impression made as the taste fades away is disagreeable, we do not desire to taste it again.

We limit the demand for milk, for butter, for cheese, by our indifference. We close the avenues to trade by our carelessness. If you will make cheese such as every man will desire, and butter that is "pleasant to the sight and good for food," you will never overstock the market, or overdo the business, and if you will bring your milk in better condition to the market, the consumption of milk will be increased, the health of everybody who uses it will be improved, life will be prolonged, and happiness diffused by your care and attention in this little particular.

I will now represent to the audience by these cubes, the size of one pound of milk avoirdupois weight, and the size of each component part of one pound of milk, the analysis of which is given in the Encyclopædie Brittanica.

As avoirdupois weight has no fixed dimensions, it becomes necessary to reduce it to troy weight, which has dimensions.

One pound avoirdupois weight equals 7000 grains troy weight, and 7000 grains troy equals a cube of 2 and $\frac{995}{1000}$ inches.

The Water,	87.02	per cent.	=	6091.4	grs.	=	a cube	2,858 in.
Sugar,	4.77	"	=	333.9	"	=	"	1,084 "
Caseine,	4.48	"	=	313.6	"	=	"	1,063 "
Butter,	3 13	"	=	219.1	"	=	"	943 "
Salts,	.60	"	=	42.0	"	=	"	117 "
Total,	100.00			7000.0				

The different parts of a pound of milk represented by these cubes would not be exact for a sample of milk of different component parts. But this is a good analysis of an average sample of pure milk, and has been taken as the standard for graduating lactometers. I am indebted to Dr. E. L. Sturtevant of South Framingham, Mass., for the size of the cubes, and for the idea of presenting the component parts of milk in this manner. Dr. Sturtevant has been and is now engaged in the study of milk, and has brought out many new and interesting facts of great practical value.

ADULTERATIONS OF MILK.

After an examination of this cube, which represents the bulk of a pound of milk, and this cube which represents the quantity of water in a pound of milk, I think every one in this audience will say without hesitation that milk has full water enough in its composition, without the addition of more. This would be my opinion; for the water in pure milk amounts to almost nine-tenths of its whole bulk. But there are thousands of milk dealers, and thousands of factory patrons who think differently, and put in an additional amount of water. Not content with the composition of the highest and most perfect food given to mankind, compounded by that chemist who is allwise, they change its composition, not for any particular love for their fellow man, but for the great love they bear for their own *dear, little, soulless, sordid self.* The deplorable fact that many of our milk dealers adulterate milk which they sell for food, is too well known; and all the tricks employed by them to deceive their confiding customers are also too well known to require any explanation here.

But most of the tinkered milk sent to market is wet with water, which renders it less dangerous to use than that containing other ingredients. Very soon after the commencement of associated dairying in New York State, the astounding fact was discovered that some men, yea, and women too, who had always maintained good reputations for integrity, and honorable dealing, had been wetting their milk with a little water. The amount of water added was always in proportion to the greed of the person adding it, and in most cases not less than twenty-five per cent. of water was used, and in some cases much more than this amount. The factory men were alarmed, as well they might be, at this state of human depravity, and obtained the passage of a law by the State legislature making the act of delivering diluted or adulterated milk at a butter or cheese factory, knowingly, a misdemeanor, punishable by a fine of not less than twenty-five dollars or more than one hundred. The law has since been amended, making the penalties greater. Notwithstanding the law, we have found in almost every factory association at least one milk and water man, and in some associations three or four men, willing to drown a life-long reputation for honesty in a very little water.

Adulterations of milk, how detected. In order that you may understand the principle upon which these implements are constructed, and the degree of accuracy to be relied upon in their use, in careful hands, I will say, that God has spoken to mankind in two ways; first, by revelation, and second, by general laws, as fixed, as immutable as God himself. By a careful examination of one of these laws we find that a cubic foot of pure water at the temperature of 60° Fahrenheit, with the barometer standing at 30 inches, will weigh precisely one thousand ounces avoirdupois weight, never more and never less. Hence pure water is taken as the standard by which the weight or specific gravity of all other things is compared. Again, it has been found by hundreds of experiments, that a cubic foot of pure milk from the mixed mess of our native herds, at the temperature of sixty degrees Fahr., with the barometer at 30 inches, will weigh from one thousand and thirty to one thousand and thirty-two ounces, the average being 1,031 ounces. Pure cream is about as much ligther than water as water is lighter than milk. But the variations in the specific gravity of cream are always owing to the amount of the other component parts of milk it contains. The specific gravity of butter is 942 ounces. You will therefore see, that milk is heavier than water, that water is heavier than cream, and that cream is heavier than butter. Again, the purer the butter, the lighter it will be; the purer the cream the lighter that will be. The greater the

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quantity of cream or water in milk, the lighter the milk, and the less the quantity of water or cream, the heavier the milk will be. As I remarked before, that the mixed milk from a large number of our native cows will usually weigh 1,031 ounces per cubic foot, at a given temperature, and under a certain pressure of the atmosphere, yet the variation in the specific gravity of the milk of cows of the different breeds, and of the milk of individual cows of the same breed, is so great that we cannot fix upon any certain weight of milk as a standard of purity.

We then arrive at this conclusion: that the specific gravity of milk is a comparative evidence only of its purity, and that when the milk of one patron from the same breed of cows is of less specific gravity than that of the other patrons, it is in every instance known to me, strong presumptive evidence that it has been watered. I have here a lactometer, an instrument subject to the same fixed laws of nature that the hydrometer is, and constructed upon the same principle, except that the hydrometer is graduated for water and other liquids of greater or less specific gravity than water, while this lactometer is graduated here, near the lower end of the stem, for average pure milk, and at this point near the top of the stem for water. Now, if I immerse this in milk it will only sink to 0, representing pure milk; but if I immerse it in water it will sink to this point indicating water. If I immerse it in a compound of half milk and half water it will settle to this point, just half way between the point representing milk and the point representing water, and is neither water or milk, but half and half, or 50 per cent. water. This lactometer, then, can only determine the specific gravity of the fluid in which it is immersed; this it will do every time, it can do nothing more, and it will do nothing less. But from the relation as shown between pure milk and a given specific gravity, the lactometer should stand as a faithful sentinel at the door of every cheese and butter factory in the land.

I have here three per cent. glasses, each one holding just one half pint, and the distance from the bottom up to the point at which each one is filled to contain the half pint, is divided into one hundred equal parts, as you will see on the sides of these jars. Whenever the milk of any one patron is found by the lactometer to be of less specific gravity than that of his neighbors, one of two things may be suspected—first, that his milk contains a large per centage of cream, or second, that it contains too much water. Now, to ascertain the truth in regard to this suspected milk, take a sample of the whole milk from several cows after mixing it together, (*milk known to be pure*), and fill one of these jars up to gauge mark ten; fill another up to the same point with the suspected milk, and fill the other jar with water; place all three side by side, so that they will be of the same temperature, and be subjected to the same atmospheric influences. Allow all to stand until the cream has arisen, then if the suspected milk has a greater per cent. of cream than the milk known to be pure, all right, it was lighter, because it had most cream, but if the per centage of cream is less on the suspected milk, note the per centage on each jar; then remove the cream from both jars, and drop the lactometer in the suspected milk, noting the point or degree to which it sinks; then place the lactometer in the pure milk jar, and from the per cent. jar turn in water until the lactometer sinks to the same point at which it stood in the suspected milk; then place the jar with the water where it will stand level, and as soon as it comes to a rest read from it the per centage of water taken, and you have the per cent. of water added to the suspected milk. Now if the proportionate loss of cream in the watered milk is greater than the water added, the milk was skimmed and watered, and the value of the cream taken out may be estimated by the amount left. That is, if the watered milk had six per cent. of cream and the pure milk twelve, fifty per cent. of the cream is lost. If ten per cent. of water was added to the milk, then forty per cent. of the cream was taken. I have made a great many tests of milk in this way at home, having one of the family water the milk, and have been able in every instance to detect the water, and the exact amount.

You will observe that in a comparative test like the one just given, no particular temperature is required, except that both samples of milk and the water used must be of the same temperature. But in all lactometer tests made to find the specific gravity the milk *must* be brought to that temperature for which the lactometer is graduated, or great injustice will be done.

It may be regarded as an axiom, that the frequency of crime is in proportion to the temptations offered, and the uncertainty of detection and punishment.

I deny that the system of associated dairying has increased the number of rascals, but it is self-evident that the temptations offered and the hitherto uncertainty of detection and punishment have developed an astonishing amount of rascality. Now, if we cannot remove the temptations to water milk delivered at the factory, we can, and should, balance the temptation with the absolute certaintity that all dilutions and adulterations will be detected and punished. It is far better to prevent crime when prevention is possible, than to suffer its commission and afterwards punish the criminals. I would therefore suggest to all our butter and cheese manufacturers on the associated plan, to obtain the specific gravity and per centage of cream of every patron's milk. This may be done once each year, and it will be found sufficient for the entire year, as cows in the same neighborhood will be affected alike by all causes tending to change the composition of their milk.

For the purpose of obtaining the standard of purity of each patron's milk, I would suggest the following plan: First, obtain a per-cent. jar for each patron, and mark it with his name pasted on or near the bottom but on the opposite side from the per-cent marks. Second, provide a safe and convenient place for all the jars to stand side by side, subject to the same atmospheric influences, but so that each one can be examined without disturbing any one of the number. Third, when ready, notify every patron that the night's or morning's milk on such a day will be tested for the purpose of obtaining and recording the standard of its purity. Fourth, when the time fixed upon arrives, take an equal quantity of the mixed milk of each patron, bringing it to the proper temperature, ascertain its specific gravity by the lactometer, and record it opposite the owner's name, and set the jar in the place provided for it. Fifth, when the cream has risen, note its per centage, and record this opposite the owner's name also. If in making this test the milk of any one or more patrons should be found to vary to any extent from the others, and the variation not accounted for by the excess of cream or caseine, the test of its purity should be made with a sample of the milk taken at the premises at milking time, in the presence of the patron, and its specific gravity and percentage of cream recorded.

With the record of every patron's milk at the factory, and the lactometer and cream gauge standing there also as faithful sentinels, to give the alarm at the approach of danger from every quarter, no patron will be able to skim, adulterate, or water his milk without being detected. Some patrons may object to this method as casting suspicion upon all the patrons, but it is not so, nor is it intended for any such purpose; and if it was, who would object, except the dishonest? A man that is honest will not object to being watched, neither will it create fears in his mind, nor cause him any uneasiness; whereas, the dishonest ought to be carefully watched—and they have no right to complain if distrusted and watched by everybody with whom they deal.

The evils resulting from the use of adulterated milk, sold in our towns and cities for food, is truly alarming, and the people ought to be protected from the wicked practices of the villainous adulterators of milk by some municipal law, providing a penalty equal to the crimes committed by these rascals.

From careful estimates, made by several competent persons, the people of the cities of New York and Brooklyn pay the sum of four million dollars annually for the water added to their milk. It has also been estimated from careful observations, that nine-tenths of all the infantile diseases of children fed with cow's milk are chargeable directly to the adulterations of the milk used.

Herod was thought to be an awful man when he sent forth the decree to slay all the babes in Bethlehem of two years old and under. He will go down as long as the sacred story is preserved as a fiend, as a cruel monster. But what had Herod to plead in excuse? He, like the Jewish people, believed the prophets, and he believed that a ruler of Israel was born at Bethlehem, who would wrest from him the Judean crown and sceptre, and perhaps destroy his life. He had an excuse for his act; but what excuse have these dairy-men, these milk-venders, these adulterers of milk, who slay more babes every year in every State of this Union than Herod slew at Bethlehem? For the few cents they make by it, they betray the confidence of their customers, and destroy their infants. And what shall we say of that class known as ladies, who live upon the topmost round of the ladder of fashion, who, for the sake of basking in the moonshine of fashion, will cast their own offspring into the hands of irresponsible, ignorant servants for care, depend upon the adulterer of milk for food, and take to their bosom a contemptible poodle puppy? They unite in the crime with the milkman, and share the responsibility of the murder of their offspring. I would it were otherwise. I would feed all this adulterated milk to the puppies; I would feed the milkmen with the puppies that their adulterated milk killed, and I had almost said that it was a pity that these ladies could not have been born female dogs. But I will not say it, Mr. President.

THIRD DAY.

Business Meeting of the Board.

A business meeting of the Board was held at 9 o'clock A. M., at which several matters were disposed of. One-fourth of the bounty received from the State, which has for two years past been offered by the several county societies for permanent farm improvements, was recommended to be expended in the same way for the present year. And, after considerable discussion, the remaining fourth, or half of that, the expenditure of which is under the direction of the Board of Agriculture, which has heretofore been expended for the formation and encouragement of Farmers' Clubs, was left in the hands of the Trustees of the several county agricultural societies, to be expended in such a manner and for such objects as by them may be deemed best.

At the Public Convention, Ira C. Doe, Esq., of York County, in the chair, the first paper presented was on

The Importance of a System of Practical Agriculture.

BY GEORGE B. BARROWS, MEMBER FROM OXFORD COUNTY.

It will be difficult to discover, either on record or in actual life, any evidence of the existence of a generally recognized or established system of agriculture, either practical or scientific. It is true, that in some favored localities like the tropical regions, the earth produces spontaneously food enough for the wants of man and beast, without any agency of their own; and there through successive generations has been transmitted a passive acquiescence in the superiority of Nature's processes, thus establishing by a persistent letting alone, a vigorous doing nothing, what may be called a system of inaction. So again, it is well known that in every age and clime there are nations and individuals who pursue the practice of fastening upon tracts of virgin soil and extracting by great crops all the elements of fertility without making any corresponding return; and then like the locust, swooping down upon new fields doomed to like destruction, thus creating a system (if it deserves the name) of exhaustion and impoverishment. Such exceptional cases, however, will serve to substantiate our original proposition.

On the other hand, an examination of the moral and intellectual domain, and even of some other departments of the physical realm, will show the existence of schools and platforms and systems, almost without number, and will prove that without their aid no great progress would have been made in these several kingdoms.

Without further generalization, let us consider a practical illustration in a single department. The young man who desires to devote himself to the study of law, does not find that the field before him is unexplored or without a beaten track; to him the gates are opened wide, and through more avenues than one he may find a 'royal road.' Seated in his study, by close application and patient research he may become familiar with the works of jurists and publicists, and then go out into the world thoroughly indoctrinated in the fundamental principles of the profession. Or, entering the office of some distinguished lawyer who is in the full tide of successful practice, if he is gifted with ordinary discernment and readiness of acquisition, he may from the daily routine of business that passes under his eye, become a skilful and successful practitioner. Or, preferring to attend a school of law where learned professors communicate to their pupils the results of profound investigation in the form of lectures and public instructions, unless the fault is entirely his, he may make their acquisitions his own, and hardly fail of success in his vocation.

Thus through these several ways the student may go, finding success perhaps in either, but more certainly by pursuing each in turn; and similar, and even parallel opportunities are afforded him in the departments of theology and medicine, and others of minor importance. In either profession the man may become learned, and make his mark in the world, who merely studies books, or who associates himself with some practitioner, or who goes to the schools. It will be observed, that by these distinct methods the same end is attained,—pursue either and you come out right,—the principles and rules which are the vital forces of the books govern the individual worker bearing the burden and heat of his day, and the associated veterans who review the varied fields over which they and others have toiled, bringing to their disciples the full and ripened sheaves which they have gathered.

For another illustration, we may refer to the department of medicine; if one student receives his medical education in Paris, and another in one of our larger cities, upon the completion of their course should they make a comparison of progress they will find their theory and practice essentially the same; modified only by range of observation, or amount of experience; the spoken word and the written word, the remedies, the instruments, and the manifold methods are alike,—and the same thing holds good in the other professions and pursuits. Different schools and systems there may be under the same roof, yet each one finds all its own parts harmoniously related, and when brought together easily adjusted, although separated by wide intervals of time and space.

How is it in the pursuit of an agricultural education? are there similar conditions and opportunities for the student in this direction? Can the young man who has determined to acquire the education of a practical agriculturist surround himself with the works of standard authors, and make himself such? Or, can he in every town go to any farmer, and learn from the examples and illustrations of his daily life such a mode of farming as will correspond with that which every good farmer practices? Or, can he readily find some school of instruction, manned by practical men, who drawing from their stores of learning and experience are able to start him in life with those acquisitions which they accumulated only by the labor of years?

It is evident that no satisfactory answer can be given to these inquiries; for the analogies referred to as existing in other professions and callings, all cease here. It must be admitted, that there is no collection of agricultural works containing a complete and comprehensive system of practical agriculture, acknowledged as such by practical men, anywhere to be found; and therefore the young farmer who wishes to build himself up on a foundation of books, has no such opportunity as is afforded to the student of law, theology and medicine, and other departments. It cannot be denied, also, that working farmers themselves do not agree in the various methods and processes which are involved in their round of labor, and hence the student who serves an apprenticeship with farmer A, will discover that he and his fellow apprentice who may be with farmer B, are receiving two distinct courses of instruction, more alike perhaps in their diverse departures from any supposed system, than they are in conforming to it. Thus the young man who leaves the average farmer's roof after his term of practical instruction is over, does not have for a capital any system that for precision and certainty, and comprehensiveness and completeness, can sustain the tests of examination and comparison like those which are part and parcel of those before referred to. Nor are we able to find institutions and associations with grounds and buildings and other appurtenances which centuries have accumulated, with a corps of teachers composed of practical agriculturists, accompanying all instructions with practical demonstration and illustration, and requiring the same of their pupils. It is true that considerable advance has been made in this direction, but as yet there is nothing approximating the completeness of medical schools where diseases, remedies, and operations with which the physicians ought to be familiar, are considered and explained, either by those or in the presence of those who can correct all possible errors and suggest expedients for such contingencies as may occur in the subsequent life of every practitioner.

If it is true that the young man who wishes to begin the life of a working farmer, and the man of business who desires to withdraw from the bustle of the city to the quiet of the country, and the professional man, who advanced in years longs to find in rural pursuits the happiness which he has sought elsewhere in vain alike fail to find either in books or among men, or in institutions, any system of practical agriculture that will initiate them into the simplicities as well as the mysteries of the art, the natural inquiry is, Ought these things so to be?

One not familiar with the facts, would attempt to explain the condition of affairs by saying, all this arises from the nature of the case; it is because everything is so simple, the way so plain, the road so easy, and success so sure, methods and machinery are out of place; let well enough alone. An examination of the present condition of agriculture, however, will convince the most sanguine of its friends, that on the whole, as now conducted, the pursuit is not profitable; that the productiveness of the soil is diminishing, and that an army of the tillers of the soil are now deserting their farms and leaving them to be usurped by the forest and the wild beast. If then there is no such thing as a system of practical agriculture, a legitimate inference from this demonstration would seem to be that the present demoralized condition of agriculture in general, results largely from this very lack; and the first and most natural reason for its early creation and establishment would be, the mere fact of its non-existence and consequential evils. Just as a philanthropist, finding a town without church or schoolhouse, would say, the strongest argument in favor of introducing both is the simple announcement of their destitution.

To one inquiring respecting the nature of a system of practical agriculture, it may be replied, "In the arts and sciences a system is a short and plain scheme of either, well drawn up into a narrow compass. Every truth has relation to some other, and we should unite the facts of our knowledge so as to see them in their several bearings." This is done whenever a system is framed, and in the clear and simple language of the lexicographer it is a connected view of all the truths of a department of knowledge; a collection of the rules and principles governing it. In accordance with these definitions, a system of practical agriculture is one which is made up from the condensed experiences of intelligent, observing and working men, the actual cultivators of the soil; and one especially designed for the benefit of such working men—in general a system of positive results. That a complete system should be scientific, as well as practical, must be admitted; but science belongs to an advanced state of affairs—example must precede precept; and as in another kingdom, that was not first which is spiritual, but that which is natural, so here, as the herald and forerunner of a high order of progress, we find an argument and encouragement for first introducing a system of practical agriculture.

Having thus far only suggested or incidentally alluded to some of the advantages connected with our proposed system, we will briefly mention some that may not be unreasonable or undesirable. As it is based upon a collection of facts and truths, it is valuable for what it contains; like wheat sifted from chaff, gold separated from dross, all the valuable experiences of the past that have been preserved are digested and compacted, and from them rules and principles are evolved that become the laws of life. Simply regarded as a museum, a reservoir, it may be of no small account; and by virtue not only of what it preserves from the past, but of what it attracts from the present, it becomes inherently self-sustaining; thus perpetuating itself, and growing by what it feeds upon.

How the list of "lost arts" has been swelled, because the last solitary possessor died and made no sign. The science of medicine to-day, derives its continued strength from the added discoveries and inventions and experiences of each generation. More than three-fourths of the human race have for 6000 years expended their energy in one direction, the cultivation of the earth, and for one object, the production of food; shall all their experience be lost? Shall the tillers of the soil who bear as a burden upon their shoulders the support of the entire population of the globe, through negligence or indifference fail to give their sons such an inheritance, or lose an opportunity so essential to place them abreast of others in the race of life? Law regulates the descent of property;

may we not lawfully recognize the transmission of ideas, and may not farmers rightfully look up their neglected heritage? As order came from chaos, so out of this mass of fragmentary and disconnected material may be built a strong foundation; a substantial platform, upon which men may stand together, strong from its own cohesion, and stronger by the strength of those who stand upon it. Let such a system of agriculture be created, and a new standard is raised, around which men of the same faith may rally, and which they have a just pride in upholding; they are linked together by a common bond of union, and animated by the same aims and interests.

What is in a name, a creed, a parchment, or a silken flag—what is their value? Nothing intrinsically—everything practically; and as for these things called unconsidered trifles, men live by them, and die for them. Such a new combination will give additional power to the principles of association and co-operation, from which agricultural unions have heretofore received too little benefit. Mere gatherings, multitudes, affirm nothing, attempt nothing, accomplish nothing, without some common end; the body must be vitalized by the heart and soul, and so they must believe in something, desire something, strive for something; or else they go to pieces, aimless and useless, as completely as does a broad sheet of ice that all at once disappears under the sun and wind of an April day. It does not follow that any school or system of agriculture will command the assent of all; outside of everything that assumes form and comeliness, doubters and unbelievers may always be found; positive affirmation is frequently met by positive denial; new schools or systems may rise in opposition, but still out of the generous rivalry which springs from the differences of honest believers and doubters, some sure progress may be expected.

As no truths can be considered final and complete except in morals, any assertion of principles in agriculture will be found to be somewhat incomplete and erroneous, and therefore this first step means progress, is really an announcement of something better beyond, and will serve to stimulate and encourage intelligent investigation; more than this, it may be confidently anticipated that nothing promises to be so successful in adjusting an economical expenditure of time and labor and money, in such investigation. In no calling is there so much useless expenditure and waste as in the almost endless experimenting of the ignorant farmer, who travels in the same path of failure trodden by his ancestors, and tries for the thousandth time, the old way that has been a thousand times demonstrated to be wrong. We marvel at the persistency with which men in the past dreamed of transmuting the baser metals into gold, or those of to-day, of finding the secret spring of perpetual motion, and yet it is almost paralleled in the daily life of many farmers.

A chart of the ocean serves most the ignorant voyager, and by its aid he may cling to soundings; he who has become familiar with the shore may the most safely venture beyond capes and headlands into the unknown sea. In the broad field of agriculture, where so much still remains to reward the diligent seeker, let inquiry and investigation by all means be encouraged, but always in the right direction and under proper guidance. A precise and definite system, such as is contemplated, gives answer to the myriad questions which are so often asked by old and young; the oracles are no longer dumb—to the young farmer it furnishes a capital better than money; consulting his catechism, or creed; or manual of methods, or book of theory and practice, or whatever you may call the helps our system affords, he is "booked up." The great value of such a system is, that it settles something, there is in fact something more than an approximation to a finality. It will be entirely unnecessary to allude to the vast number of disputed and unsettled points in agriculture, or even to give a single illustration, they rise so readily before the mind of every one. Imagine for a moment the progress that would be made, or success that would follow the physician, or carpenter even, who should start on his round of duty with no more aid from men and things than is afforded from the same sources to the farmer. The carpenter works by line and rule, in a two-fold sense, and is consciously and willingly under bondage to both by the two-fold interpretation, alike the willing slave of the instruments and of the record back of them. No honest and capable builder would venture to erect your house, or even construct an entablature for it, except in strict conformity to some well known order of architecture. For 1800 years the common house door has borne the cross of Christ in obedience to this law. Is it any more difficult for some suitable tribunal to settle the different processes of the farmer, or more unreasonable to expect the same willing and intelligent conformity to them?

So, too, the physician surrenders his own will to constituted authorities, nor does he dare to go outside the prescribed limits of the books and schools, unless in emergencies, or at the risk of pains and penalties in property and reputation. Can it be that the living, moving body of man, with its fine and delicate organization can be brought under bonds to certain fixed rules of treatment, and that the dull, senseless, inert earth cannot be? that it is easy to prescribe appropriate food and remedies for the one, and not for the other? that the necessary adaptations can be made to nerve and brain and temperament, but not to soil and climate and condition?

The analogy existing between the body and the earth, the system of medicine and a system of agriculture, might be traced still further, and great aid derived in the introduction and establishment of the latter. A closer examination discovers the existence of a suggestive parallelism, and by the instructive lesson all apprehended difficulties and objections to a system of practical agriculture would be done away. The questions, How shall it take shape, in what likeness shall it appear, and with what body shall it come? need not be raised; nor need we wait till it be proclaimed by sound of trumpet, or as a creation of statute law. Every list of fruits or vegetables, recommended by competent individuals or associations, every breed of animals tried and pronounced best for certain localities, every process or invention or suggestion commended or condemned, will mark successive steps in this progressive movement. Without doubt the most effective agencies can be found in organized bodies; yet the work may be considered well begun when a few earnest and intelligent workers have faith enough to see fulfillment in the not far distant future, and to set their faces to the front for a forward movement.

AFTERNOON.

After the performance of some business matters, the regular business of the public session was a paper on

Farming as a Profession.

BY J. W. LANG, MEMBER FROM WALDO COUNTY.

At our last meeting, held at Houlton, I heard the farmer's calling alluded to by some high in authority, as a "profession;" I also heard the taste that would thus seem to strain and put on airs criticised by others equally the peers of those using the expression. In seeking a way out of the quandary, I consulted my dictionary for a definition of the word, and found it thus: "Profession—act of professing; a calling; a vocation; an employment requiring a learned education." Simply this and nothing more; and the train of thought this awoke may form some of the points I propose to present at this time, and let me hope these points may be sharp enough to prick through the dead hide of slothful professional farmers, thereby stirring them to combat the sentiments held forth, or to "put their shoulder to the bow" to pull our agricultural masses to a higher stand-point. But let us refer to the dictionary again: "an employment requiring a learned education." What does "learned" mean? Our authority says, "Learned, having learning; knowing;" and defines learning as "skill in science," &c. Education it tells us is "Instruction, nurture, act of educating," &c. All very good. Now put this all together and we find that profession means an employment requiring knowing how, instruction, nurture, and is also the act of educating. Really is not the farmer's every day activities asking, imploring demanding, forcing all this? Then why deny the man that tills the soil this expression, and give it all to the teacher, the minister or the doctor and the lawyer? Does not the farmer train and teach his animals, prune his vines, uproot vicious weeds, and lead his crops in the way they should go—to market at least? Don't he drug and physic his soil with doses Esculapius never dreamed of, and has he not a stock of *patience* that would be any M. D.'s fortune? Don't he plead at the bars, isn't he a justice of the peas, and don't he loaf at the corner grocery as much as lawyer Skinflint? Don't he cheat his acres, fleece his flock, use the rod, and wear a tall hat Sundays? And yet we, some of us, would deny him the simple title of *profession!*

But we were to speak of farming as a profession, and try to show that it has not as yet reached a level with other professions that should be subordinate—are really so—but from apathy of the farmer are allowed to become uppermost and ruling. We also propose to show that agriculture may speedily attain her rights, benefits, and her immunities, if we, her followers, are but true to her and to our own interests. Already the notes of reform are bourne to our ears by every passing western breeze. Our own New England is waking up and eager to join her relatives of other sections in the great work at hand. The chains that the farming classes have quietly submitted to be riveted upon them, that were forged with their consent through apathy and inaction, they are being burst asunder as did Sampson the green withes when his strength returned. Grasping monopolies that have grown up, if not like Jonah's gourd in a night, have nevertheless grown to huge proportions and grinding exactions, the farmers—the producers—are battling armed with right, and the weight truth gives every cause in which it is pitted against error. Are we so free, so exempt, so happily situated, that we have no interest in this "Irrepressible conflict" of capital against labor, of monopoly against individual rights, of the producer against the consumer, that we put the issue aside, and refuse to aid the cause? If so we deny our profession, seal our doom, accept the taskmaster, and become, as we deserve to be, serfs!

Why is it that every class in the community seem to be thriving, as a whole, except the farmers? Why are our villages and cities able to show such uniformly neat, tasteful and elegant residences? Why are the citizens of such better dressed, fed and lodged, and do less manual labor in order to secure this than the farming community? These questions arise as we journey over our State and see the villages, the country, and the cities. Where did the wealth come from that built up the village and the city? It came from the farm. It came from the soil. The quarry and the forest have no value in themselves except that which labor delegates. The same is true of the water-power. Labor is the foundation of all wealth, and draws its nourishment from the farm. The husbandman is the custodian of the sustenance of labor, and the elements of trade and manufactures. He produces, others handle and consume and grow rich out of it, while he remains compararatively poor, and why? Because the great mass of farmers are ignorant of their profession, so much so that the same comparative ignorance in any other profession would ruin it. So much so that the farmer is willing to take advice in farming from the doctor, the lawyer, the minister, the teacher, the merchant, and the mechanic, and they are often his superior in knowledge of his profession, though his inferior in muscle. There is something beyond the routine—

"To plow, to sow,
To reap, to mow,"

in farming as a profession. There is something beyond ability to produce good crops, breed and feed good stock, make good butter and cheese, or make and save manure, that if not known and practiced will effectually blockade the pathway to success, for what avail is it to produce when prices received are only the cost of producing, or a trifle below, at best but little above? The farmer must *control* prices by knowledge of crops, of producing, and knowledge of farming as a profession. Is it a wonder our sons and daughters leave the farm when both ends of every trade are in the hands of the middlemen. We go to market and inquire, first, *what our products are worth.* We know what they have cost, or ought to, and should know what we can sell for, *and should sell for no less.* But we first ask "what will you give for what we have brought, and what will you take for what we want in exchange." Could any other manufacturer live at this risk and rate? Would anybody except the farmer remain in a business that he had no voice in making prices on what he had to buy? Our boys and girls see this and are too smart to settle down tied hand and foot by consumers, content to toil like galley slaves for the exacting task-master of every other profession. It was told us at our last meeting by one who ought to know, that farming paid the least per cent. for labor and capital invested, of any employment or business known. He closed with the consoling remark, that notwithstanding this, 93 out of 100 farmers die solvent. We supposed by this that they began with nothing and held their own well; or that no one would trust them but to very limited extent! Don't this cud, well chewed, give out some sweet morsels of comfort? "Farming is the poorest paying business known!" And who can deny it? A life of toil, of privation perhaps, from "Early morn till dewey eve," year in and year out and no hope of reprieve, knowing every day and every hour, it is "the poorest paying business known!" The tradesman can dress in his broadcloth, can loaf and smoke, and hunt and fish, and visit, can ride in his costly carriage behind a 2-40 nag, while you follow the plow, dig the rocks, gather the harvest, or shovel manure, rough, dirty, and bearing with you wherever you go the unmistakable marks of "countryman" and *farmer*. You beat the bush and he catches the bird, and then won't divide! I am here to ask you to take such a course as will oblige him to divide, that shall compel him to raise his own bread, or pay you a just price for doing it. I am here to ask you to stand up for your rights, get a better knowledge of your profession, and combine for mutual defense. I would cast no reproach upon your and my own calling, or picture imaginary evils. But I must present the case as it is. Are you content to let it remain "the poorest paying business known," resting on the 94 chances in the hundred that you die solvent?

Will some farmer tell us why more hours' labor should be required to support a family on a farm than anywhere else? Will some one tell us why farm products cannot wait for sale until they are wanted, as well as all other things? Will some one tell us how it is that those farm products that were all used up, not a pound or bushel of which rotted or was wasted for want of consumption, are often so much in excess of their demand that they bring next to nothing? Will any one tell us why a business which requires a capital of three to five thousand dollars, with skill and a long apprenticeship to learn it, and 14 hours a day to labor and to look after it, should not pay as much dividend as the hand-cart or the wheelbarrow with a man behind it?

Will any one tell us why, when one man holds in his hand that which another man will die for want of if he does not get, that the man who holds it should beg and plead for the other man to take it? Will some one explain how it is, the corner grocery man knows so much better what it is worth to raise a bushel of potatoes than the man who did it? Don't ever again call farming an independent occupation, or even the one that comes nearest to it, till the farmer gets independence enough to set his own prices on his own products. No other profession is sunk so low in abject servitude, and no other class submit to such degredation.

It is useless to seek financial success on the farm so long as the incubus of prices made for farm products by other classes is submitted to. In vain the farmer may double his diligence, increase his flocks and herds, gather more and richer fertilizers, extend the breadth or the product of his crops, deny himself and family the comforts and the luxuries they are entitled to—he is fast in the stocks of made prices. He has as little to do with them, except to dole out his products and receive just what others are pleased to give, as has the man in the moon. In vain may we counsel together about any of the farm industries, for it is as water spilled on sand, of no avail. We must first grapple with this great question and bend our energies for the elevation of farming as a profession, till it stands shorn of no right accorded to any other calling. This is the duty of the hour—the *one thing* needful, and a truly Herculean task that is set for us—not individually but altogether to do. We must band together for mutual offence and defence, work together, and in the club-room, at the fair, at the fireside, and last, not least, *at the polls!* Send no men to represent you, no matter where, except your best, and men of and among you. Send no man to Legislature or to Congress whose hands are not familiar with the occupation you gain your living by; send him fresh from the farm, strong and sturdy, and who will represent *you*, not *himself*, in the halls of legislation. Send no more starvling lawyers, greedy gourmands, or fossil politicians; these are the material for "salary grabbers," who make laws there is no call for, and who do not know what legislation is needed, and do not care. Cut through old political organisms and stand fair and square on the sound platform of your rights, your interests, (too long heretofore ignored), and your sterling manhood and good common sense. Never mind the stigma of "sorehead," "bolter," or "turncoat," but stand firm to the *farmers' ticket*, and see whose head will be sorest after election, who is "bolted" from the public stalls, and whose coat is the one right side out. You may call this incendiary talk; if so, I hope it may kindle into such a flame that will consume all false pretences, purify the gold from the dross, and light up the old Pine Tree State to a showing of her true and best interests.

Farming as a profession, and as a business, is not only cheated by the middle-man making prices which are not gauged by want and supply, but by his schemes of speculation to which the farmer submits as tamely as the whipped cur to the lash; but it is cheated in the fact that it is heavily overtaxed as compared with all other professions. The farmer's property in real estate and stock of the farm lies spread out, and all may see, and nothing can be hidden. Very few farmers have anything else. The farm, and the stock upon it are taxed to the uttermost farthing, while in the same town thousands of dollars are hidden away from the assessors by other professions, and often but little pains are taken to ferrit it out. How many traders reduce stock through March that their shelves may present a bare appearance of goods, and consequent small account of stock on the first of April may be far below that usually displayed, and the first of May beholds that same store crammed full of merchandize. The farmer can't play these sharp tricks, neither would his conscience allow him to in most cases.

The wild lands of the State are valued by the Board of Valuation (packed for the purpose, we presume) at certainly $10,000,000 less than their worth. The farmers of Maine, with their families, comprise some three-fourths of her population, and own only about 100,000,000 of the State valuation, which cannot be less than $350,000,000. These farmers who comprise three-fourths of the State population, and have two-sevenths of the property of the State valuation only, bear three-fifths of the burden of taxation, when they ought only to bear one-fifth. Two-fifths are crowded upon them by other professions, they thereby escaping the same proportion; and much of this comes of farmers sending other classes to represent them, following political grooves blindly, and getting fleeced in the end.

We frequently see panaceas recommended for "keeping the boys at home on the farm," which are recommended in good faith, and are good in many instances, except the all important and the underlying principle which underlies all farming for profit, namely the obtaining of remunerative prices for farm products. If we are to continue the old practices of letting middle-men rob us, and virtually help them rob our neighbors, by running competition with them in selling every farm product we market. No other trade or profession can afford, will suffer themselves to run competition, for they well know combination and consolidation which keeps up prices is the more profitable way. I repeat, if we are to eternally ruin and keep down prices by competition, by isolation, and by refusing to unite for our best interests, I for one don't want to keep our boys, or girls either, at home on the farm, tied down to ceaseless toil, and doomed to pursue that profession which pays the least for capital and labor invested of any known employment.

But, if on the other hand we are to work together for mutual advantage, if we are to elevate farming as a profession, if we are to take and hold the ground that shall give us just profits, if we are to apply business principles to our calling, and make the pursuits of agriculture, business farming, then I am ready and eager to help replenish our ranks by recruits of the boys we rear.

Then, if we would keep the boys at home, we must keep at home ourselves; give them plenty of work adapted to their capacity and taste. The garden has attractions to boys; our wealth lies in the land, and it must be dug out. Teach the boys they are somebody, and learn them to respect themselves; that literary and public places are open to them if they are fit for and deserve such, and may be attained; that places of honor and trust are open to them, and true manhood is always in demand; the road to eminence is open to them, and we must help them gain it. In very many farming towns only grey-headed men remain upon farms to-day. We must give our boys and girls educational opportunities equal to other classes. Men of mark have usually come from the farm. The man who says farming don't pay, when rightly conducted, goes back on his creator. If it don't pay as conducted now it is because it is robbed of its rights. Men who have robbed the farmer must bring it out and divide; must bring it out and develop the country, not keep it stored away. There is power enough in the hands of those that till the soil to accomplish this, if exerted in maintaining their rights. Encourage the boys; enter stock they help rear and handle, at fairs in their name. Notice them, and give them their share of responsibility and profit of the farm; counsel them and confide in them. Dress your children so they will not feel ashamed of themselves; let them go to proper places of amusement; let them feel the responsibility in earning and spending the money of the farm. Prejudice against farm labor often drives our children from home. Farming, as we have shown, is overtaxed and robbed, and this is why it does not pay as it ought. Educate our boys and girls to help right these wrongs. The man who digs the earth is a true enricher; those who have not learned to work are only half educated. The education our sons receive on the farm enables them to succeed elsewhere. We don't counsel keeping our children at home, unless they and their profession can be respected, is made so no one class should be considered above another. Make home attractive, and do not be penurious in the purchase of fruit trees, flowers, shrubs, plants, pictures, books or papers; judiciously select and abundantly supply.

Franklin asked this question,—and it is worthy of the philosopher—"How shall we live in this country of ours so as to live in it, we and our children after us, forever?" Who of us is solving this grand and vital problem? Who even ever thinks of it? How many even think to plant the seed of the delicious fruit they are eating, that others may eat in years to come? The fact that a man is a farmer, does not render him independent, unless he exercises the perquisites of that calling, and takes advantage of its capabilities.

Undue prosperity to other classes tends to corruption, venality, and decay of the manhood and virtue of any people, when the agricultural classes do not prosper proportionately with them. Turn to ancient or modern history for the proof. Rome, once mistress of the world, is a striking illustration. A recent observer writes, "England, corrupted by industrial and commercial wealth, has lost the bold verility of ancient times. Among the trifling liberties enjoyed by the people of England is the privilege of starving when they can get no work, or when incapacitated from age or disability from working any more." And yet all England is a garden. Her farmers are held up for models to pattern after, her stock is unequalled in the world, and her climate mild and enjoyable. Here, even in "Merrie England," we see that teeming fields and intelligent farming does not raise the farmer and the laborer above abject penury as a whole. Here farming as a profession does not ensure the same returns that other professions do. As our country becomes older, as commercial and industrial wealth accumulates, as monopolies extend their borders, are not we of the United States, and of the State of Maine, sinking gradually, surely to the condition of our brethren in England? Who does not believe that if the associated wealth of this country makes as rapid encroachments on the rights and the substance of the people for the next quarter of a century that it has for the past, that the producers of this country will be as much at the mercy of the moneyed lordlings as are the laborers of England at the present moment? One hundred years ago England raised sixteen million bushels of wheat; to-day she raises one hundred millions a year, and her peasantry go half fed as well as half clothed.

Our brethren of the West have banded together "to fight fire with fire," and organized the whole country into Granges of the Order of Patrons of Husbandry. Already we see granges springing up all over New England; and the initiatory one in our own

State has been established by the enterprising farmers of Hampden. And we hail them bands of hope for the salvation of farming as a profession. In Iowa, where perhaps the patrons have deepest root, and most widely extended branches, their good offices are most apparent. Fifty thousand dollars has been saved the past season to themselves on the one item of farm machinery, and this was on the necessary articles of plows. Granges, through an agent, who is one of their number, buys for all in the grange who wish, and gets them at wholesale rates, or at 20 to 25 per cent. below retail rates. On the purchase of mowing, reaping, threshing and sowing machines, the discount is the same ratio per cent., and probably on these two millions of dollars, that otherwise would have gone into the hands of middle-men, has been saved in the pockets of the farmers. Co-operative buying is no more desirable or profitable than co-operative selling, and when the farmers combine and buy and sell by co-operation then they will buy cheaper their supplies, and sell their products higher; but till then they cannot; there must be unity of action before advantage can be reaped. Isolation, and competitive selling to middle-men, coupled with competitive buying, are evils under which we labor and for which co-operation is a cure.

Wealthy iron and coal-mongers have bought up the coal and iron ore lands of the south, to prevent their being worked to the detriment and competition of their mines in Pennsylvania.

The tax per capita of the Federal Government for the fiscal year ending June, 1873, is just eight dollars and twenty-seven cents for each man, woman and child in the United States. [Proof—there was paid into the treasury $333,738,204; deduct that received from sales of land, $2,382,312, and there remains $310,-855,892, which was received for customs, internal revenue, and other taxes; divide this by the number representing the population of the United States, and this is 40,000,000, and we have $8.27 as per capita tax!] Under the administration of Washington the tax was only $1.00 per head for each inhabitant. Under John Quincy Adams the tax was a fraction less than a dollar a head to each person per year. Jackson soon paid off the National Debt and put $40,000,000 into the treasury, which was divided back among the people. The financial history during the first half century of its existence is full of wisdom, as it is now full of warning. We conscientiously believe, with American farmers it is reform or ruin. Cannot some farmer be found to succeed the illustrious one of Mt. Vernon, just one hundred years after the declaration of our independence?

When we see monopoly all about us, when we find the rights and immunities of our calling yearly hemmed in to a narrower circle, when we feel the consequent privations in our homes, by our firesides, and in our pockets, shall we not all as one man rise up to battle for our rights, assert our manhood, and secure just recompense for our toil? Will we not at once join hands with our struggling but half victorious brethren of the West, and press on to victory that shall be full and complete? Shall we not *all* unite and render farming a profession in every sense—not only one of thrift and honor, but also one of emolument and financial prosperity?

After the reading of the paper, Hon. E. Wilder Farley of Newcastle, a former member of the Board, was called for and addressed the Convention. He spoke of the local farming interests of Lincoln county, of her adaptations for certain kinds of farming, and believed we should prove reasonable theories by practice, using judgment as to the climate, soil and other peculiarities and conditions. Our farmers should grow those products adapted to our soil, climate and markets. He spoke at some length on the subject of taxation, and its unequal bearings upon farmers, and believed with the views of the paper just read that taxes should be fairly and equally assessed. His vigorous and practical remarks were warmly applauded.

Isaac T. Hobson, Esq., of Wiscasset, made some very candid, earnest and thoughtful remarks on the agriculture of Maine, and on our position as a farming State. He showed by a very clear statement of figures, that in the yield of corn Maine exceeds the average production per acre of the New England States, and the average value per acre of the six largest corn producing States outside of New England; that in the yield of wheat Maine exceeds the average yield of the six largest wheat growing States, viz: Pennsylvania, Ohio, Illinois, Indiana, Wisconsin and Iowa, by more than two bushels per acre, and the average value by more than $14 per acre; that in potatoes Maine exceeds the average yield and value not only of New England, but of the six largest potato growing States outside of New England; that in the matter of hay our State takes high mark, and also in oats it exceeds the value per acre of the six largest oat producing States out of

New England. From these facts he argued that agriculture in Maine, carried on with that intelligence and business skill which our farmers are able to put into it, ought to be one of our most remunerative pursuits. There is more intelligence and brain force among our farmers than is found among the farmers of most other States; in proof of which he cited the fact that all through the West it is the men of Maine who are found to be leaders in the chief business enterprises. How could our State have stood the strain she has been doing in sending her best men away, had we not had good material of this kind left? Such men as these are worth thousands of dollars apiece to us, and if they remain at home their influence must be felt in making our agriculture better, and our State richer. He closed with some forcible remarks deprecating the extravagance of the times, and attributing to this much of the unnecessary, burdensome taxation under which the people are laboring.

Remarks were also made by Col. Orrin McFadden of Wiscasset, and by Messrs. Colbrun, Shaw, and others of the Board, after which the meeting adjourned.

EVENING.

The Convention assembled at 7 o'clock, the Court House being crowded to its fullest capacity. The lecture of the evening was delivered by Hon. Charles L. Flint of Boston.

A Hundred Years' Progress of American Agriculture.

BY CHARLES L. FLINT, SECRETARY OF THE MASSACHUSETTS BOARD OF AGRICULTURE.

The Centennial Celebration, to take place in the city of Philadelphia in the year 1876, is to be a memorial of the struggles, the sacrifices, the heroic endurance, and the triumphs of our fathers in founding a free government, claimed to be the highest type of civil polity which the world has ever seen. As the time draws nigh, this grand occasion appeals to the pride, to the patriotism, to the reverence for the past, to the memory of the dead, to the highest and most unselfish feelings of every American heart, to make it a success, and, beyond all question, the grandest event of the sort which mankind has ever beheld. Anything short of this will fail of its purpose.

It is true the happiness and prosperity of a nation depend upon the union and the harmonious development of every variety of industrial pursuit; but the groundwork and the pillar of civilized society, on which its prosperity, its solidity and its glory must ultimately rest, is agriculture, the production of the means of sustaining a rapidly growing population. Commerce draws its life-blood from this; manufactures grow out of it. "They all stand together," as Webster said, "like pillars in a cluster, the largest in the centre, and that largest is agriculture."

A glance at the history of this great industry in the United States will therefore be found to possess much that is interesting, instructive and useful.

BEFORE THE REVOLUTION.

There is little need to look beyond the period of the Revolution in search of the first steps at any real progress in the agriculture of this country. The first European settlers upon these shores had to begin life anew, as it were, in the midst of untold hardships, privations, and dangers. They found a climate widely different from any which they had known before; a soil which the foot of civilized man had never trod, and natural productions which they had never seen. They brought with them little or no experience which could have fitted them for the rude struggle with nature in which they were about to engage. This they were forced to gain, painfully and laboriously enough, with the axe in hand to clear the forest, and the gun by their side to defend their lives. That progress in agriculture should have been slow is not, therefore, a matter of surprise. We must rather wonder that they got on at all in the struggle for life.

The different colonies, no doubt, had a somewhat different experience. The winters of Virginia were milder than those of New England, and the settlers on the James River suffered less from this cause than those farther north, but all were alike surrounded by a wilderness infested by savage men and by wild beasts, always ready to prey upon their live stock or to destroy their crops. For some months after landing there were, indeed, no cattle to be destroyed. The first animals imported into the colonies were those that arrived at the James River plantation some time previous to 1609, the exact date of their arrival not being known. In 1610 several cows were landed there, and a hundred more in 1611. The first may have been brought by the early adventurers, either at the time of their first voyage, in 1607, or soon after, but the latter additions probably came from the West Indies, being the descendants of the cattle brought to America, in his second voyage, by Columbus, in 1493.

So important was it considered that the cattle should be allowed to increase and multiply that, according to old authority, an order was passed forbidding the destruction of domestic animals, on pain of death to the principal, burning of the hand and cropping the ears of the accessory, and a sound whipping for the concealer of the facts. Such being the nature of the encouragement to the raising of stock, the number of cattle in the Virginia colony increased to about five hundred head in 1620, and to about thirty thousand in 1639, while the fact that the number had decreased to twenty thousand in 1648, would seem to indicate that the restriction had been removed. Many also had been sent to the colonies further north.

FIRST CATTLE IN NEW ENGLAND.

The first cattle that were brought to New England arrived at Plymouth in 1624, in the ship Charity. They were imported for the colony by Gov. Winslow, and consisted of three heifers and a bull. They possessed no uniformity of color, being black, black and white, and brindle. In 1626 twelve cows were sent to Cape Ann, and in 1629 thirty more, while in 1630 about a hundred were imported for the "governor and company of the Massachusetts Bay in New England." In the meantime a hundred and three cattle and horses were imported into New York from the island of Texel, Holland, by the Dutch West India Company; and in 1627, the settlements along the Delaware were supplied by the Swedish West India Company, so that by the year 1630 the number of horned cattle in all the colonies must have risen, by importations and by natural increase, to several thousands, to which were added in 1631, 1632, and 1633, many yellow cattle from Denmark, brought over by Captain John Mason, who was engaged in extensive lumbering operations along the Piscataqua river, in New Hampshire.

These were the sources from which our common or "native" cattle sprang. The earlier importations were undoubtedly more extensive than any subsequent ones, the colonists relying upon the natural increase to supply their wants, but there is historical evidence to show that there was more or less interchange of stock between the various colonies at an early date, and that this resulted in a mixture of blood, such as we find it now in our common stock.

We are to bear in mind, also, that the stock of the mother country and of various other countries from which the supplies of the colonists were drawn was not at that time improved as we find it in the present day. It was long before the interest in the improvement of stock had been awakened, and it is a historical fact that the ox of that day was small and ill-shaped, quite inferior to the ox of our own time; that the sheep has undergone a vast improvement, both in the fineness and value of its wool and the size and quality of the carcass, within the last century; that throughout the earlier part of the last century the average gross weight of the neat cattle sent to Smithfield market did not exceed three hundred and seventy pounds, and that of sheep twenty-eight pounds, while the average weight of the former is now over eight hundred pounds and of the latter over eighty pounds. Nor is it probable, on account of the high price of cattle at that period, and the risks to which they were exposed, that the colonists obtained the best specimens then know. In fact, the difference in animals, and what are now considered the best points and the highest indications of improvement, were nowhere understood or appreciated two centuries ago. That the cattle of the early settlers were poor of their kind, as compared with our ideas of the quality of similar animals, is, therefore, plain enough to be understood.

TREATMENT OF CATTLE.

In addition to this, the means of keeping stock of any kind, in such a manner as to secure any improvement in it, were not at hand. The early colonists had no notion of raising grass or hay for their animals by artificial means. They relied chiefly, and almost from necessity, upon the production of natural meadows and the grasses upon the salt-marshes along the sea-shore. The cattle, like their owners, had to browse for their lives, and through the long northern winters to live upon poor and miserable swale hay. Death from starvation and exposure was not uncommon, and sometimes an entire herd fell victims to the severity of the season. The most terrible droughts were of frequent occurrence, and caused great distress. The Indian corn and the grasses perished to such an extent that both grain and forage for stock, at times, had to be imported from England, to keep the people from starving, and to keep the cattle alive, even so late as 1750.

Of the mode of keeping cattle in the Virginia colony, Glover, a contemporary, as appears by the Historical Register, says: "All the inhabitants give their cattle in winter is only the husks of their Indian corn, unless it be some of them that have a little wheat straw, neither do they give them any more of these than will serve to keep them alive; by reason whereof they venture into the marshy grounds and swamps for food, where very many are lost." And Clayton, another contemporary authority, says that "they neither housed nor milked their cows in winter, *having a notion that it would kill them.*" A still later Swedish traveler, Kalm, after whom our beautiful mountain laurel, the Kalmin, was named, in speaking of the James river colony, in 1749, says:

"They make scarce any manure for their corn-fields, but when one piece of ground has been exhausted by continual cropping, they clear and cultivate another piece of fresh land, and when that is exhausted proceed to a third. Their cattle are allowed to wander through the woods and uncultivated grounds where they are half starved, having long ago extirpated all the annual grasses by cropping them too early in the spring, before they had time to form their flowers or to shed their seeds."

This statement will apply with nearly equal force to the other colonists at that date. That the description is strictly correct, I may qucte from a distinguished Virginian, the Hon. James M. Garnett, who, in 1842, said:

"Previous to our Revolutionary war, as I have been told by the farmers of that day, no attempts worth mentioning were made to collect manure for general purposes, all that was deemed needful being saved for the gardens and tobacco lots, by summer cow pens. These were filled with cattle such as our modern breeders would hardly recognize as belonging to the bovine species. In those days they were so utterly neglected that it was quite common for the multitude starved to death every winter to supply hides enough for shoeing the negroes on every farm. This was a matter so generally and constantly anticipated, that my own grandfather, as I have heard from unquestionable authority, was once very near turning off a good overseer because cattle enough had not died on the farm of which he had the supervision to furnish leather for the above purpose. When any cattle were fattened for beef, almost the only process was to turn them into the cornfields to feed themselves. Sheep and hogs were equally neglected."

BEGINNING OF GRASS CULTURE.

In order to realize still more fully the condition of the early settlers, so far as the treatment of their stock is concerned, we are to consider that no attention was paid to the culture of the grasses, even in England, in the early part of the seventeenth century, and that very few of the roots now extensively cultivated and used as food for stock had been introduced there. The introduction of red clover into England did not take place till 1633; that of sainfoin, not till 1651; that of yellow clover, not till 1659; that of white or Dutch clover, not till 1700. Of the natural grasses, our well-known timothy was first brought into cultivation in this country, and it was not cultivated in England until the year 1760. The culture of orchard grass was first introduced into England from Virginia in 1764. There is no evidence of any systematic or artificial cultivation of grasses there until the introduction of the perennial rye grass in 1677, and no other variety of grass-seed appears to have been sown for many years; not, indeed, till toward the close of the last century, upon the introduction of timothy and orchard grass. The *Edinburgh Quarterly Journal of Agriculture,* the highest authority in such matters, says the practice of sowing grass-seed was never known in Scotland previous to the year 1792. Such being the case, in a climate so severe as that of Scotland, it is not at all surprising that the custom in this country dates back only little more than a hundred years.

It is a somewhat curious fact that the modern improvements in cattle in England did not begin till after the systematic culture of the higher qualities of natural grass. It is not strange, therefore, that the colonists here, who had vastly greater hardships to encounter in the practical operations of the farm, were slow to recognize the possibilities of improvement, or that their cattle, poor as they must have been at the outset, continued rather to depreciate than to improve in quality until sometime after the Revolution. The number increased, however, as the range of pasturage or browsing grounds was comparatively unlimited, so that the keeping of stock may be said to have assumed some importance in the older settlements, by the middle of the last century, when it had become comparatively safe from molestation.

EARLY FARM IMPLEMENTS.

One of the chief obstacles the early colonists had to encounter, to add to the hardships of their lot in the cultivation of the soil, was the difficulty of procuring suitable implements. A few, no doubt, were brought with them, but all could not obtain them in this way, and the only metal they had was made of bog-ore, and that was so brittle as to break easily and put a stop to their day's work. Most of their tools were made of wood, rude enough in construction, and heavy of necessity, and little fit for the purpose for which they were made. The process of casting steel was then unknown. It was discovered in Sheffield, England, but not till the middle of the last century, and then kept a secret there for some years. The few rude farming tools they had were for the most part of home manufacture, or made by the neighboring blacksmith as a part of his multifarious business, there being little idea of the division of labor, and no machinery by which any particular implement could be exactly duplicated.

PLOUGHS.

But it is recorded, that as early as 1617 some ploughs were set to work in the Virginia colony, for in that year the governor complained to the company that the colony "did suffer for want of skilled husbandmen and means to set their ploughs on work; having as good ground as any man can desire, and forty bulls and oxen, but they wanted men to bring them to labor, and iron for the ploughs, and harness for the cattle. Some thirty or forty acres we had sown with one plough, but it stood so long on the ground before it was reaped it was most shaken, and the rest spoiled with the cattle and rats in the barn." A contemporary resident of that colony says, in 1648, "We have now going near upon a hundred and fifty ploughs," and they were drawn by oxen. In 1637 there were but thirty-seven ploughs in the colony of Massachusetts Bay, and for twelve years after the landing of the Pilgrims the farmers had no ploughs, but were compelled to tear up the bushes with their hands, or with clumsy hoes and mattocks. It afterwards became the custom in the Massachusetts colony, for some one owning a plough to go about and do the ploughing for the farmers over a considerable extent of territory, and a town sometimes paid a bounty to any one who would keep a plough in repair for the purpose of going about to work in this way. The massive old wooden plough required a strong team, a stout man to bear on, another to hold, and a third to drive. The work it did was slow and laborious. The other tools were a heavy spade, a clumsy wooden fork, and later a harrow. I have had in my possession specimens of these forks, two hundred years old. It is difficult to see how they could have been made to do very effective work.

ON THE MISSISSIPPI.

The ploughs used by the French settlers upon the "American bottom," in Illinois, from the time of their occupation, in 1682, down to the war of 1812, were made of wood, with a small point of iron fastened upon the wood by strips of raw hide, the beams resting upon an axle and small wooden wheels. They were drawn by oxen yoked by the horns, the yokes being straight and fastened to the horns by raw-leather straps, a pole extending back from the yoke to the axle. These ploughs were large and clumsy, and no small plough was in use among them to plough among corn till about the year 1815. They used carts that had not a particle of iron about them.

Among the forms of the old wooden plough that achieved something more than a local reputation during the last century was that known as the "Carey plough." It was more extensively used than any other, though its particular form varied very much according to the skill of each blacksmith or wheelwright who made it. The land-slide and the standard were made of wood, and it had a wooden mould-board, often roughly plated over with pieces of old saw-plate, tin, or sheet-iron. It had a clumsy wrought-iron share, while the handles were upright, held in place by two wooden pins. It took a strong man to hold it, and about double the strength of team now required to do the same amount of work. The "bar-share plough," sometimes called the "bull plough," was also used, a flat bar forming the land-side, with an immense clump of iron, shaped like half a lance-head, into the upper part of which a kind of colter was fastened, which served as a point. It had a wooden mould-board fitted to the iron-work in the most bungling manner. A sharp-pointed shovel, held with the reverse side up, and drawn forward with the point in the ground, would give an idea of its work. Then there was the "shovel plough," in very general use in the middle and southern colonies; a roughly-hewn stick was used for a beam, and into this another stick was framed, upon the end of which there was a piece of iron, shaped a little like a sharp-pointed shovel. The two rough handles were nailed or pinned to the sides of the beam. A plough known as the "hog plough," was also used in some parts of the country in the last and early part of the present century, so called probably on account of its rooting propensity. Specimens of this plough were taken to Canada in 1808, for use there, which would seem that it was thought to be one of the best ploughs then made. These old forms of the wooden plough continued to be used with little or no improvement till sometime after the beginning of the present century. The wooden plough was liable to rapid decay.

As for most of the other implements of husbandry, they were very few and very rude. The threshing was done with the flail. The winnowing was done by the wind. Slow and laborious hand-labor for nearly all the processes of the farm was the rule, and machine labor the exception, till a comparatively recent date. Indeed, it has been said that a strong man could have carried on his shoulders all the implements used on his farm, except, perhaps, the old wooden cart and the harrow, previous to the beginning of the present century, and we know that the number as well as the variety of these tools was extremely small.

EARLY MODES OF CULTIVATION.

Of the crops raised by the early settlers, and upon which they relied chiefly for sustenance, Indian corn, pumpkins, squashes, potatoes, and tobacco, were mostly new to them. Few Europeans had ever seen them cultivated previous to their arrival here, but necessity soon showed their value, and from the Indians they learned how to grow them. It was a method followed with little change down to the opening of the present century. It was to dig small holes in the ground about four feet apart, put in a fish or two, drop the seed, four or six kernels of corn, and cover it up. The instrument used by the Indians for this purpose was made of a large clam-shell, but the colonists soon substituted the heavy mattock or grub-hoe. The James River settlers, under the tuition of the Indians, began to raise corn in 1608, and within three years after they appear to have had as many as thirty acres under cultivation. The Pilgrims found it under cultivation by the Indians on their arrival at Plymouth, and began its culture in 1621, manuring as the Indians did, with alewives, then called "shads." An early chronicle of the Pilgrims says, "According to the manner of the Indians, we manured our ground with herrings, or rather shads, which we have in great abundance, and take with great ease at our doors." And later: "You may see in one township a hundred acres together set with these fish, every acre taking a thousand of them; and an acre thus dressed will produce and yield so much corn as three acres without fish." In 1623 the drought was so severe and long protracted that the corn, planted very shallow and manured with these fish in the hill, soon began to wither and curl up, and on the higher lands it was ruined. And so in many years succeeding.

WHEAT.

Wheat was first sown by Gosnold, on Cuttyhunk, one of the Elizabeth islands, in Buzzard's Bay, as early as 1602, when he first explored the coast. In Virginia, the first wheat appears to have been sown in 1611, and its culture continued to increase there till, in 1648, it is recorded that there were several hundred acres of it. But it soon after fell into great disrepute as a staple crop, as the tobacco culture was found to pay a great deal better. For more than a hundred years after it was but little cultivated in that colony. Wheat was early cultivated by the Dutch colony of the New Netherlands, for it is recorded that in 1626 samples of that grain were taken to Holland to show what could be done in the new country. It is probable that the Plymouth colony began its culture within two or three years of the settlement, though there appears to be no distinct record of it until 1629, when wheat and other grains for seed were ordered from England.

But though the cultivation of wheat was begun almost simultaneously with the settlement of the several colonies, it did not attract very great attention for more than a century, Indian corn, and later, potatoes, being relied upon for food to a much greater extent. It was soon found to be subject to blast and mildew in the eastern colonies. In July of 1663, "the best wheat," according to an old manuscript diary that I have consulted, "as also some other grain, was blasted in many places so that whole acres were not worth reaping. We have had much drought the last summer, and excess of wet several other springs, but this of blasting is the most general and remarkable that I yet heard of in New England." But it was "heard of" often after that, and to such an extent that it never became a very prominent crop in that part of the country. It is a matter of history, that there never was a time in the eastern colonies when it was a sure and reliable crop, unless it be so now with our improved modes of tillage, deep ploughing, and thorough drainage.

RYE AND BARLEY.

Rye and barley were also introduced and cultivated by the early settlers, and it soon became the almost universal practice to mix the meal of the former with Indian meal in the making of bread. It is known to have been the custom as early as 1648, and probably it began at a considerably earlier date, perhaps as early as 1630. Oats were also introduced at the same time with rye. Captain Gosnold raised them with other grains on one of the Elizabeth islands, on the southern coast of Massachusetts, in 1602. Though much more extensively grown than rye, they appear to have been used chiefly as food for animals. The practice of sowing grass seed, as we have seen, never became common in the colonies. It was not generally adopted till about the time of the Revolution, though here and there an individual farmer may have tried to see what he could do to help Nature clothe the surface of his old fields, but any general or systematic attempt to cultivate grasses for hay was wholly unknown and unthought of. This culture was of recent origin in this as in the mother country, and is the result of modern improvement in agriculture.

The culture of the potato, though introduced early in the history of the colonies, being among the seed ordered for the Plymouth

Colony as early as 1629, was not recognized as a very important and indispensable crop till about the middle of the last century, when it had come to be widely known and esteemed as an article of food, for we know that in 1747 about seven hundred bushels were exported from South Carolina. It was the sweet potato that first came to be regarded as a delicacy in England, and the allusions of some rather early English writers undoubtedly refer to this, rather than the common potato.

CULTIVATION OF FRUIT.

Very little attention was paid to the raising of fruits previous to the Revolution, except for the manufacture of cider. The first apples were raised upon Governor's island, in the harbor of Boston, from which, on the 10th of October, 1639, "ten fair pippens were brought, there being not one apple or pear tree planted in any part of the country but upon that island." The first nursery of young trees in this country was that planted by Governor Endicott, on his farm at Salem, now Danvers, in 1640, and it is related that he sold five hundred apple-trees for two hundred and fifty acres of land. The systematic cultivation of fruit was not common in this country previous to the Revolution, nor did it become so till within the last fifty years. Orchards were set out upon many farms, but they were designed chiefly for cider. Much greater care, however, was taken to raise good fruits in New York, New Jersey, and Pennsylvania, than in New England, and several noted orchards and nurseries existed there in the latter part of the last century and the early part of the present, but they were the exception to the general rule even there. Choice varieties of apples, pears, peaches, and cherries were known only to a few careful cultivators, and the number of varieties of these was quite limited as compared with the present day. Cider was plenty, but its quality was much less regarded than its quantity. It is stated that so late as 1824, there was not a nursery for the sale of apple and pear trees in New England. Trees had to be bought in New York or New Jersey, or imported from abroad. The first horticultural society in the country was established in New York, about the year 1820. It lived but eight or ten years, and then died. The Pennsylvania Horticultural Society was organized in 1827, and the Massachusetts in 1829. The orchard products, according to the last census, have now risen to $48,000,000, and the general culture of fruit is rapidly progressing.

We are now prepared to appreciate the condition of our agriculture at the time of the outbreak of the Revolution. We have seen that the settlers had but poor and inefficient tools, poor and profitless cattle, poor and meagre crops, and poor and miserable ideas of farming. They had no agricultural journals, no newspapers of any kind, and few books, except the old family Bible. There were less than a dozen papers published in the country at the middle of the last century. There was not one in New England at the beginning of that century, but four in 1750, and these had but a very limited circulation in the rural districts. There was little communication from town to town. The facilities for travel were extremely limited. It was before the days of many stages even, and the liberalizing influence which modern travel and social intercourse exert. Everything was favorable to the growth of prejudice and of narrow-minded views.

RESTRICTIONS ON COLONIAL AGRICULTURE.

Moreover, it is to be considered that throughout all the days of the colonies, from the very outset, the policy of the home government was to make the provinces a source of profit to the mother country. It was a rigorous rule that all manufactured articles were to be procured of England. The colonies were not allowed to produce such articles for themselves, or to do anything which should come in conflict with the industry of the old country. But if there were any articles that England was in need of, the industry of the settlers was confined to them, and they could sell them only to England, and buy what they required only of her. They encountered new restrictions at every turn. The grants or charters were issued, in some cases to individuals, in others to companies, and this involved, as it was clearly understood to involve, self-government; but the home government very soon began to claim the right and the power of confirming the several governors. Some of the colonies were forbidden even to cut down pine trees suitable for ship timber, on any pretence. They were denied the right to export wool to any place out of the king's dominions, to sell land to anybody except subjects of the British Crown, to ship any produce except in English vessels, to coin money, to do anything, in fact, which could lessen their dependence upon the mother country. Every new step taken, even in settling and working new lands, was met by some new and burdensome restraint, intended to keep the colonists in leading-strings. A formal act of Parliament, passed soon after the beginning of the last century, denied the right of the colonists to make hats. The home government was very indignant at the custom which the people had of working up their wool and flax into homespun cloth. They were forbidden to manufacture ore beyond the state of pig-iron. Thus the most oppressive restrictions bore upon colonial agriculture, as well as upon colonial commerce and manufactures, from the very outset of the settlements. They finally became so burdensome as no longer to be endured with patience, and led to an open rupture with the home government, commonly known as the Revolution, at a time when the population of the whole country was considerably less than three millions, the general and popular estimate of three millions being supposed to be too high.

During the period of the Revolution farm production was brought to a partial stand-still, and for some years after it was in a state of extreme depression. It took time to recover from the effects of the struggle. Gradually, however, the importance of some effort to develop and improve the agriculture of the country was impressed upon the minds of the more intelligent and public-spirited of the people, men for the most part who were in advance of their time. The result of their deliberations was the formation of societies for the encouragement of agricultural improvement.

ORGANIZED EFFORT.

The South Carolina Agricultural Society was established in 1784; the Philadelphia Society for Promoting Agriculture, in 1785; the New York [city] Society, in 1791; the Massachusetts Society for Promoting Agriculture, in 1792. These were rather city than country institutions. They were very slow in reaching the common people. The average farmer of that day was not up to their standard of thought and observation. Their example, their teachings, their entreaties for aid, their reports and papers, fell comparatively dead upon the mass of the people. Farmers were not to be taught by men who never held the plough. They did not want anything to do with *theories*. Custom had marked out a road for them, and it was smooth and easy to travel, and though it might be a circle that brought up just where it had started, it had the advantage, in the old farmer's mind, that in it he never lost his way. It didn't require any exertion of mind. His comfort, as well as his happiness, was based on a feeling of filial obedience to old usage that was hereditary in his being. It was born in the blood, and ruled him with an irresistible power. His field of vision was bounded and narrow, and his work was strictly *imitative*, so far as he could see, and in no way *experimental*. The old common law, based on precedent, custom, practice, was his guide and his rule. He would be governed by custom, not by reason. If ancient custom was *known*, that was enough for him. It wasn't for him to doubt. To investigate would imply doubt. To investigate was to theorize. Theory is at the bottom of all investigation, and theory was a bugbear in his mind. The logical result—that no improvement could be reached without investigation—had no terrors for him. He seldom read. The *written* word he received with distrust. It might contain principles, and it wasn't principles that he cared anything about, but *practice*. No matter whether founded on wisdom and experience or not, practice was the thing. It seemed to be his opinion that farming could not be improved, though it might be injured by books. Its processes were so peculiar that they could be gained only by tradition.

It is probable that the events and the excitements of the Revolution itself, with the travel, the observation, and the social intercourse which it involved, had much to do with breaking up the impregnable barrier of prejudice and slavery to custom and precedent which ruled so strongly in the popular mind. Great passions which reach and stir up the lowest depths of the nation's heart have a liberalizing and progressive influence. They excite thought and awaken a spirit of inquiry. But that the picture is not in the least overdrawn, is evident from the fact that here and there are a few specimens left to remind us that the leaven which the early societies infused among the people has not yet permeated the entire mass.

PUBLIC EXHIBITIONS.

But time brings its changes. Something more was felt to be needed, and a convention was held in Georgetown, in the District of Columbia, on the 28th of November, 1809, from which grew the Columbian Agricultural Society for the Promotion of Rural and Domestic Economy; and the first exhibition, probably, in this country, was held by that society on the 10th of May, 1810, with the offer of liberal premiums for the encouragement of sheep-raising, &c. Elkanah Watson exhibited three merino sheep in Pittsfield, Massachusetts, in the October following of the same year.

It was an innovation upon old custom, and the occasion of much ridicule and contempt among the farmers of that day and generation; but it was the germ of the Berkshire County Agricultural Society, whose regular exhibitions began the year following, and are believed to have been the first county exhibitions ever instituted in this country.

The Massachusetts Society held its first exhibition at Brighton in 1816, offered a list of premiums, and instituted a ploughing-match; but it appears to have been rather with the design of testing the strength, training, and docility of the oxen than to improve the plough. The plough-maker, however, happened to be there with his eyes open, and there can be no doubt that this and similar exhibitions which soon followed gave a new impetus to the progress of Agricultural mechanics.

CAST-IRON USED.

Improvements in the plough had begun, even before the close of the last century. A patent had been granted for a cast-iron plough to Charles Newbold of Burlington, New Jersey, in 1797, combining the mould-board, share, and land-side, all cast together, and it was regarded by intelligent plough-makers as so great an improvement that Peacock, in his patent of 1807, paid the original inventor the sum of $500 for the right to combine certain parts of Newbold's plough with his own. The importance of this implement was so great as to command the attention and study of scientific men to improve its form and construction, and Thomas Jefferson, in 1798, applied himself to the task, and wrote a treatise upon the requisite form of the mould-board, according to scientific principles, calculating the exact form and size, and especially the curvature to lessen the friction. I have in my possession his original manuscript of this essay, containing his drawings and calculations.

But these changes and improvements were not readily adopted by the farming community. Their introduction was far slower than any new invention that promised to economize labor and do better work would be at the present day. Many a farmer clung to his old wooden plough, asserting that cast-iron poisoned the ground and spoiled the crops. He required an ocular demonstration before paying his money for an iron plough. It was not so much the weight of the old plough as the form of the mould-board, and the construction of the various parts, that needed correction. Its draught was great, on account of the excessive friction. The share and mould-board were so attached as to make too blunt a wedge. Its action was not uniform, and it was difficult to hold, requiring constant watchfulness and great strength to prevent it from being thrown out of the ground. To plough to any considerable depth it was necessary to have a man at the beam to bear down. The mould-board was often shod with iron to lessen the friction and prevent wear, but it was usually in strips, often of uneven thickness, so that the desired effect was not always attained. The cast-iron plough remedied these serious defects, and secured at least some greater uniformity in construction. The modifications of the mould-board, which resulted from a better understanding of the true principles of construction, have enabled the farmer to do vastly better work, and a greater amount of it in the same time, and at a less expenditure of strength, and to reap larger crops as the result of his labor, while the cost of the implement, considering its greater efficiency and its durability, is less by half, probably, than the old wooden plough.

WHAT WE HAVE GAINED.

There can be no doubt that the saving to the country from these improvements in the plough, within the last half century, amounts to many millions of dollars a year in the cost of teams, and some millions in the cost of ploughs, or that the aggregate of crops has been increased by them many millions of bushels. The plough has also been modified to adapt it to a much greater variety of soils. In the mode of manufacture, too, a vast improvement has taken place. Half a century ago it was made sometimes on the farm, sometimes by the village blacksmith, and the wheelwright. The work is now concentrated in fewer establishments, which make it a specialty. In Massachusetts, for example, in 1845, there were seventy-three plough-manufactories, making 61,334 ploughs and other instruments annually, while in 1855 the number of establishments had decreased to twenty-two, which made 142,686 ploughs, valued at $707,176.86, annually. A very large plough-factory was established in Pittsburg, Pennsylvania, in 1829, and, as early as 1836, it was manufacturing as many as a hundred ploughs a day, by the aid of steam-power, to supply chiefly the Southern market. This establishment first made a hill-side revolving-beam plough, and the iron-centre plough, and more recently it has made a vast number of steel ploughs, adapted to the prairie soils of the

West. Another factory, in the same city, as early as 1836, made ploughs at the average rate of 4,000 a year. The two factories made 34,000 ploughs a year, valued at $174,000.

There are now many other still larger factories, some of which make from ten to twelve hundred different patterns, adapted to every variety of soil and circumstances.

No one can for a moment doubt the vast superiority of the best of the ploughs of the present day over the old forms in common use half a century ago. They have greater pulverizing power; they are less liable to clog; while in lightness of draught, ease of holding, durability, cheapness, perfection of mechanical work, quality of material, completeness with which the surface is inverted and the weeds or stubble buried, uniformity of wear, regularity of turning the furrow-slice, and other respects, we have made a vast and unquestionable improvement. In short, mechanical principles are better understood and more intelligently applied. We have combined simplicity of construction with economy of power. A better knowledge of the strength of materials has enabled us to reduce the size of all the parts of farming-tools, and so to avoid the clumsiness of the older style of implements, and, at the same time, to secure much more effective work. We have made some progress, also, in substituting the principle of the spade, or the fork, for that of the plough, as the use of the rotary spader is a sufficient proof. We have made some progress in the application of steam to the operation of ploughing, and the wonderful performances of the steam-plough, in the few instances where it has been tried, have indicated the possibilities of the future, and shown that the time is not far distant when we shall have it in our power to develop the resources of the great West to an extent and with an economy never yet dreamed of.

THE HARROW.

The importance of a complete and perfect pulverization of the soil, to admit of the extension of the roots of plants, and the access of air and moisture, was never more fully realized than at the present time. As it is at best but partially effected by the plough, which crumbles and breaks down the soil simply in the process of turning, something farther has always been required, and the harrow has been used for this purpose, to follow the plough, from time immemorial. With the early settlers this implement, like most others, was made of wood, of simple bars and cross-bars, furnished with wooden teeth. It was usually home-made, rude and clumsy enough. The first improvement was the substitution of iron for wooden teeth, which were afterward pointed with steel, when it was made lighter, so as to admit of being moved more rapidly through the soil.

The changes and improvements of this implement came very slowly, and it is scarcely twenty years since it can be said to have approached perfection. It has now assumed a more compact form and greater flexibility, certain parts of the frame-work being hinged together, so that any part can be lifted or raised without disturbing the working of the rest, while particular forms have been made for special purposes, like the Shares and the Nishwitz, admirably adapted to mellowing the surface of newly broken land without tearing up the inverted sod. The rotary and the smoothing harrow may be mentioned, also, as a vast improvement upon the old styles. These and many other patterns, after which the harrow is made, seem to leave little to desire in the form and efficiency of this most important implement.

SMALLER FARM TOOLS.

A large class of the most valuable labor-saving implements may be mentioned, which are almost entirely due to modern ingenuity, such as the cultivators, the horse-hoes, the grubbers, the drills and seed-sowers, and others of a similar character. By means of the horse-hoe and the cultivator the soil can be frequently stirred among growing crops, at a slight expense, thus enabling them to withstand the effects of drought, giving us, practically, a greater control over the seasons. Many of these smaller machines are wonderfully perfect, and well adapted to the purpose for which they were constructed. And while mechanical invention has been active in this direction, our shovels, spades, hoes and forks have been vastly improved and made more effective, till, for lightness and finish, in combination with strength and durability, they are unsurpassed by any similar tools in any part of the world; while the rapidity with which they can be manufactured, and the consequent cheapness with which they are sold, are among the marvels of modern mechanics.

The manufacture of these important articles was undertaken, to be sure, even before the Revolution, and as early as 1788 the iron-plated shovels made in Bridgewater, Massachusetts, gained the credit of being superior in workmanship to the best imported shovels of that day, and they undersold them at the same time. A large shovel factory was established at Easton, Massachusetts, about seventy years ago, and as early as 1822 it was making about 30,000 shovels a year. By improvements in the process of manufacture, the patents for which were issued in 1827, the proprietor gained so high a reputation and such an increase of business, that by 1835 he was making about forty dozen shovels and spades per day, each shovel, in the systematic division of labor, passing through the hands of no less than twenty different workmen. The same establishment can now produce over two hundred and fifty dozen a day.

THE WORK CONCENTRATED.

It may be stated that cast-steel shovels were first patented in 1828, but cast-steel hoes were made by two different establishments in Philadelphia as early as 1823. Shovels and hoes were made at Pittsburg, Pennsylvania, in considerable quantities previous to the year 1803, and by the year 1831 steel hoes were made there so as to be sold at the rate of $4.50 a dozen, only half the price of the iron hoe ten years earlier. Two factories in that city, in 1836, were able to make steel hoes at the rate of 1,600 dozen, besides 8,000 dozen shovels and spades a year, in addition to a large quantity of other tools; while, in 1857, four large establishments there made 32,000 dozen hoes and 11,000 dozen planters' hoes, a half million dollars' worth of axes, and large quantities of picks, mattocks, saws, &c. These facts are alluded to simply to show how this industry has become concentrated in large establishments, where perfection can be attained by the division of labor. There are many similar establishments in various parts of the country.

But perhaps the most important of modern agricultural inventions are the grain-harvesters, the reapers, the mowers, the threshers, and the horse-rakes. The sickle, which was in almost universal use till within a very recent date, is undoubtedly one of the most ancient of all our farming implements. Reaping by the use of it was always slow and laborious, while from the fact that many of our grains would ripen at the same time, there was a liability to loss before they could be gathered, and practically there was a vastly greater loss from this cause than there is at the present time.

THE CROWNING GLORY.

It is not, therefore, too much to say, that the successful introduction of the reaper into the grain-fields of this country has added many millions of dollars to the value of our annual harvests, by enabling us to secure the whole product, and by making it possible for the farmer to increase the area of his wheat fields, with a certainty of being able to gather the crop. Nothing was more surprising to the mercantile community of Europe than the fact that we could continue to export such vast quantities of wheat and other breadstuffs through the midst of the late rebellion, with a million or two of able-bodied men in arms. The secret of it was the general use of farm-machinery. The number of two-horse reapers in operation throughout the country, in the harvest of 1861, performed an amount of work equal to about a million of men. The result was, that our capacity for farm production was not materially disturbed.

The credit of the practical application of the principles involved in this class of machines undoubtedly belongs to our own ingenious mechanics; for though somewhat similar machines were invented in England and Scotland many years ago, they had never been proved to be efficient on the field, and had never gained the confidence of the farmers, even in their neighborhood; while the patent issued to Obed Hussey of Cincinnati, in 1833, and another issued to McCormick of Virginia, in 1834, not only succeeded in the trials to which they were subjected, but gained a wide and permanent reputation. Many patents had been issued in this country, previously, the first having been as early as 1803, but they had not proved successful. Hussey's machine was introduced into New York and Illinois in 1834, into Missouri in 1835, into Pennsylvania in 1837, and in the next year the inventor established himself in Baltimore. McCormick's machine had been worked as early as 1831, but it was afterwards greatly improved, and became a source of an immense fortune to the inventor. He took out a second patent in 1845, fifteen other machines having been patented after the date of his first papers, including that of the Ketchum, in 1844, which gained a wide reputation.

NATIONAL TRIALS.

The first trial of reapers, partaking of a national character, was held under the auspices of the Ohio State Board of Agriculture in

1852, when twelve different machines and several different mowers were entered for competition. There was no striking superiority, according to the report of the judges, in any of the machines. A trial had been held at the show of the New York State Agricultural Society, at Buffalo, in 1848, but the large body of farmers who had witnessed it were not prepared to admit that the work of the machines was good enough to be tolerated in comparison with the hand-scythe. Some thought they might possibly work in straight, coarse grass, but in finer grasses they were sure to clog. The same society instituted a trial of reapers and mowers at Geneva in 1852, when nine machines competed as reapers and seven as mowers. Only two or three of the latter were capable of equalling the common scythe in the quality of work they did, and not one of them all, when brought to a stand in the grass, could start again without backing to get up speed. All the machines had a heavy side-draught, some of them to such an extent as to wear seriously on the team. None of them could turn about readily within a reasonable space, and all were liable to tear up the sward in the operation. The old Manning, patented in 1831, and the Ketchum machines were the only ones that were capable of doing work that was at all satisfactory. One or two of the reapers in this trial did fair work, and the judges decided that, in comparison with the hand-cradle, they showed a saving of 87¾ cents per acre. Here was some gain certainly, a little positive advance, but still most of the reapers, as well as the mowers, did very inferior work. The draught in them all was very heavy, while some of the best of them had a side-draught that was destructive to the team.

BEFORE THE WORLD.

The inventive genius of the country was stimulated by these trials to an extraordinary degree of activity. Patents began to multiply rapidly. Local trials took place every year in various parts of the country to test the merits of the several machines. The great International Exposition at Paris in 1855 was an occasion not to be overlooked by an enterprising inventor, and the American machines, imperfect as they were at that time, were brought to trial there in competition with the world. The scene of this trial was on a field of oats about forty miles from Paris, each machine having about an acre to cut. Three machines were entered for the first trial, one American, one English, and a third from Algiers, all at the same time raking as well as cutting. The American machine did its work in twenty-two minutes, the English in sixty-six, and the Algerian in seventy-two.

At a subsequent trial on the same piece, three other machines were entered, of American, English, and French manufacture, when the American machine did its work in twenty-two minutes, while the two others failed. "The successful competitor on this occasion," says a French journal, "did its work in the most exquisite manner, not leaving a single stalk ungathered, and it discharged the grain in the most perfect shape, as if placed by hand for the binders. It finished its piece most gloriously." The contest was finally narrowed down to three machines, all American. Two machines were afterwards converted from reapers into mowers, one making the change in one minute, the other in twenty. Both performed their task to the astonishment and satisfaction of a large concourse of spectators, and the judges could hardly restrain their enthusiasm, but cried out "Good, good!" "Well done!" while the excited people who looked on hurrahed for the American reaper, crying out, "That's the machine!" "That's the machine!" The report of a French agricultural journal said: "All the laurels, we are free to confess, have been gloriously won by Americans, and this achievement cannot be looked upon with indifference, as it plainly foreshadows the ultimate destiny of the New World."

ANOTHER ADVANCE STEP.

Five years after the Geneva trial there was a general desire to have another on a scale of magnificence that should bring out all the prominent reapers and mowers of the country. The United States Agricultural Society accordingly instituted a national trial at Syracuse, New York, in 1857. More than forty mowers and reapers entered, and were brought to test on the field. It was soon apparent that striking improvements had been made since the meeting at Geneva. The draught had been materially lessened in nearly all the machines, though the side-draught was still too great in some of them. Most of the machines could now cut fine and thick grass without clogging, and there was a manifest progress in them, but of the nineteen that competed as mowers, only three could start in fine grass without backing to get up speed. The well-known Buckeye, patented only the year before, won its first great triumph here, and carried off the first prize.

Every year now added to the list of new inventions and improvements. In 1859 the Wood mower was invented, and soon gained a high reputation. By the year 1864 there were no less than a hundred and eighty-seven establishments in the country devoted to the manufacture of reapers and mowers, many of them very extensive, and completely furnished with abundant power, machinery and tools of the most perfect description, while the work had become wisely and thoroughly systematized. The people directly sustained by these factories exceeded sixty thousand, while the value of their annual product exceeded $15,000,000, the number of machines amounting to one hundred thousand.

SOMETHING NEAR PERFECTION.

Nine years after the Syracuse trial, another exhibition of mowers and reapers, national in its character, was held at Auburn, New York, under the auspices of the New York State Society, in July, 1866. The number of mowers that entered, single and combined, was forty-four; the number of reapers, thirty; or seventy-four in all. It was plain at a glance, that a decided improvement had taken place in workmanship and mechanical finish. The mowers were more compact, simpler in construction, lighter, and yet equally strong; they ran with less friction; the draught was easier, and the machines generally were less noisy; they cut the grass better, and were capable of working over uneven surfaces. The committee say in their report: "Those who had been present at former trials were astonished at the general perfection which had been attained by manufacturers of mowing-machines. Every machine, with two exceptions, did good work, which would be acceptable to any farmer; and the appearance of the whole meadow, after it had been raked over, was vastly better than the average mowing of the best farmer in the State, notwithstanding the great difficulties that had to be encountered. At previous trials, very few machines could stop in the grass and start without backing for a fresh start. At the present trial every machine stopped in the grass and started again without backing, without any difficulty, and without leaving any perceptible ridge to mark the place where it occurred."

We may here note the rapid progress of these most valuable labor-saving machines, for while, in the earlier trials, only one or two mowers met with any success whatever,—no one doing what practical farmers could call good work,—in this trial forty-two of the forty-four machines entered did their work well. In the early contests even a partial success was the rare exception; in the late, failure was the equally rare exception. In 1850 less than five thousand machines had been made and put into use, and few if any of them gave satisfaction. Now there is scarcely a farm of any size in the country but has its mowing-machine. It is one of the grandest agricultural inventions of modern times, and yet we see that it is less than twenty years since doubts were freely entertained as to whether it would ever become practically useful, whether the numerous mechanical obstacles would be entirely overcome. Its triumph has been complete. We have now many mowers that have not only a national but a world-wide reputation. The successful introduction of these machines was an immeasurable step in advance upon the old methods of cutting grass. They come in at a season when the work of the farm is peculiarly laborious, when labor is held at higher than the usual high rate of wages, when the weather is often fickle, either oppressively hot and trying to the physical system, "catchy" and lowering, and they relieve the severest strain upon the muscles at the time of harvest. Our reapers are at the same time self-rakers. We can reap and gather from fifteen to twenty acres a day in the most satisfactory manner.

MAKING AND GATHERING HAY.

The horse hay-rake was invented at an earlier date than the mowing machine. It has been used in this country nearly seventy years, and the saving by its use, sixty years ago, was estimated to be the labor of six men in the same time. The work to be performed in raking hay, though slow, is comparatively light. It does not require the exertion of a very great amount of strength. It is just such kind of work where the application of animal power becomes of the greatest advantage, because it multiplies the efficiency of the hand many times. The same thing is noticed in the use of the hand-drills for sowing small seeds, the tedder for turning and spreading hay, and in other similar operations. The labor of a good horse-rake is equal to that of eight or ten men for the same time, and from twenty to thirty acres a day can be gathered by a single horse and driver, and that without over-exertion. In the economy of labor the horse-rake must be regarded as second only in importance to the mower and the reaper, and is considered as essential upon the farm as the plough itself.

The tedder is another invention of still more recent date. With the introduction of the mower, by which grass could be cut so rapidly, and the horse-rake by which it could be gathered more rapidly than ever before, there was still wanting some means by which it could be cured proportionally quick, something to complete and round out the new system, as it were, to make the revolution in the process of hay-making entire. Various forms of the tedder had been patented and used in England, but they were too heavy and cumbersome for American use, and it was left to our own inventors to meet and overcome the mechanical obstacles in the way of success here. This they have done, and we have so far economized labor in this direction, that the tedder is now regarded as of nearly equal importance with the mower and the horse-rake.

To these appliances for lightening and shortening the labors of haying, have been added many forms of the horse-fork for unloading and mowing away hay in the barn or upon the stack. Few machines have met with greater popular favor than the horse pitchfork, for it saves not only the most violent strain upon the muscles, but economizes time, which, in the hurry of haying, is often of the utmost importance. The American hand-forks had been brought so near perfection, by their high finish, lightness and strength, as to leave little to be desired, but the horse-fork has been so generally introduced as, to a considerable extent, to supersede their use.

GRAIN SEPARATORS.

While these vast improvements have been going on with the other implements of the farm, the improvement in machines for threshing grain has been rapidly progressing, till they have reached a wonderful degree of perfection. Most of us can remember when the old-fashioned flail was heard upon almost every barn floor in the country. Here and there was a case where the grain was trodden out by cattle, with an amazing waste of time and labor. Compare those slow methods with the process, widely known at the present day, by which a horse-power or steam-power thresher not only separates the grain but winnows it, measures it, bags it ready for market, and carries away the straw to the stack, at the same operation, and all with a rapidity truly astonishing. The first successful attempt to construct a threshing-machine was made

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in this country in 1792, by Col. Anderson of Philadelphia. It answered the purpose well, but the inventor did not follow it up so as to secure its general introduction. Other patents were subsequently issued to American inventors, but they were not successful in introducing them. Scotch machines were introduced into New York, Pennsylvania, and Delaware in 1802, but they were too complicated and were soon laid aside. An English machine was introduced in 1816 that proved a success in respect to speed and ease of cleaning grain, and portability, but subsequent inventions have so far surpassed all these comparatively early attempts, that they have superseded them, and later American machines have been used for many years.

As early as the Paris Exposition of 1855 the victory was won by an American machine. To ascertain the comparative rapidity and economy of threshing, six men were set to work at threshing with flails. In one hour they threshed 36 litres of wheat. In the same time Pitt's American machine threshed 740 litres; Clayton's English machine threshed 410 litres; Duvoir's French machine threshed 250 litres; Pinet's French machine threshed 150 litres. Speaking of this trial a French journal said: "This American machine literally devoured the sheaves of wheat. The eye cannot follow the work which is effected between the entrance of the sheaves and the end of the operation. It is one of the greatest results which it is possible to attain. The impression which it produced on the Arab chiefs was profound." Good as that machine was at that time, it has been greatly improved since then; and it is a fact that wherever our first-class machines have come into competition with those of European manufacture, they have invariably proved themselves superior in point of simplicity, rapidity, and perfection of work.

OTHER IMPLEMENTS.

Nor has the progress in the improvement of other indispensable machines of the farm been less marked and important. The smaller implements have felt the impress of the mechanical genius of the age. The corn-sheller has been brought to such perfection as to separate the corn from the ear with great rapidity, and with the application of little power. It has been adapted to horse-power also, and to different sections of country, where different varieties of corn are raised, and to shell one or two ears at the same time. Its economy of time and labor is such as, upon large farms, where the product is large, to pay for itself in a single year.

The hay-cutter is another machine of modern invention. Wherever a large stock of cattle is kept, especially where a considerable number of horses are wintered, it is often thought to be good economy to feed out more or less of the coarser feeding substances of the farm, as straw, corn-stover, the poorer qualities of hay, etc., by mixing them, either with the better qualities of hay or with some sort of concentrated food, like meal. The hay-cutter is adjustable so as to cut at different lengths, according to the wants of the stock for which it is designed. The point is to cut short and with perfect regularity, and when this quality is attained in a machine, uniting strength, simplicity, durability, and safety to the operator, it is estimated that there is a gain of about 25 per cent. in the economy of feeding, in the increase of thrift secured, and the positive advantage to be derived in the manure. There is a difference of opinion upon this point, to be sure, but notwithstanding that, the use of some form of the hay and straw cutter has become nearly universal, and is generally regarded as quite indispensable upon most well conducted farms. Machines for this purpose are made to be worked by hand upon small farms, and by horse or steam-power upon larger ones, where they are capable of reducing to chaff a ton and a half of hay or straw per hour.

Root and vegetable cutters have been brought to equal perfection, and where large stocks of sheep and cattle are kept, and vegetables are raised for winter feeding, as they are at the present time upon all well managed farms, the root-cutter is indispensable. By its use the farmer is now enabled to cut potatoes and other vegetables fine enough to feed to sheep, at the rate of a bushel in less than thirty seconds, by simple hand-power.

Nothing need be said of the innumerable variety of churns, hand cider-mills, the contrivances for gaining power in lifting stones and pulling stumps, ditching-machines, rollers, and a thousand other labor-saving machines which mechanical ingenuity has added to the stock of farm tools, till the value of farming implements and machinery was reported, by the census of 1870, to be at least $336,878,429. The same was reported, in 1860, at $246,118,141, and in 1850 at only $151,587,638, a gain in twenty years of $185,-290,791.

As evidence that the mechanical genius of the country is not yet exhausted, but is as untiring as ever, it may be stated that the patents issued for improvements in agricultural implements and machinery for the year 1872 exceeded one thousand, of which thirty-six were for rakes, one hundred and sixty for hay and grain harvesters and attachments, one hundred and seventy-seven for seed planters and drills, thirty for hay and straw cutters, ninety for cultivators, seventy-three for bee-hives, ninety for churns, and one hundred and sixty for ploughs and attachments; and that the annual manufacture of agricultural implements amounts to over $52,000,000.

THE KING OF CEREALS.

Having alluded briefly to the wonderful progress made in the improvement of the implements of the farm, by means of which the possibility of production has been so largely increased, let us consider for a moment the practical results attained.

Indian corn has always been regarded as the great staple crop of the country. It is a plant of American origin. In the universality of its uses, and its intrinsic importance to mankind, no other grain can be compared with it. Its flexibility of organization is such that it readily adapts itself to every variety of climate and soil, from the warmest regions of the torrid zone to the short summers of Canada. The early settlers, as we have seen, found it in cultivation by the Indians, and it soon became the leading crop throughout the country, the crop upon which the colonists relied, not only for food, but for sale and exchange for other necessaries of life. It soon became a prominent article of export, especially from the Middle States,—New Jersey, Pennsylvania, and Delaware,—and, to some extent, from the States farther south. Thus, in 1748, South Carolina exported 39,308 bushels, and in 1754, 16,428 bushels. In 1755, there were exported from Savannah 600, and in 1770, 13,598 bushels. And so, in 1753, North Carolina exported 61,580 bushels; and the exports from Virginia, before the Revolution, sometimes amounted to 600,000 bushels a year. The total amount exported from all the colonies, in 1770, was 578,349 bushels. These figures are not large, to be sure, when compared with the immense exportation of this grain at the present day, but they serve to show that even before the Revolution, Indian corn had come to be regarded as an important money crop, as well as a prime necessity for home consumption. They show a surplus beyond the wants of the population at that time.

PRACTICAL RESULTS.

Nothing will more clearly demonstrate the exceedingly slow progress of our agriculture after the Revolution than the fact that in 1791 the export of corn, including 351,695 bushels of meal, amounted to only 2,064,936 bushels; in 1800, to only 2,032,435 bushels, including 338,108 bushels of meal, while in 1810 it fell down to 140,996 bushels, of which 86,744 bushels were in the form of Indian meal. That was before the avenues to the great West were opened. It was at a time when the inland farmer had no available market, the cost of transportation of so bulky a product making it impracticable to team it to any great distance. It was before its real value as an article of human food was appreciated in Europe, and when its consumption as such was very small. It was before our cattle had been much improved, and when their number was much smaller than it is now, when it has come to be realized that it makes our beef, our mutton, our pork and our poultry.

Nor did the production materially increase till within the last forty years. The Erie Canal was not open till the year 1825; nor were there any railroads to facilitate the transportation of merchandise; but the gradual extension of settlements westward after that date, and the increase of population, led to an increase of production, till, in 1840, when this crop first appears in the census, the yield had risen to 377,531,875 bushels; and from that time its increase has been quite marvellous, for in 1850 it had reached to within a small fraction of 600,000,000 bushels (or, more nearly, 592,071,104), occupying 31,000,000 acres of land. Its value was reported at that date as $296,034,552. It was a gain of 57 per cent., or 214,539,229 bushels in ten years, while the increase of population in the same time was but 35 per cent. It formed about three-sixteenths of the whole agricultural production of the country, occupied more than three-tenths of the improved land, and amounted to more than 25½ bushels for each inhabitant. The export of this grain rose in value in 1856 to nearly $9,000,000.

This wonderful rapidity of increase continued, partly on account of the vast improvement in agricultural implements and the means of raising the crop, partly on account of the multiplicity of railroads and market facilities, till, in 1860, it amounted to 838,792,742 bushels; but it had fallen off somewhat in 1870, for it is reported then as 760,944,549 bushels, a portion of the land evidently having been devoted to wheat, which had very largely increased in the same time. When it is considered that our agricultural resources are still but partially developed, the product of this cereal appears to be truly amazing.

WHEAT CULTURE.

Nor is the growth of wheat in this country less important than that of Indian corn. In some respects it is even more so. It is the brain-food of the world. It has been said that the progress of civilization and intellectual culture can be traced from one degree to another by the extent of its growth and consumption. It is gratifying, therefore, to find that our present annual production of this cereal amounts to nearly 300,000,000 bushels, and that our ability to increase it is capable of an almost unlimited expansion. It has always entered into our exports to an extent dependent chiefly upon the foreign demand, and experience has proved that the surplus of this grain, the amount we could spare from home consumption, is as elastic as India-rubber. If Europe needs our wheat or our flour, and is ready to pay us good prices, either from a short crop, a disturbed state of political affairs, or from any other cause, no one could set bounds to our surplus, because the more she wants the more we have to spare, and the less she requires, the more freely is it used at home. In other words, the amount of exports will be regulated chiefly by the price, and if foreign countries are willing, or are compelled to pay for it, we can supply them to any extent under any ordinary circumstances. The export, for instance, in 1850, amounted to little more than eight millions and a half, while in 1854 it went up to over twenty-seven millions of bushels.

We have seen that wheat was cultivated, to some extent, by the early settlers of the country. Occasionally, to meet the exigency of a short crop in England, France, Portugal, Spain, or the West Indies, it was exported, to some extent, in the early part of the last century. By the year 1750, New Jersey had come to take the lead of all the Colonies in raising wheat, and may be regarded as at that time the great centre of the wheat-growing region. Its culture had grown to be very considerable along the Hudson and Mohawk, and in Pennsylvania. Maryland, Virginia, and the provinces further south had made tobacco the leading object of culture, almost from the first of their settlement, and this crop constituted for a long time the most important export from the British provinces, though North Carolina had shipped, on an average, about 130,000 barrels of pitch, tar and turpentine, and South Carolina considerable quantities of rice. But the product of tobacco had been diminishing for some years previous to the Revolution, on account of the exhaustion of the soil for that crop, and the planters there had turned their attention, to a greater extent, to the growing of wheat and other grain. They could by law export tobacco only to Great Britain, but they could ship wheat, flour, lumber, &c., to the West Indies and elsewhere. Wheat, therefore, had begun to enter into the exports of the more southern provinces prior to the Revolution.

INCREASE OF PRODUCTION.

But that the production of wheat and flour had not risen to anything like the relative importance which it holds at the present time, will appear from the fact that in 1791 the export of this grain was but 1,018,339 bushels, and 619,681 barrels of flour; while in 1800 it was but 26,853 bushels of wheat and 653,052 barrels of flour. In 1810 the amount sent abroad was 325,024 bushels of wheat and 798,431 barrels of flour. No statistics of the actual production of this grain were gathered previous to the census of 1840, but it is reported in that year to have been 84,823,272 bushels. From that time to 1850 the increase appears to have been but 15 per cent., the product, at the latter date, being 100,485,944. In that year, or rather in 1849, on which the return is based, Pennsylvania produced more than any other State in the Union, or 15,367,691 bushels. Its product at the last census was nearly 20,000,000, but the centre of production has moved farther and farther to the west.

Since the practicability and economy of the reaper and other machinery became certain, the increase in the production of wheat has been more rapid, as appears from the fact that in 1860 the crop amounted to 173,104,924 bushels, and in 1870 to 287,745,626 bushels. Our exports of this cereal in 1860 amounted to about 12,000,000 bushels, in 1861 to over 20,000,000, and in 1862 to very near 30,000,000, a greater quantity than had ever been known before. In addition to the vast increase of this crop in the Middle and Western States, the production of wheat in California now comes in to swell the aggregate capacity of expansion, to an extent worthy of notice; for while in 1850 her product of wheat is returned as only 17,228 bushels, her yield of 1870 was nearly

17,000,000 bushels, with her resources but slightly developed. And when it is considered that the great Northwest,—Iowa, Minnesota, and the region lying beyond them,—still remains, to a large extent, unoccupied, there seems no reason to apprehend that the growth of this important crop will not continue to increase in the future as rapidly as it has in the past.

The other smaller grains have never occupied so prominent a position in our agriculture, being grown more especially for home consumption, but in the aggregate they constitute no mean item of our national agricultural wealth. Thus our rye crop, as returned in 1870, amounted to nearly 17,000,000 bushels, our barley to nearly 30,000,000, our buckwheat to nearly 10,000,000, and our oats to over 282,000,000. Rice, which in 1860 was reported at 187,167,032 pounds, had fallen off in 1870 to 73,635,021 pounds.

THE POTATO.

The potato is more universally cultivated than any other plant except, perhaps, Indian corn. It is scarcely more than a hundred years since it became universally recognized as an indispensable farm product. During the latter part of the last century, and the earlier part of the present, its cultivation in new soils was so easy, and its yield so abundant, that it became an important article of food. No account was taken of it in the census, however, till 1840, when the yield was reported as 108,298,060 bushels. Since that time the liability to disease has become so great that the production has not increased in the same ratio as many other crops, though the amount, by the census of 1870, including over 20,000,000 sweet potatoes, was 165,047,297 bushels. It has at times formed no inconsiderable item of export, though by no means to be compared in this respect with wheat and Indian corn. It is largely used in the feeding of stock in some sections of the country.

AN EARLY EXPORT.

The culture of tobacco was undertaken by the settlers in Virginia from the very outset of the colony. It is recorded that in 1615 the gardens, fields, and streets of Jamestown were planted with tobacco. It immediately became not only the great staple crop, but the principal currency of the colony. By the year 1622 the product amounted to 60,000 pounds, and it more than doubled in the next twenty years. The culture of this plant was introduced into the Dutch colony of New York in 1646, though it never gained the prominence there that it did farther south. But Maryland, the Carolinas, Louisiana, and later, Kentucky, made it the leading object of their culture almost from their first settlement. It long constituted the most valuable export of British America; but the product per acre had been diminishing for many years before the Revolution, owing to the difficulty of supplying manure, and the consequent exhaustion of the soil. But from 1744 to 1776 the exports of this crop averaged 40,000,000 pounds a year.

Tobacco has now become a somewhat prominent crop in Massachusetts and Connecticut, and in both of these States its culture is rapidly extending. In 1850, for instance, but 138,216 pounds were raised in Massachusetts; in 1860 the crop increased to 3,233,198 pounds, and in 1870 to 7,312,885, while the crop of 1872 is probably at least 25 per cent. greater still. The aggregate yield of the country in 1840 was reported by the census of that year as 219,163,319 pounds, while in 1850 it was reduced to 199,752,655 pounds; but in 1860 it went up to 434,209,461 pounds, to fall again in 1870 to 262,735,021 pounds, a fluctuation to be explained in part by the many casualties to which it is liable, as damage by insects, hail, drought, frosts, &c.

THE COTTON SUPPLY.

The cotton crop of the country has grown np entirely within the last hundred years. The first improvements in the process of spinning it in England were not made till the invention of Arkwright, in 1769, and the spinning-jenny of Hargreaves in 1770, and comparatively little cotton had been raised in our Southern States previous to 1793, when Eli Whitney invented the cotton-gin. Up to that time the difficulty of freeing the cotton from the seed had been such that one hand could clean but a pound a day, and even at the high price of 25 or 30 cents a pound it could not be made profitable. By Whitney's invention a hand, instead of one pound, could clean 360 pounds a day. At about the same time steam was introduced as a motive-power in England, and that, with the great improvements in carding and spinning, enabled one man to do the work which it had previously required 2,200 men to do, in the same time, by the old methods.

Machinery had introduced an entirely new condition of things. The effect of it was to produce a vital change in the state of affairs at the South, and the cotton crop very rapidly grew up to immense importance, constituting about a third part of the whole exports of the country. Each decade showed an increase of about 100 per cent. in production, till, in 1840, it had reached 744,000,000 pounds, six times the product of 1820. The quantity of cotton exported in 1792 was only 138,328 pounds. The quantity exported in 1860 was 1,765,115,735 pounds, or 4,412,789 bales of 400 pounds each, but the quantity produced in 1860 was 2,079,230,800 pounds, or 5,198,077 bales. This production had fallen off somewhat in 1870, when the quantity produced was reported as 3,011,996 bales, or 1,204,798,400 pounds.

THE HAY CROP.

The hay crop of the country has also grown up almost entirely within the last hundred years, and considering the necessity that exists throughout all the northern portions of our territory for stall-feeding all stock from three to six months of the year, it has an importance there which it cannot have farther south. It has been asserted that the hay crop, instead of forming a legitimate part of our national agricultural production, and going to swell the aggregate of its money-value, ought rather to be regarded as a tax imposed by the severity of the climate—a tax involving a vast amount of labor and time and money to which the farmer in our milder latitudes is not subjected. There may be some shadow of truth in this view of the case, and yet, like all other apparent hardships, it has its compensations, as the history of the various parts of our country abundantly demonstrates.

There is scarcely anything which a person who has become accustomed to the fine close carpet of green with which nature covers every hill-side and every landscape in our northern sections, would dispense with so reluctantly as the green turf of our natural grasses. But the greatest compensation to be found is the facility which the production of grass and hay gives for keeping up and increasing the fertility of our lands. The system of stall-feeding, for which the making of hay is designed to provide, is the only system by which a constantly improving mixed husbandry can be sustained; and the want of it may be assigned as the true cause of the exhaustion of the lands of Virginia under the constant culture of tobacco. The only substitute for it is the soiling system, and that becomes impracticable of general application in a country where pasturage and browsing are abundant and cheap.

The artificial production of hay is of comparatively modern origin, as I have shown; but within the last quarter of a century it has increased with great rapidity, especially since the introduction of the numerous labor-saving machines has put in our power to cut and cure our grasses so quickly and so cheaply. At the time of the first appearance of this product in our national census of 1840, the yield of the entire country was but 10,250,000 tons, and it had increased in 1850 to only 13,838,642 tons. But in 1860 we cut and cured over 19,000,000 tons, while in 1870 the product was stated at 27,316,048 tons, an increase of more than 100 per cent. in twenty years. The money-value of this crop cannot, therefore, be less than $300,000,000, to which is to be added at least an equal amount for the value of grass for summer pasturage, making an aggregate of over $600,000,000 for the grass and hay crop of the country.

That the quality, and consequently the value, of the hay made now has vastly improved over that made a half century ago, no one at all familiar with the subject can entertain a reasonable doubt. A great amount of thought and experiment has been directed to the best methods of production and of curing, while machinery has given us a greater control over the seasons, or rather has enabled us to avoid the exposure to the exigencies of the weather, to a vastly greater extent than was possible within the memory of men still living.

IMPROVEMENT OF STOCK.

Let us see now what effect this progress has had upon the number and quality of our cattle. There can be no doubt that the idea of the possibility of improving the common stock of the United States was first suggested by the great results obtained by the early improvers of stock in England. The present advanced position of the stock interest of this country can be traced directly to the practical labors of Bakewell, the Messrs. Cully, Colling, Bates and others, just as the first impetus which these distinguished breeders received can be traced to the efforts of such men as Lord Kames, "to improve agriculture by subjecting it to the test of rational principles," and Jethro Tull (1740), the inventor of the horse-hoe, the drill-husbandry, and many other bold and advanced notions. Tull launched out bravely into the field of experimental agriculture, and boldly threw open the door of improvement, never again to be closed, and this new-born spirit of progress very soon appeared to spread; for it was only about ten years after him, or about 1750, when Bakewell began those skilful experiments in breeding, and with such marked success as to impress his influence upon the progress of agriculture all over the civilized world.

It was, of course, some years before Bakewell's magnificent results began to attract public notice, even in England, and their influence was much slower in reaching this country. It began to be felt here toward the close of the last century, or more properly, perhaps, directly after the close of the Revolutionary war, for Mr. Goff and two other gentlemen of Maryland imported some very large animals from England, in 1783, which appear soon after to have gone into the hands of Matthew Patton of Virginia, who, about the year 1794, removed to Kentucky and carried the cattle with him. A part of the same stock was taken to Ohio in the year 1800, by John Patton, a son of Matthew. These cattle were well known in Kentucky and Ohio, where they soon gained a wide reputation.

There were a few other importations about that period, all of them in small lots, the most important of which were some cattle introduced into Maryland by a Mr. Miller, between 1790 and 1795, and a few Shorthorns into Westchester County, New York, in 1792 and 1796. These were probably the only importations made with any design of improving American cattle. Here and there a Jersey of that day, and possibly a very few individual animals of other breeds, brought over by ship-masters, are known to have been introduced and kept here, but they made no perceptible mark on our common cattle. Nor were there many or frequent importations until after the year 1820, though a herd of Devons, consisting of a bull and six heifers, presented to Robert Patterson of Baltimore, by Mr. Coke, afterwards Earl of Leicester, were imported in 1816; twelve head of Shorthorns arrived in Kentucky in 1817, and two more in 1818. It was in that year the celebrated bull Cœlebs, the founder of Colonel Jaques's "cream-pot breed," Fortunatus, owned by Gorham Parsons of Brighton, and Young Denton, owned by S. Williams of Northborough, were imported into Massachusetts, while Henry Clay introduced the Herefords into Kentucky in the year 1817, and Colonel Saunders's importation of Shorthorns arrived in that State the same year.

Of all these early importations made by public-spirited individuals, the Patton stock probably made the most mark. They did much to teach people the possibility of improvemnt. They were the pioneers, and, together with subsequent importations, not only infused their blood into the stock of that great Western country, but did something to excite a spirit of emulation among the farmers there, and this may be said to have laid the foundation for the splendid results which Kentucky, Ohio and adjoining States have since realized.

FREQUENT IMPORTATIONS.

After 1820, that is within the last half century, importations became more frequent. But though from time to time all the prominent breeds, the Shorthorns, the Herefords, the Devons, the Ayrshires, and the Jerseys, were introduced on trial, and, to some extent, crossed with our common cattle, the interest in stock was confined chiefly to individuals. The mass of farmers were slow to make changes, especially among the smaller farmers at the East. We may discover the first evidences of some general interest at the West about the year 1834, when the Ohio company for importing English cattle gave a great impetus to the spirit of improvement by large importations of Shorthorns, and from that date the progress in cattle-husbandry became very rapid, and we see the magnificent results of it at the present day.* Early maturity and

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* The results of these frequent importations and the enterprise they indicated and created in the improvement of stock, may be said to have culminated, so far as the Shorthorns are concerned, in the great sale of the New York Mill's herd on the tenth of September, 1873. Nothing like it has ever been known in the history of any herd of domestic animals in any part of the world. A hundred and eight head of cattle, old and young, brought $380,890, or an average of over $3,500. Eleven cows of the Duchess family of Shorthorns brought $238,650, and a bull of the same family sold for $12,000 Seven head of the Oxford family brought $31,600. A heifer calf, five months old, a Duchess, brought $27,000. The 1st Duchess of Oneida, three years old, brought $30,600, to go to England The 10th Duchess of Geneva brought $35,000, also to go abroad. The 8th Duchess of Geneva sold for $40,600. Four cows averaged over $33,000 apiece.

The Duchess family of Shorthorns was established by Thomas Bates, a distinguished English breeder, in the early part of the present century. The herd of the celebrated Charles Colling was brought to the hammer in 1810, and Bates, who already had some of the Duchess blood, bought of Colling at private sale, here laid the foundation of what he called the Duchess family. "Comet," an uncommonly finely formed bull, brought at that sale a thousand guineas, the highest price that had ever been paid for such an animal. After breeding with great skill for many years, this celebrated herd was sold at auction in 1850, after the death of Mr. Bates. At this sale, Col. Morris of New York, bought several of the Oxford family, also established by Bates, and forming a part of his herd, and numbers 5, 6, 10 and 13 came to New York, together with the famous bull "Romeo," bought of the Marquis of Exeter, in the same year. In 1853, again, Col. Morris and Mr. Becar bought at Earl Ducie's great sale, Duchess 66 and the a tendency to fatten well are of transcendent importance to the Western farmer who breeds to supply the stalls in our Eastern markets, and he was quick to see how he could improve the intrinsic qualities of his stock in these respects.

In the Eastern portions of the country the dairy early became the leading object of pursuit. Size and fattening properties were of less account, and hence we find that modern importations for that section have consisted chiefly of the celebrated dairy breeds, of which the Ayrshires and the Jerseys have taken the lead, according to the special object proposed. These importations have been especially numerous within the last twenty years, till they have greatly modified the stock. In Massachusetts, for example, in 1853 there were less than seventy-five pure-bred Jerseys in the whole State. Now they number several thousands, and single herds now contain more pure and high-bred animals of this breed than could have been found in the State twenty years ago. And the same remark applies to the Ayrshires.

While the constant introduction of improved cattle from abroad has effected a very marked general improvement in the quality of our animals, the universal interest in cattle-husbandry has led to greater knowledge of stock, to better systems of feeding and management, and so to more satisfactory results. No longer ago than 1841, Mr. Colman, a well-known agriculturist, remarked that the general treatment of cows at that time, in New England, would not be an inapt subject of presentment by a grand jury. Now they are better sheltered, better fed, and more tenderly treated.

And while this progress in the improvement of the intrinsic qualities of our stock has been going on, the number of neat-cattle in the country has largely increased. The aggregate number by the census of 1840 was 14,971,586; in 1850 it was 18,378,907; while by the census of 1870 we find 23,820,608. Of these there were about 9,000,000 cows. It will be seen that the amount invested in this class of live stock alone cannot be less than $300,-

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Duke of Gloucester. In 1856, Col. Morris, then sole proprietor of these choice animals and their progeny, sold fifty head of them to Samuel Thorne of Westchester County, New York, who had also purchased at Earl Ducie's sale, in 1853, the cows Duchess 59, 64 and 68, and that most perfect of all his kind, "Grand Duke," at over a thousand pounds sterling. In 1857, Mr. Thorne sold his whole herd to J. O. Sheldon of Geneva, N. Y., who, after breeding it ten years with great skill, in 1867 sold the herd to Wolcott & Campbell of New York Mills, near Utica, N. Y. Mr. Campbell became sole proprietor of the herd in 1872, to sell again in 1873, with the result stated above.

000,000, the total value of the live-stock of the country being officially reported as $1,525,276,457.

THE DAIRY INTEREST.

It would be interesting to study the form in which the product, or, in other words, the profit of the vast amount of capital invested in neat-stock appears in different parts of the country. Space will admit of only a brief allusion to this point, but it is evident that throughout the Northern and Middle States it will appear very largely in the form of dairy products, while in the West we shall find it more generally in the form of slaughtered animals. Among the dairy products we find by the last census that we sold 235,500,599 gallons of milk in its natural form. It went chiefly to supply our large towns and cities; the figures not representing the vast amount consumed at home, and thus contributing so much to the comforts and the necessities of life. At the same time we produced 514,092,683 pounds of butter and 53,492,153 pounds of cheese. These figures, large as they are, do not represent anything like the production of the country. The value of butter made in New York alone in the year 1865 exceeded $60,000,000. It is probable that the cheese made in factories, now numbering something like fifteen hundred, was returned under some other head, and that the 53,000,000 is the amount supposed to have been made in private dairies, for we know that the quantity of cheese made in New York State in 1864 for sale, in addition to that consumed on the farm, was nearly 72,200,000 pounds, while the product there, as in all the other Northern States, has been rapidly progressing since that date, owing to the constant expansion of the factory system and the stimulus of high prices. It is quite within bounds to say that the butter product of the country is fully 600,000,000 pounds, and that the cheese exceeds 200,000,000 pounds a year.

The dairy business of this country has developed with such rapidity and to such a degree of importance, with the aid of the highest intelligence and the application of the most consummate skill, as to be regarded as one of the highest triumphs of modern agriculture. Its annual product amounts to over $400,000,000, and the capital invested in it does not fall short of $700,000,000. It gives employment to a vast number of hands, and contributes to the comfort and the health and the wealth of all classes of the community.

THE PACKING BUSINESS.

Another product of the cattle-husbandry of the country, and a most important one, whether considered from a financial point of view merely, or as furnishing a vast amount of food for the sustenance of mankind, is represented in the value of animals slaughtered or sold for slaughter, and by the census of 1870 we find this item amounts to about $400,000,000, or more accurately, $398,-956,376, a gain in ten years of very nearly $200,000,000. This, of course, includes the pork-packing business, till recently confined, to a large extent, to certain Western cities, but now carried on as a growing business at many convenient points along our great lines of railway in other parts of the country.

Improvement in swine began less than three quarters of a century ago. The first that excited any general interest was made by some animals sent from Woburn Abbey, by the Duke of Bedford, to General Washington. The Englishman entrusted with the care of delivering them, seized an opportunity to sell them on their arrival in this country, but they were bred and became popular, and from all accounts they were splendid animals, small and fine in the bone, with a deep round barrel, short in the leg, feeding easily, and maturing early. They were long known as the Woburn breed, and in some sections as the Bedford hog, and were originated by a fortunate cross of the Chinese and the large English hog of that day. They would weigh from four to seven hundred pounds at a year old, with light offal and most excellent quality of flesh. They became very common in Maryland, Delaware, and Virginia, and they were sent to Colonel Timothy Pickering of Massachusetts, and became well known in that part of the country. They are now extinct. The Byfield breed, so popular for many years, originated in the same way. China thus did a good thing for our agriculture fifty years ago and more.

Previous to the introduction and diffusion of the Woburn, the Byfield, the Mackay, and more recently the Suffolk, the Berkshire, the Essex, and other popular English breeds, the classes of swine that prevailed in the Eastern and Middle, and especially the Southern and Western States, were coarse, large-boned, long-legged, and unprofitable creatures, better calculated for sub-soilers than for the pork barrel, though the grass-fed hog had done something to improve them as early as the time of the importation of merino sheep. But it soon became settled that neither the Eastern nor the Middle States could compete with the West in the production of pork upon a large scale, on account of the difference in the cost of grain. The raising and packing of pork has, therefore, grown up very naturally in the Western States, and vast quantities are exported from there every year. At the same time the facilities for carrying on this business have been so greatly multiplied that the whole packing trade has been reduced to a system so perfect that it may almost be said that no particle of the animal is now wasted, that all is economized, either for food or in the form of some commercial product, as bristles, lard, grease, stearine, soap, Prussian blue, etc., the aggregate of which collateral industries is scarcely less important than the preparation of food itself. The business involves a vast amount of capital, gives labor to a vast number of men, and adds amazingly to the material prosperity of the country.

THE WOOL INTEREST.

Sheep husbandry in this country has been subject to great vicissitudes. Sheep were imported by the early settlers, by the Virginia colony, as early as 1609, and they increased by 1648 to three thousand. The Dutch West India Company introduced them about the year 1625, but they proved to be too much of a temptation for dogs and wolves, for it is recorded that in 1643 there were but sixteen in that whole colony. They were kept upon the islands in Boston harbor as early as 1633, and two years after there were ninety-two in the vicinity of Portsmouth, New Hampshire. It became the universal practice in the days of homespun for a farmer to keep a number sufficient to clothe his family.

The old "native" sheep was a coarse, long-legged, and unprofitable animal, and there was no improvement made in the breeding till towards the close of the last century, when, in 1793, the first merinos, or fine-wooled sheep, were imported by William Foster of Boston. They were wholly unappreciated, were given to a gentleman to keep, and he, knowing nothing of their value, "simply ate them," and a few years after was buying the same class of sheep at $1,000 per head. The embargo of 1808 induced many to turn their attention to fine-wool sheep, and soon after very large numbers of merino sheep were imported and distributed throughout the United States, and our modern sheep-husbandry, now grown up to its proportional importance, may be said to date from these importations.

The condition of the country gradually changed, and since the opening of lines of communication to the West, the Eastern States have found it hard to compete in the raising of fine wool with farmers who could furnish us with the raw material for our manufactories at a cost of a cent a pound or less for transportation. The growing of sheep for mutton and for wool has, therefore, been left to a great extent to the Western States and to Texas. We find, accordingly, that of the 28,477,951 reported by the last census, Ohio had about 5,000,000, California 2,768,187, Michigan nearly 2,000,000, and Indiana, Illinois, Missouri and Wisconsin over a million each. The quantity of wool raised exceeded a hundred million of pounds, more than a fifth part of which was raised in Ohio. This was a gain of over forty-seven and a half million pounds over the product of 1850, and of very nearly forty million over that of 1860.

It will thus be seen that the production of wool constitutes no inconsiderable part of our agricultural industry, and that in this respect we have made a highly commendable degree of progress. This production, though little enough when compared with what it ought to be in a country so extensive and populous as ours, is still sufficient to place us in the front rank as compared with other wool-producing countries. And while the quantity has increased, the quality has been greatly improved since the modern interest in breeding began. At the World's Fair in London, in 1851, the fleece that commanded the highest prize for the fineness and beauty of staple, in a free competition with Spain, Saxony, Silesia, and other parts of Germany, was grown on the green pastures of Tennessee, while at the International Exhibition at Hamburg, in 1863, the Vermont merinos carried off the prizes.

AMERICAN HORSES.

Whether the horse in general has actually undergone any improvement or not may admit of some question, but it is certain that the horses of this country have been greatly improved within the present century. The chief means of carrying on our early inland commerce, including a large amount of heavy teaming and transportation, was the horse. The public roads were bad, worse even than they are at the present day, and over these the freight of the country, whatever it was, had to be moved in wagons made to be capable of the hardest usage. The modern light carriage would have been comparatively useless in a new country and over such roads, while a speed now seen every day would have been quite unsafe. The mail contracts, even over a very large part of the country, when the post system was instituted, were based on a speed below four and five miles per hour. But there were no mails previous to 1790; and in 1791, the first year of the mail service, there were but eighty-nine post-offices in the whole country, and less than two thousand miles of post-roads, and on these nine-tenths of the mail-service was done on horseback, the stage service being very small.

A few stage routes had been established at an earlier date. The first, and at that time the only stage wagon in America, is said to have left Boston for Portsmouth in 1661. There were then but six stage coaches in all England. The first line of stages between Boston and New York was started in 1732, a coach leaving each city once a month, and fourteen days being required to complete the journey. A regular stage line between Boston and Gloucester, Mass., was established in 1788, and consisted of one open two-horse wagon running twice a week. Besides this there were only four stages which ran into Boston at that time.

It will thus be seen that the social conditions of the last century were not favorable to the improvement of the horse, certainly not to increase his speed, now considered indispensable. Fast trotting was scarcely known at the time of the old "Justin Morgan," foaled in 1793, nor was speed estimated as of special money-value till the invention of the modern light buggy and the improvement of roads; but this quality has now come to be essential to the comfort and convenience of all classes of people. In this respect there can be no question that a great increase has been attained by careful breeding, especially within the last thirty years, while much greater attention has been paid to style, action, temper, form, constitution and endurance, so that the aggregate money-value of our horses has been enhanced by the higher general average of intrinsic good qualities.

MORGANS AND BLACKHAWKS.

These improvements are largely due, no doubt, to the frequent importation and infusion of thoroughbred blood into our stock. In some sections of the country, at the South and the Southwest, they may be said to be almost wholly due to this source. But in the New England States, and to no small extent in the Middle and Western States, they are due to the influence of two great classes of horses, both very celebrated roadsters, known as the Morgans and the Blackhawks, the former deriving their origin from the old "Justin Morgan," remarkable for compactness of form, strength and docility, and unsurpassed for general utility; the latter excellent as roadsters, of a high and nervous style of action, wonderfully elastic step, and a symmetrical and muscular form. These two families of horses have added many millions of dollars to the value of the stock of this country. They infused a new spirit into the whole business of horse-breeding, and gave us such a reputation for great success in this direction as to lead Professor Low of Scotland, in his "History of Domestic Animals," to say of us: "They prefer the trot to the paces more admired in the old continent, and having directed attention to the conformation which consists with this character, the fastest trotting-horses in the world are to be found in the United States."

But the draught-horse has not been neglected. The Convestoga, a large and heavy breed of horses, used mostly for the purposes of slow work in the drays of our large towns and cities, is extensively raised in some parts of the Middle States, while the Percheron has more recently been introduced and bred in some parts of the West.

The number of horses in this country, according to the last census, was 8,690,219, of which 8,142,849 were on farms, and the balance found in cities and large towns. This was a gain of more than a million in ten years, for, in 1860, the total number was reported as 7,434,688, of which 6,249,174 were upon farms. The number on farms in 1850 was 4,336,719, there having been no effort made to ascertain the number not kept on farms.

It will thus be seen that the capital invested in horses constitutes a large item in our national wealth; and to this should be added more than a million of mules and asses, the number returned in the census of 1870 being 1,125,415. The extent of our dependence upon this class of stock was never more completely realized than during the prevalence of the epizootic of last year, when the infinitely varied transactions of the country, social, manufacturing and commercial, were so nearly brought to a stand-still for the want of the services of the horse.

LIGHT OF INTELLIGENCE.

This brief sketch of the rise and growth of the great agricultural interests of the country, involving such vast amounts of capital, giving employment and bread to myriads of men, and producing annually the incredible income of more than $2,447,538,-658, would be incomplete without an allusion to the increase of intelligence, and the part which science has taken in bringing about such magnificent results.

I have already referred to the early attempts at associated effort and the growth of agricultural societies. Few and feeble enough at first, and slow in the growth of their influence among the people, they have now become a powerful aid in the progress of all departments of agricultural knowledge, and have grown up to a harmonious system of national, State, county and township organizations, all active, not only in gathering and diffusing information, but furnishing a constant stimulus to new effort and to higher triumphs of practical skill.

To the earnest spirit of inquiry which these societies awakened in the community is due, in a great measure, the growth and respectability of the agricultural literature of the country. With the exception of four brief "Essays on Field-Husbandry," by the Rev. Jared Eliot, of Connecticut, the first of which is dated in 1747, I know of no agricultural book, of any account, printed in the colonies previous to the Revolution; and all that followed that event for many years consisted chiefly of the more or less valuable papers submitted to the Massachusetts, the Philadelphia, and the New York societies, till the "American Farmer" was started in Baltimore in 1819. This is believed to have been the first regular strictly agricultural journal published in the United States. Others soon followed, however, till we have now about a hundred periodicals devoted to the various branches of farm economy, some of which are of a very high order of merit. The aggregate regular circulation of these journals cannot be less than three hundred thousand copies, and they indicate a wide-spread desire for information which must necessarily have an important influence on the future development of this great interest.

OUR AGRICULTURAL LITERATURE.

The permanent agricultural literature of the country, now so extensive and so creditable, has grown up, for the most part, within the last twenty years. A few books of a high character appeared, from time to time, forty or fifty years ago, among them Coxe on Fruit Trees; Thacher's American Orchardist; Arator, by Colonel Taylor, of Virginia; Fessenden's Complete Farmer, Buel's

Farmers' Companion, etc.; but a large proportion of the farmer's reading, previous to 1850, consisted of English works, many of which were reprinted in this country. Since that date American treatises, in the highest degree instructive and useful, have appeared, and we have works upon landscape-gardening, fruits, animals, dairy-farming, drainage, and, in fact, upon subjects covering the whole range of farm economy, many of them of unexceptionable literary merit in point of style, finish and perfection, and the results of accurate scientific research.

To bring the facilities for improvement within the easy reach of the largest number of people, the system of township and district libraries was first initiated by the State of New York, in 1837, with an appropriation of $200,000 a year for three years, and subsequent grants of $50,000. This example was followed by Massachusetts in 1839, and more recently Michigan gave each township the sum of $50 annually for this purpose. Indiana adopted the same policy in 1854, Ohio in 1857, the former appropriating $300,000 a year for two years, the latter $80,000 annually. Illinois and other Western States adopted a similar course, and it was properly regarded as admirably adapted to promote agricultural improvement, as well as the general welfare of the community. At the same time most of the States early adopted the plan of publishing and distributing large numbers of documents upon agriculture, gratuitously, among the people. These documents are, many of them, of high merit, containing the most recent scientific investigations, reports of experiments, and the observations of the most experienced practical men. Probably about two hundred thousand volumes are thus freely distributed through the farming community every year, with the addition of about as many more issued by the Department of Agriculture at Washington. These and various similar instrumentalities, all now in constant activity, are exerting a vast influence in developing our material resources.

WHAT SCIENCE HAS DONE.

The contributions of science to the progress of practical agriculture are by no means small or unimportant. Agricultural chemistry, itself in a state of transition and rapid growth, was never so helpful or so available to the farmer as at the present day. Though Sir Humphry Davy may be said to have opened the door to progress and improvement in this direction, in the early part of the present century, the accumulation of scientific facts was so slow that it was not till 1840 that Liebig announced propositions that opened a new world of thought and study, and awakened the attention of intelligent farmers to the importance of applying the results of chemical investigations, and, in some respects, essentially modified the practice of all civilized countries.

They were simple words to lead to such results:—"To manure an acre of land with forty pounds of bone-dust," said he, "is sufficient to supply three crops of wheat, clover, potatoes, turnips, etc., with phosphates; but the form in which they are restored to the soil does not appear to be a matter of indifference; for the more finely the bones are reduced to powder, and the more intimately they are mixed with the soil, the more easily they are assimilated. The most easy and practical mode of effecting their division is to pour over the bones, in the state of fine powder, half of their weight of sulphuric acid, diluted with three or four parts of water." Simple words, and yet they opened the way to the whole system of concentrated fertilizers, which has extended so far in modern times and grown to such gigantic proportions as to affect the commerce of the whole civilized world.

Guano, to be sure, had first been brought to public notice by Baron Humboldt and by Sir Humphry Davy, but it was not till the researches set on foot by the revelations of Liebig that it was at all used in England. Twenty casks were landed there in 1840, and so great was the confidence in its use, as a means of renovating the soil and increasing the products of the country, that the importation increased to 2,000 tons in 1841, and to over 200,000 in 1845, the English trade alone employing, in that year, 679 vessels. In less than sixteen years from 1840 the quantity taken from the Chincha Islands alone reached the enormous figure of 2,000,000 tons, and the amount of sales in that time was over $100,000,000.

This precious fertilizer soon came to be extensively used in this country. In 1848, we imported over 1,000 tons; in 1849, over 21,000 tons; in the ten years previous to 1860 the quantity is reported at 842,787 tons. It is stated that in the ten years previous to 1870 the quantity imported was 387,585 tons, valued at about $6,000,000. But these figures give but a feeble idea of the extent to which special and concentrated fertilizers now enter into our agriculture, for many large superphosphate manufactories now exist in all parts of the country, while a great variety of other special fertilizers are made and offered for sale, some of them no doubt of great value, and others comparatively worthless.

COMMERCIAL FERTILIZERS.

In order to realize how immensely important these fertilizers have become in our modern agriculture, it is necessary to consider that the South is greatly dependent upon them, more dependent than the North, on account of the want of facilities for making and economizing farm-yard manures which the system of stall-feeding implies; but it is also fast getting to be recognized that they must come in as a necessary adjunct to farm-yard manures in high farming everywhere. And hence, if the exact statisticts could be known, and the extent to which they are used in all parts of the country, the figures would be truly astonishing.

The official inspector of fertilizers in Georgia, for example, estimates that the planters of that State alone pay over $10,000,000 a year for fertilizers, while it is stated, by those in a position to know, that in four months, from December, 1869, to April, 1870, more than 300,000 tons of fertilizers passed through the city of Charleston, South Carolina; that over 100,000 tons passed over the Georgia Central Railway and other points in that State; that over 6,000 tons, valued at $7,000,000, are manufactured at and sent from Chicago, on an average, every year. It is estimated that fully a half million dollars' worth are used in the State of New Hampshire every year. There are many single towns in Massachusetts that use from $25,000 to $45,000 worth, on an average, every year. There are several large fish-guano establishments in Maine, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Virginia, one of which is known to make over 7,000 tons a year. These, it is true, are but isolated facts, but they serve to mark the changes which science has already introduced into our practice. A thousand other facts might be mentioned to show what science has done to throw light upon the labors of the farm, and what progress has already been made in studying the composition of soils, of manures, of feeding substances, and of plants, while investigation and experiment are still being pushed with such vigor as to promise far more profitable and tangible results in the future.

To this end the National Government has come to the aid of the States in the establishment of agricultural colleges, where special attention may be given to the various sciences which bear directly or indirectly upon practical agriculture. All the States have now accepted the grant made by Congress in July, 1862, and in more than half of them, such colleges have been established and are actually in operation, in some form or other. They will undoubtedly do a good work for the rising generation; but whatever results may flow from them, they seem to indicate that the present is but the dawn of a new era—an era of improvements of which we cannot yet form an adequate conception. They show that a greater application of mind to the labors of the hand is to distinguish the future over all past generations, for the large numbers of young men who will go forth every year from these institutions, many of them thoroughly instructed in chemistry and kindred sciences, will give us, at least, the conditions for new discoveries which will open the way to higher triumphs, and so lead on to the golden age of American agriculture.

At the close of Mr. Flint's lecture, Hon. HARRIS LEWIS was called upon and addressed the Convention for a few moments, his remarks being well received.

Votes of thanks were then passed by the Board to the citizens of Wiscasset, and the officers of the Lincoln County Agricultural Society, for their generous co-operation in the arrangements for the meeting and for their attendance at the several sessions; to the Maine Central and Knox and Lincoln Railroads for the courtesy of free return tickets; and to the several speakers for their able and interesting lectures, after which the Board adjourned without day.

OUR NATIVE FLORA.

The flora of our State is rich both in useful and ornamental trees, and in shrubs and plants that are well adapted for rendering our homes and grounds attractive and pleasant. At the present day, as in the past, one great source of wealth in our State is its immense forests of pine, hemlock and spruce; while the value of other kinds of timber is rising as the demand for it increases in consequence of its uses in the arts. The maple and beech are being sought for the manufacture of furniture, ash for cars and agricultural implements, oak and hackmatack for ships, birch for spools, shoe pegs and other products, poplar for wood, and alder for charcoal. So far as the smaller shrubs and ornamental plants and climbers are concerned, we have large numbers now growing wild and unobserved in their native habitats, which would succeed well if removed to our cultivated grounds, and which possess characteristics entitling them to conspicuous places about our dwellings and in our gardens. But as a general thing, our people lack information in regard to the habits, uses and history of our native plants: not but what they are possessed of good intelligence, but knowledge upon this subject is generally confined to books, to which they do not have access; and hence they are ignorant concerning the trees and plants and shrubs which beautify our forests and farms, and afford the means of wealth to so many of our citizens. The opportunity given, however, for becoming acquainted, both scientifically and practically, with our native flora—and hundreds will take advantage of it, and study the subject in both these relations, who would never think of pursuing botany as a specialty, by the aid of more elaborate and expensive works. As an evidence of this eagerness on the part of our agriculturists, especially our young and reading farmers, to become acquainted with the natural history of our State, it may be remarked that the paper on the "Weeds of Maine," published in the Report of the State Board of Agriculture for 1869, excited general interest throughout the State; and among all the calls for back volumes of our reports, more are received for that year than all others, mention being made that it is wanted for the article in question. Besides, numerous letters have been received testifying to its scientific interest and practical value ; and many have been led to pursue the study of botany still farther, by having their interest in the subject excited through the perusal of this little treatise.

In the hope of contributing to a knowledge of the natural history of the State, the following paper on the "Ornamental and Useful Plants of Maine," is submitted to the public. The subject treated is one eminently apposite to the work which the Board of Agriculture has been carrying out, and the execution of it has been placed in the competent hands of the author of the "Weeds of Maine," to which reference has been made. Mr. Scribner is a young and enthusiastic botanist, who is already well known to the people of the State by his various contributions to a knowledge of our local flora, through the public press. He is a graduate of the State College at Orono, has travelled extensively through Maine, having twice ascended Mt. Katahdin, and by practical observation and thorough study is fully qualified to treat the subject he has in hand, the first part of which is now submitted to the public. It has been found necessary, on account of the length of this paper, to divide it; the second part of which will be issued at a subsequent time. A copy-right of the treatise has been secured to the author.

American Atragene.—Page 160.

ORNAMENTAL AND USEFUL PLANTS OF MAINE.

BY F. LAMSON SCRIBNER, B. S.

"A Prophet is not without honor save in his own country;" true is this saying when rendered—A plant is not wanting admiration save in its native land. Very many of our wild flowers are among the choicest plants of English and European gardens. There exists among us what seems a studied neglect of the many rare and curious plants which brighten the depths of the silent wood with their beautiful blooms, or adorn the margins of our wild water-courses with their graceful forms and perfumed flowers. Our ignorance and neglect of the floral wealth which abounds in our field and forest lands is the marvel of foreigners, and justly have they rebuked us by exclaiming: "And so in a country of Azaleas, Kalmias, Rhododendrons, Cypripediums and Magnolias—the lovliest flowers, shrubs and trees which the temperate clime affords,—you never put them in your gardens, but send every year over the waters for thousands of dollars' worth of English Larches and Dutch Hyacinths!" We find an account of an American, who, desiring to beautify his grounds, consults his catalogues for some ornamental shrubs. In the lists of some French florist he finds a plant having the desired number of adjectives applied to it, and makes his order. The plants arrive, and when in bloom there is not in all his collection anything more beautiful than are these, exciting the admiration and delight of all who see them. Now the shrubs this man imported at no small cost, grew wild in a neighboring field, and might have been had for the transplanting; for they were none other than a species of Laurel or Kalmia. What excuse is there for such ignorance existing amongst us? There are many wild flowers desirable in every respect for garden culture, which to many lovers of plants are quite unknown. Let not our native plants be left to bloom and fade in all their beauty, "and waste their fragrance on the desert air;" but let us "consider the lilies of the field," and bring under our fostering care these wildlings of the fields and wooded dells. We know not what loveliness may be developed from plants of but passing beauty, for by culture are the works of nature often greatly improved. Nature creates, but man adorns. Their culture will afford a pleasure innocent and refined, cheaply purchased and within the reach of all. To patriotic hearts there is a finer pleasure in growing our native productions than in the culture of perhaps more gaudy exotics. Ought we not to be proud of a land so rich in native trees of every description of beauty—the graceful Elm, the stately Beech, the noble Oak and the majestic Pine? To us no foreign flower is more dear than the modest Sweet White Violet, none of more resplendent beauty than the Scarlet Lobelia, and none of purer loveliness than the White Pond Lily. What distant lands yield more beautiful shrubs than our Laurels or native Rhododendrons—and where shall we look for finer or more useful trees than those the Pine Tree State afford? The value of our timber lands cannot be over-estimated, and the preservation of our forest trees is a subject of vital and national importance. Every year our forests are being sadly diminished, and the size and quality of our cut timber is greatly deteriorating.

In view of this, the writer has been led to compile the following pages upon the "Ornamental and Useful Plants" of the State, giving to the trees especial prominence. It is hoped that by this account of our native plants a knowledge of them will be extended and their values better appreciated. No claim is laid to originality—that were almost impossible for the subject is one which has been exhaustively treated by many writers. With few exceptions the writer is familiar with every plant here mentioned as it grows in its native haunts. Like friends are they to him and he takes great pleasure in praising them, or speaking of their virtues. Many of these wild flowers he has either growm himself, or seen under cultivation. Other cultural notes when given, are taken from the most trustworthy authorities. Observations upon the families and genera have been compiled from sources of unquestioned accuracy, and no pains have been spared in collecting facts of interest concerning the species, from reliable writings at command. For convenience, and that an idea of the natural classification of plants may be imparted, the arrangement of orders adopted by Dr. Asa Gray, has been followed. Technical terms have been studiously avoided, as they tend only to confuse those unacquainted with them. It has been the constant endeavor to present in as popular a manner as possible a plain and easy account of the more desirable of our native plants. Certain species have been included which some would have omitted:—others may have been omitted which some would have included. In a case like this it has been no easy matter to make a line of distinction where one must be more or less guided by his own knowledge and predilections.

To Mr. S. L. Boardman the writer is under great obligations for the free use of his most excellent library, and for much valuable assistance. To Mr. J. S. Hobbs, State Librarian, he is also indebted for the kindly loan of works from the State Library. The works chiefly consulted are the following: Gray's Manual of Botany of the Northern United States, Flora Cestrica, Darlington's Weeds and Useful Plants, Systematic Botany of Le Maout and Decaisne, Evelyn's Sylva, Emerson's Trees and Shrubs of Massachusetts, etc. When other writers have been consulted, due credit has been given.

AUGUSTA, September, 1874.

PART I.

POLYPETATOUS EXOGENS.

BUTTERCUP FAMILY—ORDER, RANUNCULACEÆ.

Herbs, or in *Clematis,* woody climbers. The parts of the flower all distinct and unconnected.

A large family, numbering about a thousand species, very many of which are cultivated for ornament. The plants of the entire order have a watery, acrid juice, which in some species—Monk's-hood—is extremely poisonous. In drying the acrid properties are destroyed. Among the exotics, well known in gardens, are species of *Clematis, Anemone, Columbine, Larkspur, Pæony, &c.*

VIRGIN'S BOWER, CLEMATIS. (Ancient Greek name.)

A genus of highly ornamental climbers, which of late have received much attention by the Florists, and very many beautiful varieties have been produced by hybridizing. *C. patens,* from Japan, has blue or purple flowers, five to seven inches across. There are native with us two species.

American Atragene, *C. verticillaris, D.C.* (Figured in this work). *Root* perennial. *Stem* 5 to 10 feet long, half woody, slender. *Leaves* composed of three ovate leaflets. *Flowers* solitary, about 3 inches across, bluish purple. *May.*

This vine stands first among our ornamental plants, as it does in the natural classification of species. It occurs from Canada to Virginia, but is, however, very scarce. It is found at Orono, growing in profusion on rocky banks, climbing, by means of its long leaf-stocks, over bushes and small trees, to the height of 9 or 10 feet. When in full bloom, about the last of May, its appearance is truly beautiful, the graceful, slender stems, clothed with light green foliage, and ornamented with large rose purple flowers, gracefully pending from the surrounding shrubbery. Each flower is succeeded by a tuft of silvery plumose, or feathery fruit. The Atragene resembles in general appearance the more common Virgin's Bower, though it is by no means so rampant a grower. It is hardy, easy to grow and manage, free from disease and the attacks of insects, but quite difficult to obtain, unless one happens to know its native localities. We do not know that it can be procured from any American nurserymen. Several European cultivators have it in their collections. The early blooms and ease with which it is cultivated, make it especially desirable. Besides the locality mentioned above the Atragene is also found in Orland.

White Clematis, Virgin's Bower. *C. Virginiana, L.* *Root* perennial. *Stem* 8 to 25 feet long, shrubby. *Leaves* composed of three ovate leaflets, which have their margins cut or lobed. *Flowers* diœcious or polygamous, arranged in a panicle, numerous, dull white. *Fruit* with a long plumose tail. *Plant* climbing by means of twisting leaf-stalks. *July, August.*

This climber is found throughout the border States from Canada to Georgia, and west to the Mississippi river, being very abundant in certain districts. It delights in a moist, rich soil, and is usually found growing over thickets along the borders of streams. It will grow very well on dry uplands if the soil be good.

The nearly white flowers are arranged in large clusters, and, owing to their abundance, are showy and attractive; they are sweet scented and multitudes of insects constantly hover about them. The flowers soon fall off, and in the female plants, are succeeded by conspicuous, silken, feathery tufts of fruit, which remain on the vine after the leaves have fallen in autumn, and give the plants a striking and pleasing appearance. The stems thus adorned make beautiful trimmings for sitting-room or parlor, and are much sought for this purpose. Like the last species, this vine is a leaf-climber.

Dr. W. J. Beal, in the *American Naturalist*, speaking of the climbing of the Clematis, says, that in addition to this mode of holding fast, the leaf stalks are sensitive to the touch, slowly bending into the form of hooks, and if successful in catching a stick, they clasp it firmly and soon become greatly enlarged and strengthened by an extra growth of woody fibre. If they come in contact with no object, after a short time they resume their original position, which is ever afterwards retained.

The Virgin's Bower is easily transplanted either in the fall or spring, doing well even after vigorous growth has commenced. Female plants should be selected.

LIVERLEAF, HEPATICA, *Dillenius.* (A Greek word, meaning *of the liver*, from a fancied resemblance of the leaves to that organ.)

Immediately below the flower are three small leaflets, forming an *involucre,* which, from its appearance and position might be mistaken for a *Calyx; Corolla* none.

Three-lobed Hepatica, Liverwort, Liver-leaf, *H. triloba, Chaix.*

Roots perennial fibrous. *Stem* not apparent (*acaulescent*). *Leaves* on long *petioles.* broadly heart-shaped in outline, with three obtuse lobes—whence the specific name, *Flowers* blue, purple, rose or white, formed of the petal like *sepals. April, May.*

Earliest among our native spring flowers is the Hepatica. With what eagerness do we search for the blooms of this little plant upon the sunny slopes of wooded hills where the snow disappears soonest, and with what a thrill of delight does the first sight of its delicately tinted blue or rose-purple flowers fill us! In its bright blooms we behold the awakening of a new life, which the warming sun has brought forth from the earth, long buried under the cold snows of winter. The older leaves are in themselves pretty objects, either being of a fine green color or beautifully varigated with deep, rich purple.

The Liver-leaf is much improved by garden culture, often producing a profusion of elegant double flowers. It has quite a medicinal reputation among the "herb doctors;" an infusion of the leaves forms an astringent drink given in cases of lung disease.

Another species of the Hepatica with acute leaf lobes may be found upon northern hill-slopes, especially in the western part of the State.

WIND-FLOWER, ANEMONE. (A name given by the Ancients, either because the plants grow in windy localities, or because they were supposed to bloom only in the windy seasons).

The Anemones have been much cultivated by the florist, so that now some of our handsomest, hardy autumnal plants are of this genus. Our native species are early bloomers.

WIND ANEMONE.

Wood Anemone, Wind-flower. *A. nemorosa, L.* (Figured in this work).

Root-stalk slender, creeping. *Stem* slender, smooth, without branches, 4 to 10 inches high, bearing near the summit 3 tri-foliate *leaves*, which form an involucre to the single, white-or rose colored *flower* terminating the stem. *May.*

> "All wan and shivering in the leafless glade,
> The sad Anemone reclined her head;
> Grief on her cheek had paled the roseate hue,
> And her sweet eyelids dropp'd with pearly dew."—(*Darwin*).

The little Wood Anemone is a delicate and graceful plant, growing in rich clayey loam along the borders of thickets and in open woods. The bright white or rose-tinted flowers, and the elegant tri-foliate involucre render our plant attractive in the extreme, so that it takes rank among the handsomest of spring flowers. The slightest breath of wind sets the whole plant in lively, graceful motion. The plant is easily grown in gardens, and though beautiful under cultivation, we are better pleased with it in its native haunts.

MEADOW RUE, THALICTRUM. (Origin of the name obscure.)

The Tall Meadow Rue, common in wet meadows and along streams, though a very pretty plant, takes rank among our weeds.

Rue Anemone, *T. Anemonoides, Mx.*

The Rue Anemone is a neat little woodland species, in habit much resembling the Wood Anemone, with which it is usually associated, though a far less common plant in Maine. The flowers are white or pink, about the size of those of the Wood Anemone, opening at nearly the same time, early spring. The leaves are smaller, and more delicate than those of the last named plant. The roots are formed of a cluster of small tubers. The Early Meadow Rue, *T. dioicum, L.* is a much larger plant, of very gracefull appearance. It is quite common in rich, rocky woods and ravines. Blooms in May.

BUTTERCUPS, RANUNCULUS. (A Latin word for a little frog, the plants usually growing where these animals most abound.)

These plants, owing to their active rubefacient and caustic properties have some medicinal value. In Europe, Alpine hunters frequently chew the leaves of *R. alpestris*, to keep off giddiness and to strengthen them.

The Common Buttercups, *R. acris*, enlivens our fields and meadows with its rich yellow flowers. It is, however, generally considered a nuisance by good farmers, as it forms a very poor fodder. When green it is very acrid and bitter, so that cattle will not eat it. A variety of this plant with full double flowers, is cultivated in gardens.

MARSH MARIGOLD, CALTHA. (A Greek word meaning a goblet, from the cup-like form of the flowers).

Parts of the *calyx (sepals)* 5 to 9, colored and petal-like. *Corolla* none.

Marsh Caltha, Marsh Marigold, Cowslip. *C. palustris, L.*

Roots perennial. *Stem* 5 to 10 inches high, hollow, succulent, smooth. *Leaves* large, round, heart-shaped, or kidney-shaped, often broader than long. *Flowers* bright golden yellow, an inch or more in diameter. Common in wet meadows. *May.*

The Marsh Marigold when fresh, possesses very astringent properties, which, however, are destroyed in cooking, and the plant is largely gathered for "greens" in localities where it abounds. There is a double-flowered variety in cultivation.

GOLDTHREAD. COPTIS, *Salisb.* (Name from a Greek word meaning to *chop* or *cut*, alluding to the cut or divided leaves.)

This genus includes plants found in Europe, Asia, and North America, having white flowers, and singular, narrow or club-shaped petals, which are hollow at the apex.

Three-leaved Coptis, Goldthread, Mouth-root. *C. trifolia, Salisb.*

The specific name refers to the three parted or *trifoliate* leaves. The Coptis is well known by its long, bright yellow and thread-like roots, which are highly prized for their medicinal virtues. The Shakers supply the trade by gathering the roots and leaves, and pressing them into small, square packages. The taste of the roots is bitter, and preparations from them, acting as a tonic, are used in convalescence and in dyspepsia. The name Mouth-root, is derived from the reputed powers of the root in curing canker or sore mouth. The plant is common in bog lands, and along the mossy borders of woods, rich in vegetable mould, extending from Labrador to Pennsylvania. The white flowers, and glossy, deep green leaves, render this little plant very attractive, and those who especially like to see our wild flowers growing under their care have cultivated it in gardens with success.

COLUMBINE, AQUILEGIA, L. (Name from Latin, *aquila*, an eagle, the spurs of the petals having a fancied resemblance to the talons of that bird).

Perennial plants with graceful, twice or thrice divided leaves, and showy flowers. A Rocky Mountain species, *A. cœrulea,* is perhaps unrivalled in grace and beauty by any others of the genus. In Wyoming there is found a remarkable dwarf species. It is a stemless plant, bearing a single blue flower on a scape one to three inches in height.

Wild Columbine, *A. Canadensis, L.*

Stem branching, about one foot high. *Flowers* numerous, drooping, outside scarlet, yellow inside. *Stamens* and *styles* yellow, conspicuous. The *petals* are curiously formed into long curved tubes, or spurs.

WILD COLUMNBINE.

An exceedingly showy and attractive plant, very common on rocky hills and high river banks. The bright, pendulous flowers, more beautiful than the commonly cultivated *A. vulgaris*, together with its fine foliage, than which no cultivated species is more graceful, render this a plant especially desirable for garden ornament. Transferred to the garden it soon makes itself at home, and is much improved, both in leaf and flower by the change.

BANEBERRY, ACTÆA. (Name from the Greek, meaning *Elder*, so called on account of a resemblance between the leaves of these plants.)

Herbaceous plants, with perennial spindle-shaped roots, smooth, erect stems, and compound leaves. Flowers white, in a single roundish or elongated cluster.

In rich deciduous woods one often meets this plant, beautiful both for its foliage and its bright cherry-red, or clear, shining white berries. Among our herbaceous plants we have none more attractive, when in fruit, than the Baneberry. The kind having white berries blooms a week or two later (early in June) than the red berried sort, from which it is considered distinct. The berries though so beautiful, have a bad character, being highly poisonous.

BUGBANE, CIMICIFUGA, L. (Name from two Latin words, meaning to drive away bugs; some species having been employed as a bugbane.)

Herbs, much resembling the Baneberry in growth and habit.

Black Snakeroot, Cohosh, Rich-weed. *C. racemosa, Ell.* (The specific name has reference to the arrangement of the flowers.)

Root-stock thick and knotted, externally black, with a white interior, having a sharp bitter taste and slight odor. *Stem* 3 to 8 feet high. *Leaves* compound. *Flowers* white, very numerous, arranged in a wand-like raceme.

This plant is not common in Maine, but is abundant in the Western N. E. States. It is valued chiefly for its medical virtues. In action it is anti-spasmodic and narcotic. It is sometimes employed in cases of chronic rheumatism. "An infusion of the bruised root is generally regarded as a sort of *panacea* for stock—especially for sick cows."

BARBERRY FAMILY—ORDER, BERBERIDACEÆ.

Herbs, or climbing or erect shrubs, with alternate leaves and chiefly yellow flowers.

Not a large family, but one of extended distribution, being found throughout the northern temperate regions, and in South America. Properties astringent. Malic acid is found in the fruit and leaves of most of the species. Some beautiful varieties are found in cultivation.

BAEBERRY, BERBERIS, **L.** (Name supposed to be derived from *Berberys*, the Arabic name for the fruit.)

Shrubby plants, many of which are highly ornamental, as *B. Darwinii* and *Japonica*, much grown in European gardens. The bark of the stem, and the wood and bark of the roots afford a yellow dye.

Berberry, Barberry, Pipperidge Bush. *B. vulgaris, L.* (Common Berberis.) Figured in Darlington's Weeds and Useful Plants, p. 37. Audubón's Birds, II, plate 188. London's Ency. of Plants, fig. 4922.

Stem shrubby, 4 to 10 feet high, producing many suckers. *Leaves* scattered on the fresh shoots of the season, mostly reduced to sharp triple or branched spines, from which the next season proceed rosettes or fasicles of ovate-oblong, bristly-toothed leaves.—(*Gray*). *Flowers* yellow, profuse, in slender drooping racemes, having a disagreeable odor. Fruit of oblong-oval berries, ripe in October, when they are of a showy orange-red or scarlet color, very sour. Barren pastures and by the wayside, chiefly in the southwestern part of the State. *June.*

Though a native of the Eastern Continent, the Barberry is thoroughly at home in many parts of New England. In the middle and southern part of this State it is often seen in stony pastures and along by-ways, far removed from cultivation.

There is not among the shrubs of Maine a species more useful, and we would almost add, ornamental, than the Barberry. The slender stems, clothed in light gray bark, many branched and gracefully arched above, give the plant a most pleasing outline. In early summer the drooping branches are graced with pendant racemes of golden flowers, finely displayed by the cheerful green tint of the clustered foliage. Nor does the beauty of the Barberry cease with its blooms, for in autumn our shrub is ornamented with scarlet, coral-like berries, imparting to it a most showy appearance. These berries often remain on the plant during the winter. Before the leaves fall in autumn, they change to an orange scarlet color, greatly increasing the charms of the plant. If the many suckers be removed from around the main stem, and the side buds be pinched off, the Barberry will assume the form of a small but beautiful tree, and if well cared for will grow to the height of ten or twelve feet. This shrub possesses almost every quality desirable in a hedge plant. Besides its highly ornamental character, it is a thick, and when young, a rapid grower, sending up a host of shoots thickly covered with sharp thorns. It is hardy, *very long lived*, easily transplanted, or grown from cuttings or seeds, and will bear all necessary pruning.

It does seem strange that so many people will take such pains to send out of the State to nurserymen, and pay high prices for shrubs whose appearance will by no means compare in elegance and beauty with this and many other of our native species, so easily obtained, growing close about us, yet wholly unknown.

There is a prejudice in Europe, and entertained by some in this country, against growing the Barberry, as it is thought to produce mildew or blight in grain grown in its vicinity. If there is any damage done at all to surrounding crops it must be by the free growing roots which may impoverish the soil. Upon examining the leaves of the Barberry in midsummer, one will generally find upon the under surface many little golden yellow patches formed by a very pretty fungus called *cluster-cups*, so named on account of its appearance under the microscope, which is that of an assemblage of minute cups. Botanists call this fungus *Æcidium berberdis*, but it is considered by authorities to be an entirely distinct plant from that which infests grain under the name of blight. It is certainly very different in appearance.

In the Barberry we have exhibited a remarkable instance of vegetable irritability and movement, which almost leads one to believe that *some* plants at least possess a *nervous force*, similar, if not identical with that more evidently displayed by animals. This power of movement lies in the stamens of the flower, which when touched near the base on the inside with the point of a pin make a sudden movement forward towards the pistil, generally discharging some pollen upon the stigma in the process. After a few moments the stamens gradually assume their erect position. This action is best observed in warm, dry weather, for the stamens seem to have lost their power of movement after a rain.

The berries of the Barberry are extremely sour; properly prepared, however, they form a delicious and wholesome jelly, and when candied with sugar make excellent preserves. A cooling and refreshing drink in fevers is made by steeping the bruised berries, or by mixing the jelly in water. When green the berries are sometimes pickled in vinegar and used as capers. "In some countries in the north of Europe the berries are used instead of lemon in flavoring punch." The leaves are quite acid, and have been used for salad. Medicinally the Barberry acts as a tonic and purgative. In some of its parts it is powerfully astringent, and a decoction of the bark has a reputation for strengthening the gums. The bark abounds in tannin, and in common with the wood, and the bark of the long, irregular roots, contains a yellow coloring principle. These parts are often used, especially in Europe, to tan and color leather. Dr. Emmerson says, that in Massachusetts the Barberry is employed to give leather a yellow color. The wood of this shrub is hard, brittle, fine-grained, and of a beautiful yellow color. On account of this last, unusual property, it is sometimes employed in fancy wood-work.

When grown especially for its berries, the Barberry should be cultivated in a deep and well manured soil, and all the suckers should be removed. There are several varieties, having different colored berries.

WATER-LILY FAMILY—Order, NYMPHÆACEÆ.

Aquatic herbs, mostly with floating heart-shaped or peltate leaves, arising from a large prostrate rootstock or rhizoma. This family is widely distributed, having representatives in all the continents, both north and south. It includes the beautiful *Victoria regia*—a native of tropical South America—remarkable for its gigantic size. The round leaves are from three to five feet in diameter, having an upturned edge or rim, two to six inches high. The magnificent flowers—more than thirty inches in circumference—are at first white but rapidly change through pale pink to bright red. The fruit is about the size of an apple, and the seeds which are rich in starch, are roasted by the natives who consider them excellent food. Our common water shield *Brasenia peltata*—singular in having its leaf and flower stems, and the under surface of the leaves coated with a clear, jelly-like substance—possesses mild astringent properties.

WHITE POND LILY, Nymphæa. (Dedicated by the Greeks to the Water-Nymphs.)

Our plants of this genus have large, prostrate rootstocks, often several inches in diameter. The rounded leaves float upon the surface of the water. The large and beautiful flowers have a multitude of pure white or rose-tinted petals, which are displayed during the middle portion of the day, except when cloudy, during the summer months.

Water-Lily, White Pond Lily, *N. odorata, Ait.*

Mrs. Hemans has thus beautifully described this plant:

> "Know that the Lilies have spread their bells
> O'er all the pools in our forest dells;
> Stilly and lightly their vases rest
> On the quivering sleep of the water's breast,
> Catching the sunshine through leaves that throw

> To their scented bosoms an emerald glow;
> And a star from the depth of each pearly cup,
> A golden star unto heaven looks up,
> As if seeking its kindred where bright they lie,
> Set in the blue of the summer sky."

Upon bright summer mornings, what can afford more pleasure than to stroll away from the haunts of men and seek some hill-embosomed lake, where upon the rippling surface of the waters gently rests this most beautiful emblem of silence—the White Pond Lily, fittingly dedicated to the Goddess of the waters? Where grows there a sweeter bloom of purer loveliness?

> "For beautiful thou art,
> Thou sculpture-like and stately River Queen!
> Crowning the depths with the light serene
> Of a pure heart."

We often see large extents of Lake surface whitened by the flowers of the Pond Lily mixed with the rich yellow blooms of the *Nuphar*, and the splendid blue flowers of the *Pontederia*. The peculiar charms of this aquatic make it especially desirable for cultivation where one has upon his premises a proper body of water. The plant bears transplanting well, and is often much improved in the size of its flowers by the change. It requires a rich, muddy bottom. When the large rootstocks are obtained, which may require considerable labor, they can be sunk in the place desired by attaching stones to them. This plant was included in the "*Floral clock*" of Linnæus, as the flowers have nearly fixed times for expanding and closing. A brown colored dye is obtained from the rhizoma. Its properties are styptic and tonic.

YELLOW POND LILY, NUPHAR. (From its Arabic name, *Neufar.*)

Aquatic plants, with showy petal-like sepals, and numerous stamen-like petals.

Yellow Pond Lily, Spatterdock, Cow Lily, Frog Lily. *N. advena, Aiton.*

A very common and well known plant, delighting in the muddy shores of lakes and in sluggish streams. By no means so beautiful as the last, yet the rather large globular flowers of this species are very curious and quite attractive, making it worthy of attention. If the large rhizoma be cut with a steel knife it quickly turns black. In domestic practice it is sometimes used as a tonic, and in a bruised form the rootstock is applied as a poultice.

PITCHER-PLANT FAMILY—
ORDER, SARRACENIACEÆ.

A little family of wholly American plants, growing in turfy, spongy bogs, and remarkable for the peculiar formation of their leaf-stalks or petiole, which are hollow and pitcher or urn-shaped.

SIDE-SADDLE-FLOWER, SARRACENIA, Tourn. (Named in honor of Dr. Sarrazen, of Quebec.)

A genus of six species, five of which belong to the Southern States.

Side-Saddle-Flower, Pitcher Plant, Huntsman's Cup, Adam's Drinking Cup. *S. purpurea, L.*

Root perennial fibrous. *Leaves* radical, evergreen, composed of a hollow pitcher-formed petiole, the blade of the leaf forms a heart-shaped, erect hood above the pitcher. *Flowers* large, deep purple, nodding, born singly on tall scapes. Peat bogs. *June.*

There are few plants more singular or interesting than this denizen of our northern bogs. It also possesses much beauty. The pitcher-shaped leaves grow in a rosulate cluster around the root, and are made showy by their bright purple veins. The whole leaf when much in the sun, often becomes deeply colored. The inside of the "*hood*," or true blade of the leaf, is covered with stiff hairs pointing downwards. The leaves, which are generally partially filled with water, are perfect insect traps, for small insects seem to be attracted to them, and when once within the pitcher the stiff hairs of the hood prevent their escape, so that vast numbers find within a watery grave. Beside dead insects, the water of the pitchers often contains living larvæ. Owing to their singular shape the leaves form elegant designs for vases and like articles of ornament. The flowers are quite showy, and when fully expanded are pretty if not elegant objects. Some parts of the flower are hardly less peculiar than the leaves. In color they are deep reddish-brown or purple, with a greenish-yellow centre.

We have several times seen it stated that the Pitcher plant is an efficient remedy for small pox. These statements have no foundation in fact, as has been proved by direct experiment.

Owing to its unique and attractive appearance this plant is desirable for cultivation. Though common, it often forms a subject of wonder and admiration, to those even who do not live in cities. If one has not a suitable spot out of doors for growing this plant, it will do very well in pots if a sufficient quantity of bog earth is taken up with the roots and they be well supplied with water. We have seen this plant growing finely in a fern case, and sending up flower buds in the month of March.

POPPY FAMILY—ORDER, PAPAVERACEÆ.

Herbs with a milky or colored juice, either narcotic or acrid. From the milky juice of *Papaver somniferum* two well known and valuable drugs, morphine and opium, are obtained.

BLOODROOT, SANGUINARIA, Dill. (Name from Latin, *Sanguis*, blood, alluding to the color of the juice.)

There is but one species, a native of North America.

Canadian S., Bloodroot, Puccoon. *S. Canadensis, L.*

Root-stock 2 or 3 inches long and about one-half inch in diameter. *Leaves* at time of flowering small, finally they are 4 to 5 inches wide and nearly as long. *Flowers* an inch to an inch and a half in diameter, composed of 8 to 12 pure white petals, and two sepals which soon fall off. Rich, wooded ravines, common. *April, May.*

The elegant, pure white blooms make this a prettier plant for garden culture than many a foreign species upon which much care is bestowed. It grows readily upon transplanting, and when made into a bed, the early flowers of snowy whiteness, present a most pleasing spectacle. In spring the delicate buds are tenderly enfolded in the young leaves. Besides its beauty, the Bloodroot has a well established medicinal value, having active emetic and narcotic properties. It has been used in cases of rheumatism and in inflammation of the lungs. In some parts of the country the leaves are given to horses to promote the shedding of the hair, and the roots are given to destroy bots.

FUMITORY FAMILY—ORDER, FUMARIACEÆ.

Herbaceous plants, with alternate, cut leaves and irregular terminal flowers. Fumaria officinalis or Common Fumitory is a very delicate and pretty little plant, but it has become so common about some gardens that it ranks as a weed.

DUTCHMAN'S BREECHES, DICENTRA, *Bork.* (Name from the Greek, meaning two-spurred, referring to the shape of the corolla.)

D. spectabilis, or Bleeding Heart, is a very elegant and well known garden plant.

Both the Dutchman's Breeches, *D. Cucullaria*, and the Squirrel Corn, *D. Canadensis*, are sometimes found in this State growing in the rich leaf mold of deciduous woods. The former is a very delicate little plant arising from a granular scaly bulb, having very singular white flowers, tipped with yellow. The latter species has, instead of a scaly bulb, scattered grain-like yellow tubes resembling in appearance grains of Indian corn. This plant is very ornamental, having the same habits and general appearance of the Dutchman's Breeches, except in its flowers, which have the perfume of Hyacinths and a delicate rose or flesh color. The spurs of the corollar are also much shorter. The Squirrel Corn grows in the vicinity of Waterville.

Another very pretty and attractive plant of this family is the **Pale Corydalis,** *C. glanca.*

PALE CORYDALIS.

The plant is herbaceous, varying in height from 6 inches to 3 or 4 feet, and covered with a glaucous bloom. The flowers appear from May to August; they are numerous, and though small are rather showy, being beautifully variegated with shades of yellow and pink. They resemble the flowers of the *dicentra*, excepting that they have but one spur.

"Among the many wild flowers that we have introduced into the garden none have given us more pleasure than this. It is a biennial, which ripens its seeds and drops them early, and the young plants from them acquire sufficient size the same season to flower the next."—*(American Agriculturist.)* The Corydalis grows in rocky places, especially about newly cleared lands.

The climbing Fumitory, *Adlumia*, is said to be a native of this State. It is a beautiful climbing plant, with most delicate foliage and drooping purplish flowers. It is often seen in the gardens.

MUSTARD FAMILY—ORDER, CRUCIFERÆ.

A clearly defined family, of about 1,200 species, possessing well known acrid or pungent properties. The calyx and corolla are each composed of four parts, arranged crosswise, whence the name of the order, *Cruciferæ*. To the market-gardener this family is one of the most important, for to it belong the numerous varieties of turnip, radish, cress, cabbage, &c. We have several introduced species which rank as weeds, and are described in the Agricultural Report for 1869. There is also quite a list of ornamental plants belonging to this order, as the TEN-WEEK STOCK, WALL FLOWER, HONESTY and CANDYTUFT. The native species either for use or ornament are few.

Winter Cress or Scurvy Grass, *Barbarea vulgaris.*

This is frequently met in low grounds, and is sometimes used as a salad. The flowers are bright yellow, leaves and plant deep green.

Pepper-root,—*Dentaria diphilla*, and a species of Rock Cress,—*Arabis Drummondii.*

The above are perhaps our prettiest native species. The first is not uncommon in rich woods and moist meadows. It has quite large white flowers, in a terminal raceme, opening in May. The pungent, aromatic root-stock is from 5 to 10 inches long, and beset with teeth. The second is a rare plant, with very pretty rose-colored flowers, quite conspicuous. The plant is a biennial, with an erect, wand-like stem, one or two feet high. The writer has observed this plant in the vicinity of Orono, and it is said to occur near Lewiston.

Cakile Americana is a peculiar fleshy species with purple flowers, growing along the sea-shore.

VIOLET FAMILY—Order, VIOLACEÆ.

A family of wide distribution, known to us by the many beautiful cultivated and wild species of the genus Violets, or *Viola* in the language of the old Romans.

The Violets are easily recognized, and so well known that special descriptions are deemed unnecessary. All the species are attractive and ornamental. Especially prized is the *Sweet White Violet,* that opens its delicate and sweetly scented flowers so early in the spring. We have another white flowered species with narrow lanceolate leaves, which is quite common along the borders of ponds and moist river banks. Common in moist deciduous woods, we find the *Early Yellow* or *Round-leaved Violet,* and

> "When beechen buds begin to swell,
> And woods the Bluebird's warble know,
> The Yellow Violet's modest bell
> Peeps from the last year's leaves below."

One is filled with delight when first he sees the bright and beautiful purple-veined petals of this "wee" flower, just springing into the light, and cheerfully reflecting to the warming sun its golden rays.

> "Of all her train the hands of Spring
> First plant thee in the watery mold,
> And I have seen thee blossoming
> Beside the snow-bank's edges cold."

We have another yellow flowered species, called the *Downy Yellow Violet.* The whole plant, which is from 6 to 12 inches high, is covered with a soft pubescence. With us it blooms about the last of May. The most conspicuous of our Violets are those with violet blooms—

> "Gleaming like amethyst in the dewy moss."

There is the small *Selkirk's Violet,* with its heart-shaped leaves, lying flat on the ground, and beardless petals. Then there is the arrow-leaved species common in sandy fields and on dry hill-sides. More prevalent still is the common Blue Violet, *V. cucullata.* It grows everywhere in moist, low grounds, and is the tallest among the species with blue flowers. Most beautiful of our natives is the Bird-foot Violet, which is found, though rarely, in sandy fields and pastures. Its numerous leaves are all neatly divided into three or five narrow lobes, and above them is displayed in rich profusion the large (one inch across), lilac-purple or blue flowers. There is an occasional variety with the two upper petals deep violet in color and of a soft velvety texture, like the Pansy. Of all the thirteen species occurring in Maine this is the most desirable for cultivation. Almost any of them, however, are an improvement on many garden plants from the Florists.

ROCK-ROSE FAMILY—Order, CISTACEÆ.

A small family of low herbs or shrubs with regular flowers and alternate leaves, chiefly natives of the south of Europe. *Ladanum*, a balsamic resin used in perfumery, is the product of a species of *Cisti*.

ROCK-ROSE, Helianthemum, *Tourn.* (Name from Greek words meaning *sun* and *flower*, the blossoms opening only in sunshine.)

Low, somewhat shrubby plants with yellow flowers. There are about thirty known species, a number of which are highly ornamental, are much cultivated in rock-work for which their habits especially adapt them.

Canada Sun Rose, Common Frost Plant, *H. Canadense, Mx.* (Figured in Sweet's Cistaceæ, plate 21).

Root perennial. *Stem* erect, downy, 8 to 12 inches high. *Leaves* nearly an inch long and 1-4 as wide, whitish beneath. *Flowers* of two sorts—the *primary*, which are terminal and have a showy yellow corolla about an inch wide, and the *secondary* flowers, which are without petals and form inconspicuous clusters in the axils of the leaves.

This rather ornamental plant is found in this State, (Orono) though probably not frequent, growing in dry sandy or gravelly places. It receives the name frost weed from the peculiar circumstance that late in the fall crystals of ice shoot from the cracked bark at the root.

The genus Hudosonia, (named in honor of Wm. Hudson), presents two very pretty heath-like shrubs, not unfrequent on sandy seashores. The Downy Hudsonia, *H. tomentosa*, is beautifully figured in Torrey's Botany of New York, Vol. I, plate 9. It is much branched, assumes a pleasing shape, grows to the height of from 3 to 6 inches, and has very small, white-downy leaves closely embracing the stem. The whole plant has a singular grayish appearance. In June it is truly a pretty object, for then it is made showy by being completely covered with small but bright golden-yellow blooms.

Hudsonia ericoides is a more delicate and has a greener and more heath-like aspect than the last. The flowers and habits of the plant are much the same. Both these species are found at Hunnewell's Point, in the southern part of Phipsburg.

SUNDEW FAMILY—ORDER, DROSERACEÆ.

Bog plants with perfect, regular flowers, and with leaves covered with scattered hairs, which exude at their tips minute globules of a viscid, sticky fluid. The species, which are perhaps more curious than ornamental or useful, are widely distributed, being especially frequent in South Africa and Australia. The Venus Fly-trap—*Dionœa*—found near Wilmington, North Carolina, is remarkable for the irritability of its leaves, which, when touched, close suddenly and with sufficient force to capture small insects. Our species possess this irritability though in a much less degree.

SUNDEW, DROSERA, L. (Name from a Greek word meaning *dewy*—the clear sparkling drops, exuded by the hairs, give the plant a dewy appearance.)

"Queen of the marsh, imperial *Drosera* treads
Rush fingered banks and moss embroidered beds."

Our more common species has greenish or bright red leaves, lying close upon the ground, and forming a perfect rosette, from the centre of which arises the delicate little flower-scape, uncoiling as it grows like the mainspring of a watch.

"Redundant folds of glossy silk surround
Her slender waist and trail upon the ground."

The Drosera blooms in the warmest summer months—the flowers opening one by one as the uncoiling goes on—displaying their pure white petals only during the hours when the sun shines most brightly. The Drosera is well worth a place among our winter house-plants or in the fernery, not only on account of its colored leaves "glittering with many a crystal gem," but also for its peculiar habits, as it is a veritable little "fly-trap." The shining drops—most conspicuous in the hottest sunshine—appearing so cool and inviting, cause the death of many a heedless fly who seeks to refresh himself upon them. When once the insect meets the sticky fluid tipping each of the hairs, he is made a fast prisoner and his struggles for freedom only tend the more firmly to secure him. If the hairs which lie beyond those directly in contact with the insect be patiently watched, they will be seen to incline or slowly bend inward towards the cause of disturbance, and if the distance be not too great, will come into contact with it. By some it is affirmed that the object of the Sundew in thus capturing insects, is to secure nourishment for itself by imbibing the juices of the insect.

In transplanting the Sundew sufficient earth should be taken with the roots to fill the pot in which it is to be placed. For a house plant there are few things more unique or interesting. It requires to be watered freely and placed well in the sun.

There is another species, *Dosera longifolia*, more especially confined to bogs, which has the appearance of *D. rotundifolia*, but the leaves are narrower and more loosely arranged about the stem.

ST. JOHN'S-WORT FAMILY—

ORDER, HYPERICACEÆ.

A family of widely distributed species, having the opposite, entire and simple leaves minutely punctate with translucent, and commonly some blackish dots. The flowers are usually yellow, and the numerous stamens are arranged in several—three or five—clusters.

St. JOHN'S-WORT, HYPERICUM, L. (Origin of name unknown)

Common plants of little or no agricultural value, with showy yellow flowers, blooming in summer.

The Common St. Johns-wort, *H. perforatum*, is an introduced species, and with us has the character of a weed. "This plant is called St. John's-wort, because it was supposed in olden times to have the power of keeping off evil spirits, which were supposed to be particularly busy on St. John's night." There are other powers which superstition seems to have given this plant, for we hear that formerly in England,

"The young maiden stole through the cottage door,
And blushed as she saw the plant of power;
Thou silver glow-worm, Oh! lend me thy light,
I must gather the mystic *St. John's-wort* to-night;
The wonderful herb, whose leaf will decide
If the coming year shall make me a bride."

A valuable crimson or red dye is said to be afforded by the juice of the tops and flowers of this plant.

There are five native species. *H. corymbosum* and *H. ellipticum*, growing in damp soil are the largest and most showy; the three other sorts are less conspicuous, though perhaps prettier plants.

The Marsh St. John's-wort, *Elodes Virginica*, found in wet bogs has purple-veined leaves and flesh-colored flowers arranged in close clusters near the summit of the stem.

PINK FAMILY—Order, CARYOPHYLLACEÆ.

Herbaceous or rarely shrubby plants with opposite, entire leaves and regular flowers. The stem and branches are generally swollen at the nodes, and sometimes jointed. There are many hundred varieties grown by the florist, they are among the most fragrant and beautiful of cultivated plants. Our native species have little value either for ornament or use. Formerly some of the *Caryophyllaceæ* were employed for their refreshing and demulcent properties, but now they are out of use. A peculiar syrup is prepared from the sweet scented petals of *Dianthus Caryophyllus.* Under the name of Clove-Giliflower, this plant is mentioned in the songs of Chaucer:

"Ther Springen herbs, great and small,
The Licoris and the Stetewall,
And many a Clove-Giliflore to put in ale
Whether it be moist or stale."

Common Soap-wort, *Saponaria officinalis.*

"That fluffy flower of dainty pink,
Called 'Bouncing Bet,' * *"

Should be mentioned here. It has a smooth, jointed stem about one foot high, and opposite, lanceolate leaves one to three inches long. The flowers are showy pink or light rose-colored and commonly double. This plant possesses highly demulcent properties, and the gummy, soft resinous matters contained in the leaves and roots form a froth or lather when swashed about in water. Water thus treated affords a wash which gives much relief and often entirely cures the blisters produced by "Mercury," or Poison Ivy. The Soap-wort is an introduced plant.

"A wild and ever roving flower,
Which hardy fights conditions sour,
With straggling growth and reck'ess power;
Still blooming early, blooming late,
By village road and farm-yard gate.
* * * * *
If its rank growth it would condense,
And stay within the garden fence,
Some undeveloped excellence,
Within its petals might be set,
And in new grace, we might forget
Its slighting nickname, '*Bouncing Bet.*'"—E. M. Ford.

CAMPION, Silene, L. (Name from the Greek, meaning *saliva*, because in many species there is a viscid excretion.)

This viscid matter is so sticky in some of the species as to hold small insects; hence the English name *Catchfly*. Several species are cultivated for ornament.

Moss Campion, *S. acaulis, L.* *Stem* dwarf, tufted and moss-like, 1 to 2 inches high. *Leaves* very numerous and narrow, one-half an inch long. *Flowers* purple.

A very pretty little moss-like plant, growing on the summits of high mountains.

SANDWORT, ARENARIA, L. (Name from the Latin, meaning *sand*, as most of the species grow where it is sandy.)

The Sandworts are chiefly low tufted herbs, with small white flowers.

Mountain Sandwort, *A. Grœnlandica,* Spreng. *Stems* very slender, erect, growing in dense tufts, two to four inches high.

The flowers are white and quite large and showy for so small a plant.

This interesting and attractive little Sandwort grows in great profusion upon Mt. Katahdin, and also upon high, rocky river banks near the coast, especially at Bath.

SAND SPURRY, SPURGULARIA, Pers. (Name from the likeness of the plants to those of the genus *Spergula.*)

Low spreading herbs mostly growing near the seashore, blooming all summer.

Red Sand Spurry, *S. rubra.* *Stem* prostrate, forming tufts. *Leaves* small and very narrow. *Flowers* small, numerous, of a pink-red color, opening about noon during bright sunshine.

This is a very pleasing little species common by gravelly roadsides and along sandy paths. It occurs in great abundance at Orono, Augusta, etc.

PURSLANE FAMILY—ORDER, PORTULACACEÆ.

Herbaceous, succulent plants, with entire leaves and regular flowers, which expand only in sunshine. The species are widely distributed, delighting in the driest places. The properties of the order are not very marked. Common Purslane, or as some old people say, "Pusley," *Portulaca oleracea,* one of our commonest and most troublesome weeds, is sometimes eaten as salad. It is reported to be sedative, refreshing and antiscorbutic.

SPRING BEAUTY, CLAYTONIA. (Named in honor of one of our earliest botanists, *Dr. Clayton*).

Spring blooming, fleshy plants, arising from a small tuber.

Common Spring Beauty, *C. Virginica, L.* *Root* a deep, perennial tuber. *Stem* slender, unbranched, bearing two opposite, lanceolate leaves, 3 to 6 inches long. *Flowers* in a loose raceme, rose-colored with deeper veins. Moist open woods and banks. *May.*

The Spring Beauty is a well named plant, for it is truly one of our prettiest spring flowers, and were it less common it would be highly prized by the florist. As it is, it well deserves a spot in

SPRING BEAUTY.

the garden along with the Blood-root and Squirrel Corn. This plant grows abundantly in Bangor, Bucksport and Madison.

Claytonia Caroliniana has white flowers slightly tinged with red and beautifully lined with purple veins. This species is less common than the last. It has been found both in Bucksport and Bangor. When transferred to the garden it should, if possible, have a shady place. The roots of both species should have an extra covering during the winter.

MALLOW FAMILY—Order, MALVACEÆ.

A large family, numbering about one thousand species, found in nearly all parts of the world, except in the very coldest. They are either herbs, shrubs or sometimes trees, with alternate leaves and regular, mostly showy flowers. The numerous stamens are monadelphous or united into a tube, and are also connected with the base of the petals. Nearly all the species contain a mucilaginous principle. Many are grown in gardens for ornament. Species of *Gossypium*, cultivated largely in the Southern States, have their seed coats clothed with long and numerous hairs which furnish the cotton of commerce. Some of the largest trees in the world are members of this order, such as the celebrated Boabab trees of tropical Africa, having trunks that sometimes measure one hundred feet in circumference.

The leaves and flowers of the Common Mallow (*Malva rotundifolia*) and the High Mallow (*M. sylvestris*), and the root and flowers of the Common Marsh Mallow (*Althœa rosea*) are employed to allay irritation and to alleviate inflammatory soreness.

Swamp Rose Mallow, *Hibiscus Moscheutos, L.,*

Is found in brackish marshes along our seacoast. It is a tall, showy plant with a simple, erect and downy stem five to six feet high. The flowers are very large—five to six inches in diameter—of a light rose-color with a purple or crimson centre.

LINDEN FAMILY—Order, TILIACEÆ.

A family of nearly forty genera and three hundred and fifty species, most abundant within the tropics. It contains many useful and ornamental plants. The jute of commerce—a common substitute for hemp, which it somewhat resembles—is produced by the Indian *Corchorus capsularis*; many thousand tons of this material are imported into England annually. The inner bark of nearly all the species is fibrous and tough, like that of Malvaceous plants, and is employed in the manufacture of cordage; from some of the species paper is made. The properties of the order are very mild, a mucilaginous, wholesome juice pervading all the species.

In some the fruit is palatable. These plants are known to us by the single genus—

LINDEN, TILIA, L. (The ancient Latin name).

Trees with pale yellow, fragant, honey-bearing flowers; a firm but very soft and light wood, and a tough fibrous bark. To the lower half of the stalk bearing the flowers, their is united a peculiar, whitish, ribbon-like bract, which aids in extending the distribution of the seeds.

All writers upon trees have praised the beauties and dwelt upon the values of the Linden or Lime-tree of Europe, *T. Europæa.* The virtues of the bark and wood as well as the flowers are celebrated in the writings of the ancient poets.

> "The stately Lime, smooth, gentle, straight and fair,
> —With which no other Dryad can compare,—
> With verdant locks and fragrant blossoms deckt,
> Does a large, even, odorate shade project."—COULEH.

The inner bark of the Lime tree was much used by the ancients to write upon. A book formed of this material, containing some of the writings of Cicero, was purchased in 1662, by Louis XIV, for eight thousand dollars.

In the writings of Ovid is the story of Baucis, the wife of Philemon, who asked the gods the simple favor that she might die the same day as her husband. Her request was granted by changing her into a Lime tree and her husband to an Oak; since then the Lime has ever been considered an emblem of conjugal affection.

Theophrastus says that the sweet leaves were used as food for cattle; and Pliny alludes to the uses of the wood, and the value of the tree for shade. The farmers of Sweden and Norway even now gather the leaves in large quantities to feed to their cattle.

It was the custom of the Swiss and Flemings to plant a Linden on the field won in battle. The longevity of the European tree is often much shortened by the ravages of insects; there are trees, however, known to be over two hundred years old, and some that are thought to have been growing for more than six centuries. The average height of the foreign species is from thirty to fifty feet, with a diameter of eighteen inches to two feet. There are examples, however, of much larger growth; that one mentioned as growing at Knowle, near Kent, England, seems especially noticeable. This curious and immense tree shades nearly a quarter of an acre of ground. It is especially peculiar in the manner of its growth; for the wide extended branches drooped at their extremities till they finally rested upon the ground, where they took root and sent up a circle of young trees, which in their turn spread wide their branches, that drooped after the manner of the parent tree, and eventually rooting threw up another circle of young Lindens. Under favorable circumstances the head of the Linden has reached the diameter of one hundred and twenty feet, an altitude of one hundred feet, and a circumference of twenty-four feet about the trunk. Another specimen mentioned by Evelyn, was forty-eight feet in circumference at one foot from the ground, and more than ninety feet high.

A cubic foot of dry Linden wood will weigh thirty-five pounds. It is soft and fine-grained and of great value to the carver.

"Smooth Linden best obeys
The carver's chisel; best his curious work
Displays in nicest touches."

In St. Paul's Cathedral there are some exquisite carvings in this wood, made in the time of Charles II., by the celebrated Gibbons. Though more than two centuries old, these carvings are still sharp and beautiful. The wood is much used by toy-makers and turners. The sap contains sugar like that of the maple, but it is not so sweet. It readily ferments, and yields an agreeable vinous liquor. The astringent mucilage contained in the inner bark of certain European varieties, is employed by the Germans as a vulnerary.

The Linden grows very abundantly in Russia, where vast quantities of the bark is used in making the so-called Russian mats, much used by gardeners to wrap up roots and plants. Besides the uses already mentioned, the bark is made into ropes, fishing nets, and coarse clothing.

The flowers of the Linden are remarkable for their rich and delightful fragrance, being not unlike that of mignonettes.

——— "Sometimes
A scent of violets and blossoming *Limes*
Loitered around us; their honey cells
Made delicate from all white flower bells."—(*Keats.*)

The flowers of the Linden are rich in sweets, and when in bloom are eagerly sought by bees. In Scotland the honey made from these flowers, sells for more than double the price of any other kind. It is certainly of very superior quality, and "has been used extensively in medicine, and for liquors." The odor of the Lime-tree was believed by the early English to purify the air and act as a cure for epilepsy. Although the European tree has been much planted in this country, it has the drawback of early shedding its leaves,—

> "Those virgin leaves of purest vivid green,
> Which charmed ere yet they trembled on the trees,
> Now cheer the sober landscape in decay,
> The *Lime* first fading."

The foreign sort is also more liable to the attacks of insects than our native tree.

Basswood, Linden, American Lime. *Tilia Americana, L.* (Figured in Michaux N. Am. Sylva, pl. 131; Selby, British Forest Trees, p. 11; Loudon, Arboretum Britannicum, V, plate 24, and in this work.)

American Linden.

Root strong, very deep and wide-spreading. *Stem* 40 to 80 feet high, with wide-spreading and much ramified branches. *Wood* soft, light and fine-grained, very white when green, turning to a light brown in seasoning. *Bark* of young trees smooth, of a light ashen-gray color; on the trunks of old trees the bark is thick, and longitudinally cleft on the outside. *Leaves* roundish in outline, 3 to 6 inches long, with a toothed margin, and a heart-shaped, unequally lobed base—the largest lobe nearest the branch. *Flowers* of a light honey-yellow color, in clusters of from 6 to 25 on a branched stalk, which is curiously appendaged with a ribbon-like, membranous bract, rising from the upper axil of the leaf. *Fruit* a hard, roundish and gray nut, about the size of a pea, containing *one seed.*

Rich woodlands from Canada to Georgia. Flowers late in *June* and early in *July.* Fruit *October.*

This very valuable tree is known throughout New England by the name of Basswood. It is sometimes called white-wood, but this name properly belongs to the Tulip tree, abundant in the Middle and Western States. The Basswood is common in our woodlands, though it is by no means so frequent as most of our valuable trees; the trunk is often clear of branches for thirty or forty feet and of a very uniform diameter. The uses of the tree are almost identical with those of the European species, which have been noted. To the carriage and sleigh maker this wood is almost indispensable. It receives paint quite as well as pine, and when the latter wood is scarce it is substituted for it in finishing the interior of houses. When exposed to dampness or the weather it rapidly decays, but if kept dry it is very durable. Charcoal made from Basswood is of a superior quality, and quite as valuable for the manufacture of gunpowder as that made from the willow. The wood is little liable to warp and is used in making sounding-boards for musical instruments. It is also well adapted to the carvers use, and in former times the figure-heads of the boats on our western rivers were made of it. The bark has the toughness and other qualities of the European tree, and there is no reason why we cannot make it as useful to us. Indeed, it has been affirmed that it would be profitable to raise this tree for the bark alone. The following method of preparing the bark is taken from the American Agriculturist for June, 1863:

"Young and vigorous trees should be cut down during the present month (June) and the bark stripped off. This is to be put in a stream or pond of water until the inner bark is readily separable in layers, which will be in two or three weeks; when the bark parts readily it is to be taken from the water, carefully separated, a layer at a time, and then washed to free it from mucilage, and dried. There will be found a considerable difference in the strips. The finest should be selected for tying buds and other delicate work, and the strongest and thickest left for coarse purposes. 'Mats woven from these coarser strips, or a thatch made of it forms an excellent covering for young and tender plants.' The flowers contain a volatile oil, together with sugar, a mucilaginous gum and tannin. They are sometimes steeped in water, forming a tea valued for colds and hoarseness. There is much nutriment contained in the buds and young twigs. 'In severe winters when fodder is scarce, it is common for the farmers of British American provinces, as well as those of Maine, New Hampshire and Vermont, to drive their cattle into the woods in the morning and fell a Basswood or other tree on which they eagerly browse during the day.'"—(*Browne*).

The market value of good Basswood timber in the log is from $10 to $14 per M; when sawn into boards it is valued at from $15 to $35 per M, according to its quality.

The leaves of the Linden are peculiarly characteristic and have a luxuriant and healthy appearance. In neatness and symetry of form, and in the density of its shade this tree is unsurpassed by any of the deciduous leaved sorts. It belongs to the class of round-headed trees, and, owing to its stately habits is especially fitted to line avenues and straight walks. The dust of cities, so detrimental to most trees, affects this but little, so that it is well adapted to border streets. Not only is this tree very beautiful, but it has also to recommend it, a rapid growth and perfumed flowers.

"The Lime a dewy eve
Diffusing odors."

The flowers of the Linden are so arranged that if we wish to behold the amazing wealth of bloom which in July adorns these trees, we must go under them and look up. We view a glorious spectacle—"a very heaven of fragrant honey cups."

"The fragrance of the Linden blossom symbolize the crown and glory of summer in its most charming days of roses and hay-making, and we would not exchange the associations that cluster around it for all the 'odors of Araby the blest.'"

The Linden may be readily grown from seed or by layers. The former method is considered the better, as the young trees grow more rapidly and assume better proportions. Some dry, pleasant day in October the seeds may be gathered by beating them off the tree with a pole; they should be allowed several days to become thoroughly dry, and then be planted somewhat after the following plan, given by Hunter in his notes to Evelyn's Forest Trees:—"Procure a spot of rich garden ground, and having the mould made fine by digging and raking, let it be raked out of the beds about one inch deep. These beds may be four feet wide and the alleys a foot and a half. After the mould is raked out the earth should be gently tapped down with the back of the spade, to make it level; then the seeds should be sown, at about an inch asunder all over the bed, gently pressing them down, and covering them about an inch deep. In the spring of the year the young plants will make their appearance, when they should be constantly kept clear from weeds, and gently watered in very dry weather. In this seminary they may stand for two years, when they will be fit to plant in the nursery; at which time they should be carefully taken up, their roots shortened, and the young side branches, if they have shot out any, taken off. They must be planted in the nursery ground in rows, two feet and a half asunder, and one foot and a half distant in the rows. Then they may stand till they are of proper size to be planted out for good."

The young shoots which spring up when an old tree is felled, make the best of layers. According to Du Hamel: "Among these they throw a quantity of soil which they allow to remain two or three years, after which they find the shoots well rooted, and of a sufficient height and strength to be planted at once where they are finally to remain."

There are several varieties of the Linden cultivated, one of which has leaves nearly a foot long. Although this tree will grow and flourish in almost any kind of soil it does best in a deep, rich loam. The following data from the report of the Illinois Horticultural Society, indicate the growth of the Linden for the first fifteen years:

At the age of	5	years	6	inches in circumference	and	10	feet high.
"	10	"	18	"	"	20	"
"	15	"	40	"	"	38	"

One sometimes meets old trees that have a diameter of four or five feet near the ground.

Some English authorities mention as many as eighteen species of Lepidopterous insects alone, which feed, in their caterpillar state, upon this tree. According to Packard a species of saw-fly (See "*Guide to the Study of Insects,*" page 222) *Sclandria tiliæ,* feeds on the leaves of the Linden, and Harris, in his "*Injurious Insects*" mentions the following as boring the wood or eating the leaves: *Saperda vestita, Chrysomela scalaris, Vanessa Interrogationis, Apatela Americana,* and *Hybernia Tiliaria.*

FLAX FAMILY—Order, LINACEÆ.

Herbaceous or rarely shrubby plants, with sessile leaves and regular flowers. Many species are grown for ornament on account of their showy and various colored blooms. The plants of the order are remarkable for the great strength of the inner fibre of the bark.

Common Flax—*Linum ussitatissimum*—one of the most useful plants to man, and cultivated from remote antiquity. It is not a native here, but has become spontaneous about fields where it has once been grown. Linen is a well known product of this plant; and from a pound of the fibrous inner bark a thread 36,000 yards long has been spun. From the seed is made linseed oil used by painters; the nutritious oil-cake; a most valuable emollient poultice; and "one of the best mucilaginous drinks for coughs and dysentaric affections."

GERANIUM FAMILY—Order, GERANIACEÆ.

A family of herbs or under-shrubs, rarely trees, with regular or irregular, mostly showy flowers. The species number about 750; they are very generally distributed, but most abundant in Africa. A large number are grown in gardens, either for their beautiful flowers, or variegated and oftimes sweet-scented foliage. The herbage of some has a strong, disagreeable odor. The buds and young fruit of the well known garden Nasturtium—*Tropæolum majus*—a plant for South America, are frequently pickled and used as a substitute for capers.

Eight species grow wild in Maine, some of them quite ornamental.

GERANIUM or CRANESBILL, Geranium. (Name from the Greek *Geranos*, a crane; the long-beaked fruit bears some resemblance to the bill of that bird.)

Stems forked, often with swollen joints; *peduncles* bearing one to three regular, red or purple flowers.

Spotted Geranium, Cranesbill, *G. maculatum.*

Root perennial. *Stem* erect, 12 to 18 inches high, hairy. *Leaves* 2 to 3 inches long, with about five wedge-shaped divisions, marked with whitish spots as they grow old. *Flowers* light rose purple, about an inch across. Open woods and along fences. *May* to *July*.

This is quite a showy plant, and where it grows abundantly it may possibly be classed among the weeds. Its character is redeemed by the valuable medicinal properties possessed by the roots, and on account of these every one should be able to recognize the plant when seen. "The thick, fleshy root, or rather rhizoma, which should be collected in autumn, is powerfully astringent, without bitterness or unpleasant taste, and is useful in diarrhœa and other diseases where a medicine of this kind is required. Boiled in water, and mixed with sugar and milk, it is easily administered to children."—*(Darlington.)*

Herb Robert—*G. Robertianum*—is another native species, also possessing astringent properties. It is a diffusely branched, spreading plant, having very strong scented and finely cut leaves, and small, pink or red purple flowers.

BALSAM, IMPATIENS. (Name referring to the peculiar elasticity of the seed capsules, which, when mature, fly open at the sligtest touch, widely scattering the seeds.)

> With fierce distracted eye *Impatiens* stands,
> Swells her pale cheeks and brandishes her hands,
> With rage and hate the astonished groves alarms,
> *And hurls her infants from her frantic arms.*—(*Darwin.*)

The flowers are of two sorts—the irregular and showy ones, having the calyx colored like the corolla, and the very small ones which do not expand, but are fertilized in the bud. "They are forced off by the growing pod and carried upwards on its apex."

The East Indian *Impatiens Balsamea* is everywhere cultivated in gardens for its high-colored, often variegated and double flowers.

Jewel-weed, Celandine, *I. fulva.* (Figured on opposite page.)

This is a very common plant in swamps, and in moist, waste places about dwellings, where it properly ranks as a weed. It has a smooth, shining, juicy stem, two to four feet high, and alternate, somewhat tawny leaves. The curious orange-colored and spotted flowers are most gracefully panicled at the ends of the branches, and are truly elegant. Were it not for the somewhat weedy look which the plant has it would be considered highly ornamental. The juice of the stem possesses emollient properties; it has a supposed or real power to cure warts on both man and horses, and it affords great relief to some in cases of poisoning by "Mercury" (*Rhus*). The mature capsules or seed-vessels are a source of much amusement to children, as they burst with considerable force when touched with the thumb and finger, whence the names *Touch-me-not* and *Snap-weed,* sometimes applied to it.

CELADINE.

WOOD-SORREL, OXALIS, L. (Name from *Oxys*, a Greek word meaning *sour*, alluding to the acid taste of the leaves).

Several species are grown in Europe for their farinaceous and edible tubers. The juice has an agreeable and cooling, acid taste, owing to the presence of Binoxalate of Potash, a substance "which, under the name of *Salts of Sorrel* was formerly much used for removing ink stains and spots of iron rust from linen." Several kinds from the Cape of Goodhope, with rose-tinted or yellow flowers, are grown in conservatories.

Common Wood Sorrel, *O. Acetosella, L. Rootstock* perennial, creeping, scaly. *Acaulescent. Leaves* divided into three leaflets, which are notched at the end and fold up and droop at night. *Flowers* solitary on a slender scape, 2 to 5 inches high, *petals* white with reddish veins. Deep, rich woods. *June.*

This is a most elegant little plant, common in mossy woodlands; the beautiful and delicate flowers, an inch across, are finely penciled with purple veins. The herbage makes a good salad, and an infusion of the leaves is used as a substitute for Lemonade. From the juice Oxalic Acid is prepared. This acid, also made by treating sugar with nitric acid, is a most deadly poison. The antidotes, which it may not be out of place to mention here, are chalk, whiting, or magnesia mixed with water. This should be administered as quickly as possible.

There is another species sometimes found in our woods, with pretty violet-colored flowers. The most common sort is the Yellow Wood Sorrel, growing everywhere in fields and pastures. Both the leaves and flowers are much smaller than in the above mentioned species, and it differs also in having a branching stem, from three inches to a foot high.

RUE FAMILY—ORDER, RUTACEÆ.

Trees or shrubs, with pellucid dotted leaves and flowers, which often contain pungent and strongly scented bitter juices. Most of the species are tropical. To this order belongs the *citrus* or Orange tree.

PRICKLY ASH, XANTHOXYLUM, L. (Name from two Greek words, *xanthos*, yellow, and *xulon*, wood).

A genus of about fifty species, most abundant in tropical America, nearly all possessing valued medicinal properties. The bitter aromatic capsules of the Samarian Elm (*Ptelea*) are used as a substitute for hops in brewing.

American Xanthoxylum, Northern Prickly Ash, Yellow Wood, Toothache Tree. *X. Americanum*, Mill. (Figured in Bigelow's Medical Botany, Vol. III, pl. 59; Arboretum Britannicum, Vol. I, fig. 158; Darlington's Weeds and Useful Plants, page 75).

Root yellow. *Stem* shrubby, 4 to 8 feet high, much branched, armed with stout prickles. *Leaves* like those of the ash tree, made up of from 3 to 13 leaflets, 1 to 2 inches long. *Flowers* greenish-yellow, arranged in close axillary clusters, appearing before the leaves early in *May*.

This shrub grows along river banks, and is said to occur in this State. It makes a small, well looking, round-headed tree when growing alone and properly trimmed. The aromatic and pungent principle of the order is strongly present in the leaves and bark, and these are much employed in medicine. The bark is sometimes chewed to cause a flow of saliva and to alleviate the sufferings of toothache,

"That unpitying pain
Which plucks the nerves, close sealing with a frown
Ev'n beauty's lips, which the bold Ayrshire bard
Wished in his patriot vengeance to entail
On Caledonia's foes, yielding its rage
To the rough genius of that lofty tree,
Whose yellow armour bears in countless studs
The horrid thorn."

The Indians appear to have known the values of this plant, for "they extracted from its berries the salivating power of mercury, and made use of decoctions of the plant as strong perspiratives." (*Lawson*). "An infusion is used in domestic medicine in the treatment of rheumatism and in colic."—(*Weeds and Useful Plants.*) From some West Indian species a yellow dye is obtained, and their leaves are employed as a vulnerary. The berries of certain species are used to poison fish. The plant described above is the only species found in Maine.

SUMACH FAMILY—Order, ANACARDIACEÆ.

Trees or shrubs, with small flowers and alternate, chiefly compound leaves. The juice is milky or resinous, often acrid and poisonous, and of much commercial value. The *exhalations* merely from certain species are poisonous to some people, causing blisters and severe irritation of the skin. The Pistachio and Cashew nuts are edible, and the fruit of the Mango—*Mangifera Indica*—is most delicious. There are about forty-eight genera, mostly tropical. *Rhus* is the only North American genus.

SUMACH, Rhus, L. (Name the same as employed by the ancient Greeks and Romans).

This genus numbers about one hundred species—according to some eighty, and to others one hundred and fifty—very widely distributed, being found in Europe, China, Japan, and at the Cape of Good Hope, as well as in this country. The highly prized Japan and the celebrated Copal varnishes are made from the juices of *R. vernicilera* and *R. copallina,* respectively. The bark abounds in tannin, and the bark and wood yields a yellow coloring matter. The Smoke-Tree often seen in gardens, is a well known and highly ornamental shrub of this genus.

Stag's Horn or **Velvet Sumach,** *R. typhina, L.* (Figured in *Arboretum Britanicum,* II, fig. 224).

Roots wide-spreading and throwing up suckers. *Stem* 4 to 25 feet high, irregularly branched; *wood* soft, brittle, of a deep greenish-yellow color; *juice* abundant, thick, milky. *Leaves* composed of from 8 to 20 pairs of leaflets, shining green above, changing in autumn to purplish or orange-red. *Flowers* small, yellowish-green, arranged in a dense terminal panicle 5 to 10 inches long. *Fruit* a small drupe or berry, clothed with crimson hairs. Woodlands, dry hillsides and field-borders. *June.*

This is our best known and most valued species. The wood when smoothed has a satin-like lustre, and owing to its unusual color and fine grain may well be used in ornamental work. The bark contains a large amount of tannin, and like some European species has been employed in tanning certain kinds of leather. The specific name, *typhina,* is from the Greek word *typhos,* signifying stupor or senselessness, and is applied to this plant on account of the *antifebrile* properties of the roots. The milky and adhesive juice becomes black on exposure to the air, and "the branches boiled with the berries afford a black, ink-like tincture." The acid berries are by some employed to sharpen vinegar, whence the name *vinegar-tree,* sometimes applied to this shrub.

Commonly this plant appears as a straggling, ill-shapen shrub, possessing little beauty, and, on account of its throwing up numerous suckers, is classed by thrifty farmers among the troublesome weeds. It is certainly troublesome when growing in the garden or on land that is tilled, but when grown alone upon the lawn, or in some unused corner, it becomes highly ornamental. The branches have a most irregular growth; their extremities are not small and twig-like as in most aborescent plants, but large and stiff, and densely clothed with abundant brownish hairs, giving them the appearance of *Stag's horns,* whence our common name. When grown by itself this plant assumes a tree-like form with a rounded outline. Its attractions are its multitude of graceful and shining leaves, changing to bright hues in autumn, and its conspicuous scarlet fruit, which remains on the plant throughout the winter. It is easily grown from cuttings of the root or from seed.

Though the diameter of the Sumach is generally from three to four inches, there are occasional specimens of larger size; one in particular, growing near Augusta, is twenty-seven inches in circumference at six inches from the ground. It has a large round head, and whether in flower or fruit is a very attractive object.

There are five species of Sumach or *Rhus* native to this State. The Dwarf Sumach, *R. copallina,* has much the habit of the above described species, but is a small shrub and is distinguished by having its leaf-stalk winged or margined. The Smooth Sumach, *R. glabra,* is also a low shrub growing on dry hillsides and along river banks. The young shoots are very smooth, by which character it may at once be known. The two remaining species, though ornamental in appearance, are the most to be dreaded of all our native plants, as they are extremely poisonous to the majority of persons. The more common sort, the well known "Mercury" or Poison Ivy, *R. toxicodendron,* is a proper vine, climbing over rocks and about stumps, and often ascending the trunks of trees to a considerable height. It clings to its support by means of little rootlets which it emits along its stem, after the manner of the English Ivy. The powerful properties of this plant, so painful in their effects upon some people, are perfectly harmless to others. This difference may be owing to some constitutional diversity, or perhaps to the state or condition of the body when exposed to the action of the plant. There are those who have considered themselves wholly free from the usual effects of the Poison Ivy, and who have handled it many times with impunity, yet have been severely poisoned at last under some peculiar circumstances. Some are so susceptable to the properties of this plant that they are poisoned, especially if perspiring, by merely coming into its vicinity. Thus the air about the plant seems to be poisonous; more particularly is this the case with the Poison Sumach, *R. venenata.* Emerson calls this the most beautiful plant of the swamps; and it is indeed a fine appearing shrub, especially in autumn, when the always beautiful foliage is most brilliantly colored; but its villainous character, for it is even more poisonous than the Poison Ivy, must forever banish it from all good society. Even the charcoal of this species is said to poison some people. As with the Poison Ivy, there are those who can handle the plant or chew the leaves without injury. Dog-wood and Poison-wood are names by which this plant is known in certain localities.

Below are mentioned some of the remedies employed to relieve the irritation and blisters caused by the above named plants: Acetate of Lead and corrosive sublimate, (*Dr. Bigelow*); sweet spirits of nitre; a decoction made from the roots of Indian Poke, (*Prof. Hopkins*); a wash made from *Soapwort,* (see page 179). It is common to bathe the parts affected in hot water and then apply a very strong, warm brine. Some cover the irritated parts with a coating of soft soap, which is allowed to dry in, this is very sure to kill the effects of the poison but is rather a severe remedy.

VINE FAMILY—Order, VITACEÆ.

Our plants are woody vines, climbing by means of tendrils, with small greenish flowers arranged in clusters, opposite the leaves. The order numbers about 250 species, mostly inter-tropical. A species of *Cissus* furnishes a blue coloring matter used in dyeing cotton fabrics, but the chief value of this family is in the fruit produced by certain species of

The GRAPE VINE, Vitis. *Tourn.* (Name the same as employed by the ancient Romans.)

Two foreign species are cultivated for their beautifully colored foliage. From some varieties vast quantities of wine are made; others are grown for their well known and luscious fruit. The fruit of the wild growing sorts, of which there are three in Maine, is little esteemed. According to Sir James Hall, as quoted by Emerson, the leaves of the grape vine, dried in the shade form an excellent substitute for tea.

From our Northern Fox Grape—*V. Labrusca*—not unfrequent in low thickets, have been derived most of our table and wine producing varieties. The well known Isabella grape, and the Catawba, better known farther south, are said to be seedlings from this species. It is distinguished by having the young shoots and leaf and flower-stalks covered with a tawny down. The dark purple fruit, forming compact clusters, is a little more than half an inch in diameter, and filled with a tough musky-flavored pulp. The flowers appear in June, fruit ripens in September.

The Summer Grape—*V. æstivalis*—grows in similar locations as the above; it has smooth leaves, and small, nearly black berries, which ripen in October.

The Winter or Frost Grape is the only other native species. It is not so rampant a grower as the above-named, and is recognized by its very short jointed stem, thin leaves, and very acrid, small and almost black berries, ripening after the frosts. Besides for their fruit, these vines, especially the first, are highly ornamental for the trellis or arbor.

The CREEPER, Ampelopsis. *Michaux.* (Name from two Greek words, meaning *like the vine.*)

A small genus, considered by some as not distinct from *Vitis.*

The Virginia Creeper, *A. quinquefolia, Mx.* (Figured in Abbott's Insects of Georgia, I, plate 30.)

Root fibrous, extending near the surface of the ground. *Stem* climbing extensively, supported by means of tendrils. *Leaves* ample, composed of five obovate, long-pointed leaflets. *Flowers* small, inconspicuous, green tinged with red. *Fruit* dark blue, or quite black at maturity. Rocky banks and hill-sides. *July.*

This is the most valuable of all our native vines, both on account of its vigorous, hardy growth, and abundant rich green foliage, which in autumn assumes most brilliant scarlet and purple hues. No climber is so extensively grown and none more deservedly. As the roots are all near the surface of the ground, large vines can easily be transplanted without injury, so that a trellis or arbor can be covered, or an unsightly object concealed in a season. Owing to its peculiar method of climbing, this vine is especially well adapted to grow over the outer walls of buildings, as it needs little or no artificial support. The tips of the tendrils are expanded into flattened discs, which adhere to the walls most tenaciously. A disfigured tree is often transformed into a beautiful and picturesque object by being adorned with this rich growing vine. "Often in October, it may be seen mingling its scarlet and orange leaves, thirty or forty feet from the ground, with the green leaves of the still unchanged tree upon which it has climbed."

BUCKTHORN FAMILY—Order, RHAMNACEÆ.

A small family of shrubs or low trees, with slightly bitter and astringent properties. We have two species, the Alder-leaved Buckthorn and the

New Jersey Tea—*Ceanothus Americanus*—which in early times was much used as a substitute for the imported teas. "The flowers of the *Ceanothus* are white, in full and elegant clusters, without any formality of shape, having a downy appearance, always attracting attention, not so much by their beauty as by their delicacy and profusion."—(*Wilson Flagg.*) This plant grows in dry woodlands, blooming in July.

STAFF-TREE FAMILY—Order, CELESTRACEÆ.

A small family of about two hundred species, growing chiefly in the temperate regions, and possessing more or less acrid and astringent properties. A yellow dye is made from an Indian species of Spindle-tree "with which the Hindoos make the sacred mark on the forehead."

STAFF-TREE, Celastrus, L. (An ancient Greek name.)
Plants with polygamo-diœcious flowers arranged in raceme-like clusters at the ends of the branches.

Wax-work, Climbing Bitter-sweet, *C. scandens, L.* (Figured below.)

A beautiful twining shrub, growing over rocks, trees, &c., to the height of ten or fifteen feet.

BITTER-SWEET.

Root deep growing, with bright yellow bark. *Stem* 10 to 15 or 20 feet long, twining. *Leaves* bright green, from two to five inches long, of an ovate shape with a finely cut or toothed margin. *Flowers* small, greenish-yellow. *Fruit* about the size of peas, highly ornamental. Along river banks and on rich hill-sides. *June.*

The Bitter-sweet is one of our most elegant native climbers, prized for its vigorous growth, rich foliage, and especially for its crimson and orange-colored fruit. The yellow bark of the roots has been employed in dyeing; it is also valued as a blood purifier. Both the roots and berries have a bitter and slightly sweet taste, whence the common name. The name Wax-work probably refers to the appearance of the fruit. The abundant leaves are oval in shape and are of a fine lively green. The flowers are not showy, but the fruit which remains on the vine through the winter, is singularly attractive, hanging in orange-colored clusters from every branch. The Bitter-sweet can be transplanted without much difficulty. To attain perfection it requires a deep rich soil and plenty of sun. Like the Morning-Glory, this plant climbs by twining, and so tightly does it coil that it checks the growth and finally kills, "strangles," the small trees about which it grows; it should, therefore, be provided with some artificial support. There is not a more pleasing vine, nor one better adapted from the nature of its habits to train around pillars supporting porticos or verandas. Besides transplating, the Bitter-sweet readily grows from layers or seeds.

SOAPBERRY FAMILY—Order, SAPINDACEÆ.

By some authorities the Maples constitute a family by themselves; but Dr. Gray, whose arrangement is here followed, classes them as a sub-order in the Soapberry Family. The magnificent and well known Horse Chestnut tree—*Æsculus*—grown both for ornament and shade, is not a native, so that no extended account of it will be given here. The Three-leaved Bladder-nut, *Staphylea trifolia*, is said to grow in this State. It is "an irregular, handsome, tall shrub or small tree, with spreading branches, growing on the borders of damp woods."—(*Emerson*).

MAPLE, Acer, *Tournefort*. (Name from the Celtic *ac*, hard, probably referring to the hardness of the wood of some species).

Trees or sometimes shrubs with deciduous, opposite, and lobed leaves. The flowers are polygamo-diœcious, small, and either greenish tinged with yellow, as in the Sugar Maple, or bright red or scarlet, as in the common Red Maple. The seed is furnished with a broad wing or key which aids in its distribution. Astringent properties abound in the bark, which also affords reddish and yellow coloring principles.

The species are all beautiful in appearance, and some of them rank among the most valued forest trees. The fine and beautifully grained wood is not excelled by any of our hard-wood trees, and those species most prized for their timber also furnish a sap rich in sugar, which yields to many a large income.

Pliny in his elaborate account of these plants mentions ten different kinds, and frequent allusion is made to them by the older poets. Excepting the citron, no wood was more highly prized by the ancients than the maple. Tables made from curious grained specimens were sold for fabulous prices, one is mentioned as selling for its weight in gold, and thrones made of this wood were deemed fit seats for the Gods. A pleasant account is given by one writer of this extravagance of the old Romans for fine tables. "One of the hobbies in which the ancient, luxurious Romans indulged (as the old-china mania was not then invented) was the acquisition, at enormous prices, of tables made from very rare and curious specimens of maple-wood. Their wives also happened to have another costly taste, for dresses, jewelry, and the like vanities, which their lords, oblivious of their own rather expensive little fancies, considered were needless extravagances, and sometimes ventured to hint as much; when the ladies, roused by this injustice, would in their turn point to the sumptuous Maple table, with an allusion to its ruinous price; and this was called '*turning the tables*' on their husbands; hence the phrase used to this day for a similar kind of retort."

Although comparatively free from insects, the Maple is subject to the attacks of borers which sometimes entirely destroy the Sugar Maple, the most valued species. The beautiful Clytus, *Clytus speciosus*, is the most injurious. The perfect insect is from nine to eleven-tenths of an inch in length and three or four-tenths inches in width; its color is black, variously marked with yellow spots and lines. The beetle lays its eggs in July and August and the larvæ bore in all directions through the tree.—(*Packard.*) There is a large Saw-Fly which also bores into the Maple. *Chrysobothris Harrisii*, a small beetle of a brilliant blue green color, does much injury to the Red Maple, by boring into the smaller limbs.

Two or three species of the Maple are grown from layers or cuttings, but our sorts are generally and best propagated by seed. The seeds may be planted in the fall, or perhaps better—on account of mice—in the spring; they should be lightly covered with earth, and the surface of the ground may be protected with a layer of leaves or straw. The White and Red Maple mature their seeds early in the summer, and they should be gathered then, but those of the other species may be left till October. The seed, if not planted till spring, should be placed in a box of slightly moistened sand and kept in a place sufficiently cool to prevent germination. A deep rich soil is best suited to the growth of these trees, though they will do well in almost any situation where it is not too wet.

There are about forty species of Maple known, of which five—including the most valuable—are native to this State. None of the species occupy exclusively any extended tract of land, but are more or less mixed with trees of other species, as the birch, beech, &c.

Pennsylvania Maple, Striped Maple, Dog-wood, Moose-wood, Snake-tree, *Acer Pennsylvanicum, L.*

A tall, neat looking shrub or small tree, with smooth bark, beautifully striped longitudinally with light and dark shades of green, and large, handsome leaves. The flowers appear early in June, and owing to their slender and graceful habit add much to the beauty of the tree during their season. As commonly seen growing in the woods with larger trees the Striped Maple only appears as a slender tree or shrub, varying in height from eight to twenty-five feet; when growing in open ground, however, it assumes beautiful tree-like proportions. Brown, in his excellent work on the "Trees of America," mentions a specimen of this maple growing in Germany, that in 1835 was between thirty and forty feet high and eighteen inches in diameter. There is growing in Manchester in this State, another large specimen, that, at six inches from the ground, is three feet eight inches in circumference. It begins to ramify at about four feet from the ground, and its general appearance is that of a low (15 ft.), much branched, round-headed tree. The wood is light, fine-grained and very white—the inner wood sometimes being a flesh tint when dry. It is sometimes substituted for Holly by cabinet makers in inlaying mahogany.—(*Brown.*) According to Emerson, the leaves are successfully applied to inflamed wounds and bruises. The chief value of this tree, however, consists in its highly ornamental character, on account of which it well deserves a place in every collection. The seed ripens in September, when it may be gathered and preserved till spring, as recommended above. If the seed be preserved dry it is apt to loose its germinating power. The Striped Maple has been successfully grafted upon larger species of the genus; its size has been increased in this way three or four times.—(*Michaux.*)

Spiked Maple, Mountain Maple, *Acer spicatum, Lamark.*

Like the last, this is a slender, shrub-like species; it differs, however, in having a more branched and airy appearance, and it often grows in *clumps* along the rich borders of streams. The bark of the young shoots is of a light purple color, while that upon the older growth and trunk is light ashen gray. The leaves are generally smaller, narrower, and more closely toothed than those of the Striped Maple. The small yellowish-green and delicate flowers are arranged in *erect* racemes, four to six inches long. The seeds have small, slightly diverging keys or wings. This tree is common throughout the State. "It assumes towards autumn various shades of red, and as sometimes seen, eighteen or twenty feet high, hanging over the sides of a road through woods, with its clusters of fruit beneath the leaves, turning yellowish when the leaf-stalks are scarlet, it has considerable beauty."—(*Emerson*) This species may also be grafted upon some larger sort, thereby much increasing its size. The Mountain Maple seems to be of little use except for ornament. It is well adapted for growing on low, moist lands.

Sugar Maple, Rock Maple, *Acer saccharinum, L.*

A handsome deciduous tree, often assuming majestic proportions.

Roots large, extending near the surface of the ground and finally penetrating deep into the soil. *Stem* varying from 50 to 80 or even 100 feet high, with a diameter near the ground of from three to four feet. *Leaves* smooth, three to six inches long, nearly as wide as long, 3 to 5 lobed, the sinuses obtuse. *Flowers* appearing with the leaves, yellowish green, on drooping, hair-like pedicles. *Petals* none. *Fruit* with large, slightly diverging wings, one seed of the pair always abortive. Rich woodlands, *May*. Fruit first of *October*.

This is the most valuable of all our deciduous trees, being hardly less ornamental than the Red Maple and far superior to that tree in its economic uses. The wood is hard, fine grained, receives a beautiful satin-like polish, and is durable when not exposed to the changes of the weather. It drys slowly, large timber requiring several years to season. It has the fault of "checking" badly if measures are not taken to prevent it. A cubic foot of the dry wood weighs about forty-six pounds. It is used for a vast variety of purposes where hardness and strength are required. It is largely employed in naval architecture, and is much valued for the keels of vessels, as the structure of its fibre renders it little likely to split, and it is very lasting when constantly under water.

Some specimens of Rock Maple present a peculiar structure of grain which places it among the most ornamental woods. One well known and beautiful form is the so-called Bird's-eye Maple. It is much used by cabinet-makers and car-builders in the form of veneer. Another less common form is the Curled Maple, in which the fibre takes a waving or zigzag direction. When planed this variety presents alternate bands of light and dark reflections, very pleasing in appearance. Old trees, especially those growing on wet lands, frequently have wen-like excresences called "Variegated Maple-knobs," upon their trunks. Most beautiful objects are made from these by skilfull workmen. It was probably from these "wens" that the costly maple tables of the ancients were constructed.

The wood of the Rock Maple differs from that of the Red or White Maple in being heavier, much harder and darker colored. There is also a chemical test, given by Michaux, which may always serve to distinguish these woods. If a few drops of sulphate of iron be poured upon the wood of the Rock Maple it turns greenish, while the woods of the Red or Silver Maples similarly treated turn to a deep blue. For fuel we have no wood superior to the Rock Maple—the Hickory growing only in limited quantities in the extreme western part of the State. It makes a valuable charcoal, and the ash is very rich in alkali.

Besides the great value of its timber, this tree yields a large revenue in the syrup and sugar obtained from its sap. The estimated amount of maple sugar made in the United States in 1860, was 38,863,568 pounds—the State of New York producing the largest quantity. The amount of syrup for the same year was aggregated at 1,944,299 gallons. Both the syrup and sugar are more esteemed than that produced by the cane, and always command high prices and ready sales. In his Report upon the "Woody Plants of Massachusetts," Emerson says, that in that State "between five and six hundred thousand pounds of sugar are annually made from the juice of the Rock Maple, valued (in 1846) at about eight cents a pound." The manufacture of Maple sugar forms quite an important industry in Maine, especially in Oxford and Aroostook counties. The annual yield of sap per tree depends upon so many circumstances, such as the length and favorableness of the season, the location of the tree and the number of openings made in it, that no special average can be given; it probably varies from eight to twenty-four gallons. A tree will sometimes yield three or four gallons in a single day, and Emerson speaks of one that upon a single instance produced a barrel of sap in twenty-four hours. The location of the tree greatly affects the richness of the sap; that from one standing in open ground being much sweeter. Four gallons of sap will produce upon the average one pound of sugar. In maple orchards, from two to four pounds of sugar per tree is all that can be safely depended on. Frequently a well located tree will produce nine pounds, and instances are cited where twenty and even thirty-three pounds of sugar have been made from a single tree in one season. Under certain conditions of weather, the Rock Maple has been known to yield sap late in the fall. Tapping these trees for the sap, after they have arrived at the age of thirty years, does not appear to affect them injuriously in any way.

Excepting perhaps the Red Maple, the Rock Maple stands second only to the Elm as an ornamental tree. It is a fair grower, adapting itself to almost any kind of soil; its dense and rich green foliage affords a shade only surpassed by the Linden, and its varying, though somewhat massive form, is always pleasing. In the fall the leaves of this and the Red Maple assume most brilliant colorings, so that in no country is there seen such a gorgeous display of scarlet, crimson and gold as is presented by our autumnal forests.

"Tints that the Maple woods disclose,
Like opening bud or fading rose,
Or various as those hues that dye
The clouds that deck the sunset sky."

Black Maple, *A. s. var. nigrum,*

Is a common variety of the Rock Maple. It may be recognized by its larger size and darker colored foliage. The leaves are less indented than those of the species, and are slightly downy. The Black Maple is deemed a more ornamental tree than the Rock Maple, and is thought to yield a finer quality of sugar.

Maple lumber in the form of inch boards is valued at from $20 to $25 per M, in the Augusta market.

Silver Maple, River Maple, White Maple, *Acer dasycarpum, Ehrh.*

A handsome deciduous tree, with wide extending and drooping branches.

Stem thirty to 60 or 90 feet high, and two, rarely 8 or 9 feet, in diameter; *branches* ascending, at length recurved, after the manner of the elm. *Leaves* of large size, 3 to 6 inches long, deeply five-lobed, silvery white, and when young downy beneath. *Flowers* greenish, appearing before the leaves, without *petals*. *Fruit* woolly when young, smooth at maturity, 2 to 3 inches long including the broad diverging wings. Alluvial river banks, *April, May*. Fruit *June*.

This tree is found from Maine to Georgia, but is most abundant in the Middle and Western States, where it is much grown as an ornamental tree. The fine, drooping habit of the branches, the play of the silvery-white and green surfaces of the leaves as they are moved by the wind, and especially its rapid growth render the Silver Maple most valuable for ornamental purposes. In fifteen years it will attain, under favorable circumstances, a height of thirty feet, with a diameter near the ground of one foot. The autumn foliage is not especially attractive, the leaves changing to a yellow hue.

Michaux in speaking of this tree says, that it grows most luxuriant along the banks of the Ohio. "The brilliant white of the leaves beneath forms a striking contrast with the bright green above, and the alternate reflexions of the two surfaces in the water, heightening the beauty of this wonderful moving mirror, aids in forming an enchanting picture, which, during my long excursions in a canoe in these regions of solitude and silence, I contemplated with unwearied admiration."

The Silver Maple is much cultivated in Europe, having been introduced into England in 1725, by Sir Charles Wagner. In this State it is not a common tree, and therefore is but little known. The writer has observed it growing along the Stillwater river near Orono, and above along the banks of the "East Branch." It is occasionally seen in cultivated grounds, having been transplanted from the banks of some stream or river.

Though the most graceful of all the maples, it possesses but little economic value. The dry wood is lighter than any of the other species, weighing only about 38 pounds per cubic foot, which is one half the weight of the green wood. It is soft, fine-grained, very white when newly cut, brittle, and of but little durability. It makes a poor substitute for holly in in-laying black walnut and mahogany, and it is sometimes turned into bowls when more desirable woods are wanting. This wood makes a good fuel, and for this purpose the Silver Maple gives a quicker return than any other tree. The inner bark forms a black dye with the salts of iron. The sap is about one-half as rich in sugar as that of the Rock Maple.

"The seeds ripen in two or three weeks after the leaves are fully developed, and must be gathered and sown soon after. They are usually planted in drills about one inch deep. If the ground is dry it should be rolled after sowing. The plants will appear in from six to ten days. If very hot, dry weather occurs soon after sowing, the young plants are apt to be scorched by the sun as they emerge from the soil. The whole sowing is sometimes lost from this cause. This may be prevented by shading the rows with branches of trees, or lightly covering them with straw or hay till the danger is past."—(*Bryant.*)

Red Maple, Swamp Maple, Gray Maple, White Maple, *Acer rubrum, L.*

A medium sized, highly ornamental, deciduous tree, with bright red or yellow flowers, which appear before the leaves.

Stem 40 to 50, sometimes 70 or 80 feet high, with a diameter of 1 to 2, rarely 4 to 5, feet. *Leaves* divided into three more or less deeply cut and irregularly toothed lobes; they vary much in size and outline, usually light colored beneath. *Flowers* appearing before the leaves, arranged in numerous close clusters, the perfect and female flowers bright red, the male flowers have a yellowish tinge. *Fruit,* including the wing, one inch long, ripe early in summer. Woodlands, especially in swamps, common. *April.*

Wilson Flagg, in his delightful work, "*The Woods and By-Ways of New England,*" thus eulogizes this tree: "Not dainty of its soil, but thriving equally well upon bog or upon a fertile river bank, by the side of a stream or upon a dry eminence; coming forth in spring, like morning in the east, arrayed in crimson and purple; bearing itself not proudly but gracefully, in modest green, among the more stately trees of summer; and, ere it bids adieu to the season, stepping forth in robes of gold, vermillion, crimson, and variegated scarlet, stands the queen of the American forest, the pride of all eyes, and the delight of every picturesque observer of nature—the Red Maple. * * * It stands among the occupants of the forest like Venus among the planets, the brightest in the midst of brightness, and the most beautiful in a constellation of beauty."

Although not so extensively cultivated as the Silver or the Rock Maples, this tree can but be deemed more highly ornamental than either, for throughout the season it is a constant object of beauty. The bright flowers appearing before the leaves, are among the first of Flora's vernal tributes; the fruit continues for some time most attractive, as it retains the red colorings of the blooms; like all the maples, the summer foliage is most pleasing, and the beautiful tints of the autumnal leaves is not equalled by any of our forest trees. In speaking of the colorings of the Red Maple leaves, Emerson says: "That the surface is liable to be variegated with lines of scarlet, or to become entirely scarlet, or crimson, or orange at every season of the year. This occasionally happens to all the leaves on a tree, even in the middle of summer, forming a gorgeous contrast with the green of the rest of the forest. The differences in the leaves are accompanied by corresponding differences in the branches and general appearance of the tree; and the common opinion is, that there are several distinct varieties of this tree.

The leaves begin to change in August and are usually gone by the first of November. * * * It is not an uncommon thing to see a single tree in a forest of maples turning to crimson or scarlet in July or August, while all the other trees remain green. A single brilliantly colored branch shows itself in a verdant tree; or a few scattered leaves exhibit the tints of October, while all the rest of the tree and wood have the soft greens of June. The sting of an insect, the gnawing of a worm at the pith, or the presence of minute parasitic plants, often gives the premature colors of autumn to one or a few leaves." It is evident to any one who has observed the colorings of autumnal foliage, that the action of frost has little or nothing to do with it—a fact which the weight of scientific authority also bears out.

The appearance of the Red Maple is lighter and more airy than that of the Rock Maple, and the leaves are not so deeply colored with green. The spray is finer than that of either the Rock or Silver maples, and though not so graceful as the latter tree, it is more beautiful, as the bark of the recent shoots is of a fine red color. The under surface of the leaves is pale, sometimes quite as white as those of the Silver Maple, and their play of colors when agitated by the wind is no less pleasing than that exhibited by the last named tree.

The Red Maple has a wide geographical range, extending from Canada through the Atlantic States to Florida, and west to Oregon. It is most abundant in south New England and the Middle States, attaining its maximum size in the "Maple Swamps" of Pennsylvania and New Jersey. Though delighting in moist and swampy grounds, where alone it forms extensive forests, it is not an unfrequent tree upon dry hill-sides and in open pasture lands. John Tradescant introduced the Red Maple into Europe in 1646, where it has since been much cultivated, but not so extensively as the Silver Maple. Under favorable circumstances the Red Maple will attain the height of twenty-five or thirty feet in fifteen years and from the seed. It grows but little in height after fifty or sixty years.

The wood of this tree is far less valuable than that of the Rock Maple. It is white, slightly tinted with flesh color, of little strength, and when exposed very perishable. The dry wood weighs about forty-four pounds per cubic foot, which, like the Silver Maple, is about one-half the weight of the green wood. The wood is soft, (varying much in hardness, however, according to the location of the tree), fine-grained and lustrous when smoothly planed. It is a very superior wood for turning, and is used for a great number of purposes, such as the making of common bedsteads, bureaus, chairs, and other articles of cheap furniture, also for broom handles, shoe lasts and ox-yokes. The boards make excellent floors. In old trees the grain of the wood often takes singular and unusual directions, giving rise to the "Curled Maple," the "Mountain Maple," the "Blistered Maple," etc. "Landscape and Mountain Maple are varieties in color caused by the irregular change from sap-wood to heart-wood. These are much used for the foot and head-boards of bedsteads, and for pannels of doors to wardrobes, &c."—(*Emerson.*) The "Curled Maple" is caused by the fibres taking an undulating direction. This variety occurs only in old trees, and seldom extends far into the trunk of the tree. When smoothly planed, and rubbed with sulphuric acid and linseed oil, it presents a most beautiful appearance, hardly excelled by any other native or foreign wood. The surface presents a varying succession of light and dark shades of brown, the bands bordered with lustrous lines of golden yellow, which are narrow or wide, light or dark, as the plain of the wood is varied. Blistered Maple is an uncommon form, having a remote resemblance to the Bird's-eye of the Rock Maple. The Curled Maple is extremely tough, and is much used for the stocks of rifles and fowling-pieces.

The Red Maple is much used for fuel; when dry it gives a ready fire, but it is only two-thirds as valuable for this purpose as the wood of the Rock Maple. The sap is of little value as it is but one half as rich in saccharine matter as that of Rock Maple. "The bark when used with an aluminous basis produces a lasting cinnamon color, on wool and cotton; and with sulphate or acetate of iron communicates a more intense and perfect black than even galls or any other vegetable substance known to me."—(*Bancroft.*) Darlington says, in his "*Weeds and Useful Plants,*" that the bark yields a dark purplish-blue dye and makes a pretty good bluish-black ink.

There are several cultivated varieties of the Red Maple, some of them with foliage beautifully variegated with white and yellow. The seeds ripen with those of the Silver Maple, and for propagation should be similarly treated.

MILKWORT FAMILY—Order, POLYGALACEÆ.

A small order, chiefly herbaceous plants, with simple, entire leaves, and irregular flowers. "The plants yield a bitter principle with some acrid extractive matter. *Polygala senega* (Seneca Snake-root) is the most important medicinal plant of the family. Other species are employed medicinally in Brazil, Peru, Napaul, &c.; where like our own, they are reputed antidotes to the bites of venemous reptiles."—(*Gray.*) The ladies of Peru are said to use the bark of the root of *Monnina polystachya* in smoothing their hair. Several species are employed in lung troubles.

MILKWORT, Polygala. (Name from two Greek words meaning *much milk*, as the plants are supposed to increase this secretion.)

There are five species found in Maine, all small bitter herbs, with very irregular and pleasing flowers.

Fringed Polygala, *Polygala paucifolia, L.*

A small herbaceous plant, with showy purple, rarely pure white, delicate flowers, expanding in June.

This is our most common species, growing abundantly in woods, especially where there is a mixture of Hemlock and Spruce. It has an exceedingly attractive, odd-shaped flower, and as it grows in masses over rich knolls, it presents a most pleasing appearance. The fruiting flowers are quite inconspicuous, and are borne at the surface of the ground, or just below it. Occasionally one meets a whole mass of these plants with pure white flowers.

Polygala sanguinea is a common species in moist fields near the coast; it has small purple flowers, disposed in a head, similar in appearance to the clover.

Polygala polygama is another pretty flowered species, growing in fields and pastures. The flowers are purple, in a loose terminal raceme.

PULSE FAMILY—Order, LEGUMINOSÆ.

Herbs, shrubs, or trees, with alternate, usually compound leaves, and *papilionaceous* or regular flowers.

The Pulse family has representatives in nearly all parts of the known world. It numbers more than six thousand five hundred species, of which about four hundred are natives of the United States and territories. Besides taking rank among the largest, this is one of the most important order of plants, whether we regard the beauty or the economic value of its species. No family furnishes so many species employed in the Arts and in Medicine as this. The farmer depends largely upon it for fodder for his cattle, as well as for food for himself; and to the florist it supplies many choice and valued plants.

It may be of interest to mention a few of the best known foreign products of the family. A species of Acacia, growing in North-eastern Africa and Arabia, yields Gum-Arabic; from species of Cassia is obtained the Senna of commerce; Log-wood, used in dyeing red and black, is from a tree native of Central America and the West Indies; the much prized Rose-wood is supplied by species of *Dalbergia*, natives of Brazil, India and Africa; the Pea-nut, extensively cultivated in the Southern States, is a native of South America; *Indigofera tinctoria*, or Indigo Plant, yields the well known blue coloring matter of the same name; the China Aloe-wood burns with a fragrant flame; Brazil-wood is much used in coloring and tanning leather.

Of this truly Royal Family of plants Maine has thirty-one native and fifteen introduced species. It is not proposed to give space in this paper to any but native plants; however, in the case of this order, where the species introduced are of so much importance, and constitute so large a proportion of the whole, it is thought best to make a brief synopsis of the most valued.

Wood-waxen or **Dyer's Green Weed,** *Genista tinctoria.*

A low, shrubby plant, with lanceolate, simple leaves and bright yellow flowers, appearing early in summer. It is a native of Europe, but has become abundant in many parts of Massachusetts, growing upon dry hill-sides. It has some medicinal properties, but is chiefly valued for dyeing wool yellow. There are four introduced species of Clover-Trifolium.

Stone Clover or **Rabbit-foot,** *T. arvense.*

A low, much branched plant, clothed with silky down, the small, flesh-colored corolla is nearly concealed by the plumose silky calyx. This plant has no agricultural value; it is sometimes sought for bouquets, as the grayish heads are quite pretty.

Red Clover, *T. pratense.*

Is one of the most valuable forage plants. It is a native of Europe, and was grown in this country prior to the Revolution.

Yellow Clover, *T. agrarium,* and **Low Hop Clover,** *T. procumbens.*

Are yellow-flowered species, not uncommon in sandy fields and by the wayside. They have no agricultural value, but are pleasing in flower.

Lucerne or **Medick,** *Medicago sativa.*

Is a native of Spain. It has been introduced into this country and is cultivated, especially South, for green fodder.

Locust-Tree, *Robinia Pseudacacia.*

Is much grown in this State as an ornamental tree. "The timber is one of the most valuable, whether for strength or durability; in the former quality it ranks but little below the Oak, while its resistance to decay, even when exposed to the most destructive influences, exceeds that of the wood of any other of our forest trees."

The Rose Acacia, *R. hispida.*

Is a graceful and beautiful flowering species, grown for ornament.

Wistaria, *W. frutescens.*

Is a highly ornamental woody vine with beautiful blue-purple flowers.

Horse Bean, *Faba vulgaris.*

From the shores of the Caspian Sea, is sometimes cultivated for the table.

Common Pea, *Pisum sativum.*

Is a well known garden vegetable. Its native country is unknown.

Vetch, *Vicia sativa.*

Also known as Tare, is valued in Europe as a fodder for cattle. With us it seems to rank among the weeds.

The genus *Phaseolus,* yields the many varieties of Beans. The valued sorts are from the East.

Honey Locust or **Three-thorned Acacia,** *Gleditsclua triacanthos.*

Is a tall, slender tree, with light airy foliage and long compound thorns. It is grown in this State for ornament.

Few of the native species have as yet any special values. The most important is perhaps the

White or **Sweet Clover,** *Trifolium repens,*

A plant too well known to require any description. It is highly prized as a forage plant, especially for pastures. The flowers are very sweet, and afford a rich harvest of honey for bees.

The Wild Lupine, *Lupinus perennis.*

Has showy purple flowers, late in spring, and is of value for its beauty.

Astragalus, *A. alpinus.*

Is a beautiful, herbaceous plant, with a diffusely branching stem and violet flowers. It is found along river banks, though rarely. Between Hallowell and Augusta it grows in profusion, forming a most pleasing spectacle. This is a most desirable plant for garden culture, and may be grown from the seed, after the manner of other species of the genus procured from the florists. A dry, somewhat sandy soil is best suited to it.

Some of the species of *Desmodium*, or Tick-treefoil, are very pretty and well deserve a place in the garden. The flowers are purplish, arranged in panicles or racemes, and appear late in summer. The pods are jointed, and adhere to the clothing and the fur and wool of animals. There is one cultivated species, *D. gyrans*, from the East Indies.

Vicia Caroliniana and *V. Cracca* are native species of the Vetch or Tare. Both are pretty, slender, climbing plants; the former has pale flowers, tipped with blue, opening in May; the second and more common species has deep blue flowers, in a dense raceme, appearing in July. They delight in sandy, gravelly soil along river banks, etc.

GROUND-NUT, Apios. (Name from a Greek word, meaning pear, referring to the pear-shaped tubers of the roots.)

Ground-nut, Wild Bean, *A. tuberosa, Mœnch.*

An elegant twining herb, with beautiful deep green, compound leaves, and handsome reddish or brownish-purple flowers, arranged in dense clusters. This is a very ornamental plant and surely deserves to be grown in the garden. It grows naturally in rather moist soil in the vicinity of ponds and lakes, the twining stems climbing over bushes to the height of four to six feet. Even dried specimens of this plant are beautiful, and always call forth exclamations of delight when seen. The roots are remarkable in being furnished with large, edible, pear-shaped tubers. These tubers are fleshy, nutritious, and would perhaps be cultivated had we not the potato. The flowers appear in August.

HOG PEA-NUT, Amphicarpæa, *Ell.* (Name from two Greek words meaning *both* and *fruit*, there being two kinds of fruit pods.)

Hog Pea-nut, Pea Vine, *A. monoica, Nutt.*

A delicate and most graceful twining plant, growing over bushes in moist thickets. Leaves compound, of three ovate, thin leaflets, one to three inches long. The upper flowers are open from July to September; they are of a delicate purple color arranged in nodding racemes. If this plant can be made to grow in some shady place about the house or yard, it would be well worth while to cultivate it, as its appearance is most attractive.

ROSE FAMILY—Order, ROSACEÆ.

The plants comprised in this order are either herbs, shrubs, or trees, with alternate, stipulate leaves, and regular flowers, having the free petals inserted on the calyx.

The order Rosaceæ is another large and widely distributed group of plants. Hardly less valuable than the Pulse family in economic species, it ranks among the first in medicinal products, and stands unrivalled in the multitude of its ornamental species.

In this family are classed the Cherry, the Plum, the Peach, the Apricot, the Almond, the Strawberry, the Apple, the Blackberry, the Raspberry, the Pear, the Quince, &c., &c. Among those grown for ornament are species of Spiræa, Rose, Cratægus or Thorn, and Coloneaster.

Of the one thousand species included in the order, about forty-six are native to Maine.

CHERRY, Prunus, *L.* (The Latin name for the Plum.)

Trees or shrubs, with simple deciduous leaves, white flowers, and a fleshy stone-fruit (*drupe*), mostly edible.

According to Gray, this genus includes the Almond, Peach, Apricot, Plum and Cherry. From the cultivated Plum-tree, *P. domestica,* have been derived nearly all the varieties of Plums, Gages and Damsons. There are six native species.

The small Sand Cherry, *P. pumila,*

Is a dwarf trailing species, with edible fruit, growing on gravelly river banks. It has been observed by the writer at Waterville and at Orono.

Wild Red Cherry, *P. Pennsylvanica, L.*

A small, deciduous tree, with smooth brownish bark, white flowers, and small, red fruit.

The Red Cherry is a common tree throughout the State, growing upon dry soil in woods, thickets, field-borders, &c. The bark is polished and peels from the tree at right angles to the direction of the trunk. The wood is hard, close-grained, of a reddish color, but as the tree seldom exceeds five or seven inches in diameter it is but little used. The fruit is extremely acid, having little flesh and a large stone, and, excepting furnishing food for birds, it is of little value. The better varieties of cherries may be grafted upon this tree, and it is said to make a good stock for that purpose.

Black Cherry, *P. serotina, Ehrh.*

A large, handsome, deciduous tree, with white flowers in long drooping racemes, and nearly black, pleasant-flavored drupes.

The Black Cherry grows as a low shrub, as far north as latitude 62°; in Maine it attains to the height of from twenty-five to forty feet, with a diameter of one foot, but in the south-west, especially along the Ohio and in the States of Kentucky and Tennessee, it assumes magnificent proportions, often rising eighty or one hundred feet from the ground, with a trunk four to five feet in diameter. It grows far more abundantly in the Middle States than it does with us, and its valuable wood is extensively imported into this State for cabinet and car works. The timber is also imported from Canada, where there are extensive forests of this tree, but it is of smaller size and considered less valuable. The wood, as well as the bark of the tree, resembles that of the Black Birch; it is hard, richly colored and veined, and takes a fine polish. It somewhat resembles mahogany, and is used for similar purposes, but the veining is far more beautiful, especially in the wood taken from near the ramification of the trunk.

"The bark of the branches or the root is used for medicinal purposes. The latter is regarded the best. * * * In its action it is tonic and invigorating in its impression upon the stomach and general system, but sedative to the circulatory and nervous systems—the former due to a bitter principle, the latter to Hydrocyanic acid. It is used in convalescence, where irritability exists, in cases of debility with nervous excitability, in dyspepsia, etc." (*J. Forbes Royle.*)

The bruised berries impart to rum and brandy a peculiar and agreeable flavor, and are much used for this purpose. Birds are extremely fond of the fruit, and the leaves of this as well as the other species of cherry, are sometimes entirely devoured by the tent caterpillar—*Clisiocampa Americana.* A species of Buprestes —*B. divaricata*—feeds in the larval state, upon the young wood. The Black Cherry holds a high rank among the ornamental trees. It was introduced into England early in the 17th century. It is an inferior shade-tree.

Though preferring a dry soil, this tree will grow in almost any locality. It is propagated by seed which may be sown as soon as ripe, with the pulp on, or may be kept till spring in sand. "It may then be sown thin, and covered with one-quarter of an inch of soil."—(*Emerson.*) This tree may be very profitably planted in protected localities, as the wood is extremely valuable for many purposes, and quite a revenue might be derived from the fruit.

Choke Cherry, *P, Virginiana, L.*

A common shrub, rarely a low tree, with deciduous leaves, white racemose flowers, and dark red or purple fruit of a pleasant though astringent taste.

Along neglected field borders and in dry waste grounds the Choke Cherry is very common. With us it seldom attains the height of more than fifteen feet, and often blooms when not more than two feet high. Whether we consider the plant in May, when the racemes of flowers give every spray the appearance of long white plumes, or late in summer, when loaded with drooping clusters of dark-red, shining fruit, its appearance is highly attractive and ornamental. Under cultivation its size and proportions might be much improved. The fruit of this species is little eaten, except by birds, on account of its extreme astringency.

MEADOW-SWEET, SPIRÆA. (Name from a Greek word, meaning to *wind;* from its fitness to form garlands.)

This genus furnishes several beautiful and well known garden plants. The species are either shrubs, or perennial-rooted herbs, with alternate leaves and white or rose-colored flowers. "They are propagated by dividing the roots, by suckers, by layers or by seed. The root and bark generally possess astringent and tonic properties and are employed in medicine and tanning."—*Emerson.* There are about fifty known species of which the two following are common to Maine. A third, highly ornamental species—*S. opulifolia*—may also be found in some sections.

Queen of the Meadows, Meadow-sweet, *S. salicifolia, L.*

A slender, branching, leafy shrub, with large, terminal panicles of white flowers, which appear from June to September. This is a common well known plant, growing by the roadside and upon the borders of moist grounds. It is chiefly valuable for its ornamental character, which is much improved by cultivation.

Steeple Bush, Hardhack, *S. tomentosa, L.*

An erect leafy shrub, two to four feet high, growing along rocky field borders and in dry pastures. "It delights in the borders of rustic wood-paths, in lanes that conduct from the enclosures of some farm cottage to the pasture, growing all along under the loose stone-wall, where its crimson spikes may be seen waving in the wind with the nodding plumes of the Golden-rod and the blue spikes of the Vervain."—(*W. Flagg.*)

The delicate rose-colored flowers appearing in July and August, are disposed in long terminal spires, whence the name Steeple-Bush. This species is not only ornamental, but is much valued by simplers for its medicinal properties. It acts as a tonic, and it is used in dysentery, etc , and especially in those disorders incident to females.

AVENS, GEUM *L.* (Name from a Greek word, meaning to *taste well,* the roots having an agreeable taste.)

Water or **Purple Avens,** *G. rivale, L.*

This plant was noticed among the "Weeds of Maine," in the Report of the Board of Agriculture for 1869. It is included here on account of its reputed medicinal virtues. The plant is herbaceous, one to two feet high, with a jointed, perennial root, and nodding yellowish-purple flowers. It is quite common and conspicuous in meadows and low wet grounds. The dried roots have an astringent, bitter taste, and are employed as a domestic medicine in diarrhœa and dyspepsia. They are also used as a substitute for coffee.

CINQUEFOIL, POTENTILLA, *L.* (Name from the Latin *potens,* meaning *powerful,* the plants being considered highly medicinal, but they are only mild astringents.)

Mostly herbs, with showy yellow flowers, and compound leaves. There are nine native species, all of which are classed among the weeds excepting the following:

Shrubby Cinquefoil, *P. fruticosa, L.*

Stem one to three feet high, much branched; bark of the old stems light brown and peeling off in long strips like that of the Grape-vine; bark of the twigs close and dark colored. *Leaves* composed of from 5 to 7 crowded, oblong-lanceolate leaflets, each about one inch long. *Flowers* nearly one inch in diameter, bright yellow, arranged in terminal clusters. Wet grounds; not common in this State. *June* to *September.*

This is a pleasing, much branched, and densely leafy shrub. It grows by the wayside on Kent's Hill in Readfield, from which place specimens have been transplanted to the garden, where they have thrived exceedingly well. Their dense and peculiarly cut foliage and attractive flowers, appearing throughout the season, make them objects of especial interest. The writer has also observed this shrub along the banks of the "East Branch," above Medway.

STRAWBERRY, FRAGARIA, *Tournefort.* (Name from the Latin, meaning *fragrant;* in reference to its fragrant fruit.)

Our species are low herbs, with tri-foliate leaves, and white flowers, which are sometimes diœcious by abortion. There is an immense number of varieties, more or less valuable, under cultivation.

Wild Strawberry, *F. Virginiana, Ehrhart,* and the **Common Strawberry** of Europe, *F. vesca, L.*

Are both very common in Maine. Their chief and only well marked distinction is in the fruit; that of *F. Virginiana* having the akenes or seeds sunken in deep pits in fleshy, edible receptacles, while in *F. vesca* the akenes rest upon the surface of the so-called berry. No fruit is more esteemed than the Strawberry. Our wild sorts are especially sweet and delicious, and are much sought in their season. From the *F. Virginiana* we have the "American Scarlet" and the scarlet-fruited varieties. The *F. vesca* is the original of the " Alpine Perpetual," and numerous other fine varieties, differing in size, color (some being white) and flavor. In some of these the fruit is enormous, weighing an ounce or more. The wild plants transplanted from the fields, are greatly improved, particularly in size, by proper cultivation. There is an Indian species, *F. Indica,* with handsome yellow flowers, but tasteless fruit.

BRAMBLE, RUBUS, *Tournefort.* (Name from the Celtic *Rub,* red, or the Latin *Ruber;* from the color of the fruit in some species.)

Perennial, half shrubby plants, with white, rarely red, flowers. There are eight native species.

Mulberry, Flowering Raspberry, *R. odoratus, L.*

Stem branching, unarmed, the young shoots clothed with clammy hairs. *Leaves* large, broadly 5-lobed. *Flowers* bright rose purple, about two inches across. Flowers *June, July.* Fruit *August.*

This is a showy and beautiful species, common on rocky hillsides and in open rocky woods. Its handsome flowers and foliage ought certainly to place it among the ornamental plants. A somewhat moist and shady place is most agreeable to it. The fruit is large, red, saucer-shaped, as it lies over the receptacle. It is edible, though not so well flavored as the common raspberry.

Wild Red Raspberry, *R. strigosus, Michaux.*

The wild Red Raspberry is too well known to require a special description. It is very common along the borders of old fields, and especially on newly cleared and burned lands. The fruit, for which alone it is valued, is red in color and sweeter and finer flavored than most cultivated varieties. It is mature in July, and is largely collected for making raspberry syrup and raspberry jam, it being excellent for these purposes. "If the juice is squeezed from the berries and allowed to ferment twelve or twenty-four hours, according to the temperature, a thick coagulum separates from the dark clear portion, which possesses a much higher flavor than the unfermented juice. If bottled, and the bottle be filled so as to allow just room for the cork, the juice will keep in a cellar for a year or more."—*Thurber, in Darlington's Weeds and Useful Plants.*

Common High Blackberry, *R. villosus, Aiton.*

This is another very common and well known species, producing black, and when fully ripe, most delicious berries. It grows with the last mentioned, but is more prevalent in neglected, rocky fields and dry thickets. The size and flavor of the fruit varies greatly, according to the location and the nature of the soil. Not only is this Bramble esteemed for its fine fruit, which affords a pleasant jam, but also for its valuable medicinal properties. The root has some astringency, and is a well known domestic remedy in cases of diarrhœa. "Even the *knots,* which are formed on the branches by the puncture of insects, were formerly carried by credulous simpletons as a sort of amulet or charm against the toothache."—*(Darlington.)*

There are several varieties of the common blackberry, and two or three other species with more or less agreeable fruit, but the best known and most esteemed sorts have been mentioned. The low Blackberry or Dew-berry, growing upon rocky hills, etc., produces hardly less excellent fruit than the common high species.

Rose, Rosa, *Tournefort.* (The ancient Latin name.)

This genus presents an immense number of the most beautiful and fragrant garden plants. There are two or three native species which are pretty and ornamental, but they can hardly gain a place among so many lovely and hardy exotics, creations of the Florist.

HAWTHORN, CRATÆGUS, L. (Name from a Greek word, meaning *strength,* the wood of the species being very hard and strong).

Thorny shrubs or low trees of neat habit, fine foliage, and handsome white (rarely rose-colored) flowers. Natives of India, Europe, and North America.

> "Come let us rest this Hawthorn tree beneath,
> And breathe its lucious fragrance as it flies;
> And watch the tiny petals as they fall
> Circling and winnowing down our sylvian hall."
>
> *Romance of Nature.*

The thorn tree is of classic renown, for its blooms were dedicated by the Ancient Greeks and Romans to Flora; and at their May festivities were laid upon the alter of Hymen.

Our associations with this tree are derived from the legends of England, and the frequent allusions made to it in the British pastorals. For "in the olden times of merry England, the May-pole, its top decked with the gayest garlands of these blossoms, was raised amid the shouts of the young and old assembled to celebrate this happy rustic festival." Chaucer in his Court of Love makes mention of this custom:

> "Mark the fair blooming of the Hawthorne tree,
> Which finely cloathed in a robe of white,
> Fills full the wanton eye with May's delight."

The different species of thorn present a great variety in appearance and in fruit. In some the "haws" are bright scarlet, in others black, and again in others of a bright yellow color. Several species produce an edible fruit. So useful are the various species that, according to Loudon, were man to be exiled to an estate without a single shrub or tree, with permission to choose only one genus of ligneous plants to form all his plantations, shrubberies, orchards and flower gardens, it is probable that he could not find a genus that would afford him so many resources as that of the *Cratægus*. And Emerson affirms that a greater variety of beautiful small trees and ornamental shrubs can be formed of the several species of thorn than of any other kinds of tree whatever. The English Thorn, which is in no respect superior to some of our native species, is deemed of the most valuable of hedge plants, and is very extensively grown for that purpoae in Europe, as well as in this country, in the vicinity of the large cities. Our fine American species are highly prized in England and on the Continent, where they are largely cultivated for ornament—ranking first among the small ornamental trees. It is surprising that plants of so much value should receive in this State so little of the attention they deserve. The smallness of the tree and the diversity of form which it may be made to assume, render it especially suitable for grounds of limited extent, and its attractive appearance make it a "most agreeable tree in composition, when it forms the under growth or thicket, peeping out in all its green freshness, gay blossoms or bright fruit from beneath and between the groups and masses of trees; where mingled with the hazel, etc., it gives a pleasing intricacy to the whole mass of foliage."—(*Downing*) It is only when growing alone, however, that the different species attain their finest tree-like proportions and make the most advantageous display.

Besides its value for ornament the Thorn-tree is said to make an excellent stock for grafting the pear, apple, quince, mountain ash, etc. The wood is white, tinged with yellow, heavy, very close-grained and hard, making it difficult to work. It takes a brilliant polish, but owing to the size of the trees it can be used only for small articles, such as hammer handles, the smaller tools, and especially for walking sticks.

The Thorn is transplanted without much difficulty, or it may be readily grown from seed, which is the usual method of propagation. The haws gathered for seed must be thoroughly ripe. The pulp should be separated from the nuts by maceration in water, when they may be sown thinly in beds, the seeds being scattered so as to lie about one inch apart every way, and covered about a quarter of an inch. "At the end of the first year's growth, the strongest of the plants may be thinned out from the beds and planted in nursery lines; and in the autumn of the second year, the remaining plants may be taken up for the same purpose."—*(Loudon.)* Another method of propagating the thorn, successfully practised in Europe and America, is thus described in the *Transactions of the London Society of Arts:* "Purchase the desired number of Thorns, and when three years old take them up and trim the roots, from each of which ten or twelve cuttings will be obtained. Plant these cuttings in rows half a yard asunder, and about four inches from each other in the row. They ought to be about four inches long, and planted with the top one-fourth inch out of the ground, and well fastened, otherwise they will not succeed so well. April (May with us) is the best time to plant the cuttings. The thick end must be planted uppermost. The advantages of this mode are, first, in case any one has raised from haws a thorn with remarkably large prickles, of good vigorous growth, or possessing any other qualification requisite to make a good fence, he may propagate it far better and sooner from roots than in any other way. Secondly, in three years he may obtain from roots a better plant than can in six years be raised from the haws, and with double the quantity of roots.

There are sixteen species and varieties of Cratægus growing in the United States east of the Mississippi, one of these, *C. Pyracantha,* spontaneous at Washington, and near Philadelphia, is an evergreen species. The English Hawthorn has become more or less spontaneous in sections where it has been cultivated. Maine has three native species, which are mentioned below, with their distinctive characters.

Scarlet-fruited Thorn, *C. coccinea, L.*

A low, much branched, deciduous tree, with white flowers and scarlet fruit.

Stem much ramified, thorny, especially between the branches, 10 to 20 feet high, clothed with a light gray scaly bark. *Leaves* smooth, thin, broadly ovate, with an abrupt base and sharply toothed margin; leaf-stalks long and slender. *Flowers* showy, arranged in corymbs, often pale rose colored.

This tree is common on dry rocky hills, and along the banks of streams and rivers. It blooms the latter part of *May* or early in *June*.

Black Thorn, *C. tomentosa, L.*

A much branched shrub, eight or ten feet high, (sometimes it assumes the form of a low tree fifteen or twenty feet high) with large, orange-red, pear-shaped fruit.

The leaves are thickish, oval, ovate, or obovate, sharply toothed or cut, below abruptly narrowed into a margined petiole, the upper surface impressed along the main veins or ribs; flowers often one inch broad, and the fruit from two-thirds to three-fourths of an inch long, pleasant-tasted.—(*Gray*). There are several varieties, one of which—*c. t. var punctata*—may be found here, having dull-red or yellowish fruit with whitish dots. Common in thickets, blooming early in *June*.

Cockspur Thorn, *C. Crus-galli, L.*

A neat shrub or round-headed tree, ten to twenty feet high, with numerous thorns, two to three inches long.

Stem with a rough scaly bark. *Leaves* entire or slightly toothed above the middle, smooth, thick, tapering into a short petiole. *Fruit* about one-third of an inch in diameter, reddish-brown when mature.

This is considered the best species for hedges. It is common in thickets and along fence rows, expanding its flowers in *June*. The fruit is mature in *October*, when it may be gathered for planting.

PEAR, APPLE, PYRUS, L. (Classical name for the Pear tree).

Shrubs or trees, with simple or compound, deciduous leaves, and white, pink or rose-colored flowers, in terminal cymes.

This genus contains two of the most valued fruit trees of North America—the Pear and the Apple—both natives of Asia and Europe. These trees have yielded an immense number of varieties, differing in the size and hardiness of the tree, and in the size, appearance and quality of the fruit produced. The Pear and Apple are not only prized for their fruit but their timber is most highly esteemed. The leaves of the Pear are said to afford a yellow dye, and may be employed to impart a greenish shade to blue cloths. There are two native species, valued only for ornament.

Choke-berry, *P. arbutifolia, L.*

Is a low shrub, common on bogs and in low pastures. It grows to the height of from two to four, or eight feet. The numerous leaves are from one to two inches long, with finely and sharply serrated margins. The flowers appear about the first of June; they are white or rose-tinted and impart to the plant much beauty. The small, purple fruit is quite astringent, puckering the mouth if eaten, whence the common name.

American Mountain Ash, Round-wood, *P. Americana, D. C.*

An elegant, slender tree, growing to the height of from fifteen to twenty feet, with compound leaves and pleasing red or scarlet fruit.

Stem 4 to 6 inches in diameter, with smooth, dark colored bark. *Leaves* composed of about 15 oblong-lanceolate, deeply serrated *leaflets*. *Flowers* small, white, in broad showy coryms. *Fruit* red or scarlet, acid. Low woods and moist meadows. *June.*

This beautiful tree—ranking among the most ornamental of its size—is found in many parts of the State, in localities mentioned above. It occurs in Manchester, Orono, etc. At all seasons it is ornamental. In summer being clothed with rich, ash-leaved foliage, while in autumn it is brilliant with its showy fruit, which remains on the tree long after the leaves have fallen. For grounds of limited extent there is no native tree more appropriate, and in composition its effect is most pleasing. The European Mountain Ash is much grown in this State for ornament. It differs but little from the American tree excepting that the berries are brighter colored, the bark lighter colored, and habit less elegant.

The Mountain Ash may be transplanted from its native haunts or grown from seed, the latter being the method generally practiced in England. According to Loudon, the fruit should be gathered as soon as ripe, macerated in water till the seeds are separated from the pulp, when they may be immediately sown. If thus treated they will remain eighteen months in the ground before coming up. It is common, therefore, to mix the berries with light sandy soil, and spread them in a layer of ten or twelve inches in thickness in the rotting ground, covering the layer with two or three inches of sand or ashes, and allowing them to remain in that state a year. They are then separated from the soil by sifting, and sown in beds of light, rich soil, being covered one-quarter of an inch. This should be done as late as possible in the fall. They will come up in June, and by the end of the season some of the plants will be eighteen inches high, and ready to transplant to the nursery. The seeds should be not less than two inches apart.

Sugar Pear, June Bush, Shad-Bush, *Amelanchier Canadensis, T. and G.*

The Shad-Bush is a well known shrub or small tree, quite ornamental in some of its varieties; especially is it so in May, when mantled with beautiful racemes of pure white flowers. At that season of the year the borders of woods and thickets are rendered attractive with the showy blooms of this tree, which form a most pleasing contrast with the fresh green of the yet half expanded foliage of the surrounding trees.

The variety *Botryapium* assumes a handsome tree-like form often attaining the height of twenty-five or thirty feet. It is said to form a good standard for the Pear. Variety *oblongifolia* is of smaller growth, generally appearing as a shrub. It is most common along river banks. It has oblong leaves which are white-downy when young. A variety (*oligocarpa*) delighting in cold, deep swamps and bogs has smooth, narrowly oblong leaves, and racemes with only two to four flowers.

Thomas Meehan in his excellent little work, "*American Hand-book of Ornamental Trees*," says that the June-berry may be propagated by seeds, but in English nurseries is generally grafted on the Hawthorn, and sometimes on the Pear and Quince. Seeds produce the finest trees. The latter mode produce plants quickest. The fruit is about the size of the common Gooseberry; when ripe it is of a dark crimson color, and possesses a good flavor.

SAXIFRAGE FAMILY—Order, SAXIFRAGACEÆ.

Herbs, shrubs, or trees, very widely distributed. The characters of the order are not well defined. It is very closely related to the Rose family. The properties of the order are unimportant, and its value is in its ornamental species, the Currant and the Gooseberry. Among the ornamental species are Mock-orange, Drutzia, Hydrangea, Strawberry Geranium, etc. Thirteen of the forty-eight species found east of the Mississippi are multiplied in Maine. Most valued among these, are the species of Currant—

Ribes—which by some authors are placed in an order by themselves—the GROSSULACEÆ.

CURRANT, RIBES, *Linnæus.* (The Arabic name for a medicinal plant.)

Low shrubs, with smooth or prickly stems, alternate leaves, small flowers, and mostly edible fruit. The Golden Currant is a well known ornamental species from the far West, having bright yellow and very fragrant blooms. The Red-flowered Currant is another ornamental species from Oregon and California. There are six species found wild in Maine, three Gooseberries and three Currants. None of these native species are of much value. The Garden Red Currant from Europe is considered identical with the *Ribes rubrum* of our swamps and bogs.

Among the other native species of this family, which deserve here a brief notice on account of their beauty, are the Early Saxifrage, *S. Virginiensis*—and the False Mitre-wort, *Tiarella Cordifolia.* The former is among the earliest of spring flowers, and throughout the month of May gives beauty to our rocky river banks by its profusion of delicate blooms. It is a small herb, having upon the ground a rosette of ovate, toothed leaves, from the centre of which arises a slender scape bearing a loose cyme of small, white flowers. Certainly this plant is worthy of a place in the garden, for it is equally attractive with some of the species sent out by the florists. The False Miitre-wort is a low herb, abundant along ditches and in moist meadows. "The leaves are rounded, heart-shaped, sharply lobed and toothed;" the flowers are bright white, arranged in a short, loose raceme, on a leafless scape, and are open during the latter part of May and early in June.

WITCH-HAZEL FAMILY—ORDER, HAMAMELACEÆ.

A small but widely dispersed family of trees or shrubs, with alternate, simple leaves, and small flowers in clusters, heads, or spikes. The Liquidambar or Sweet-Gum, is a large and beautiful tree growing in low lands, from Connecticut southward. The following is the only species found in this State.

WITCH-HAZEL, HAMAMELIS, *Linnæus.* (Name from the Greek *Hama,* like to, and *Melis,* an apple.)

Shrubs with straight-veined leaves, and yellow flowers, which are fertile or sterile on the same or different plants. There is but one species common to Eastern North America.

Common Witch-Hazel, *H. Virginica, L.* (Figured in American Agriculturist, Vol. XXIII, p. 346; Barton's Flora III, plate 78.)

Stem 10 to 20 feet high, with a diameter of from two to five inches; *wood* white, fine-grained and flexible; *bark* smooth, gray or light ash colored. *Leaves* firm, oval in shape, 4 to 6 inches long, on short *petioles*. *Flowers* arranged in clusters of three or four, greenish yellow, usually expanding in *October* or *November*.

Common in thickets and moist woods. As if in defiance of our rigorous climate and the approach of winter, this singular shrub puts forth its conspicuous yellow flowers when

"The rust is over the red of the clover,
The green is under the gray,
And down the hollow the fleet-winged swallow
Is flying away and away."

It is not unfrequent to see the plant in full bloom long after the leaves have fallen, when the earth is clothed in her ermine mantle and the ice king has set his foot on all the lakes. Dr. Bigelow in alluding to the unusual season at which the blooms of this shrub appear, says that "among the crimson and yellow hues of the falling leaves, there is no more remarkable object than the Witch-Hazel, in the moment of parting with its foliage, putting forth a profusion of gaudy yellow blossoms and giving to November the counterfeited appearance of spring." It is from this curious habit that the Witch-Hazel is rendered desirable for cultivation. Though naturally of a straggling growth, it may be made to assume a pleasing form with little difficulty. It thrives well in almost any soil or situation, and may be propagated by seed or cuttings. It may also be directly transplanted. The oily seeds are black and shining and are discharged from the two-horned pod, when ripe, with considerable force.

The Indians are said to have employed the inner bark in allaying the pain of tumors and inflammation of various kinds, especially of the eyes.

It is thought by some that the name *Witch*-Hazel was applied to this plant on account of its unusual season of flowering, apparently reversing the order of nature, a circumstance which led the superstitious to suppose it to have some connection with witchcraft. In the American Agriculturist we find "that it is called Witch-Hazel for the reason that its twigs were used as divining rods by imposters, professing to discover hidden springs of water." Darlington says that the twigs of this native shrub have furnished a capital substitute for the divining rod of Europe, with which crafty operators were wont to impose on the credulous. The belief in the powers of this plant are not yet absolete even among the educated, for the writer has observed men of culture and position call to their aid old and ignorant men, with forked stick of Witch-Hazel in hand, to discover water about buildings, devoted to the dissemination of knowledge which should tend to dispel such relics of credulity and superstition.

EVENING PRIMROSE FAMILY—
ORDER, ONAGRACEÆ.

Our plants of this order are either annual, or perennial herbs, with opposite, or alternate, simple leaves and the parts of the flowers in fours, (in twos, in the genus *Circœa*). There are many species with showy flowers well known in the gardens, such as the different varieties of the Fuchsia, Evening Primrose, Clarkia, etc. So numerous are the species of Epilobia in New Zeland that they are characteristic of its herbaceous vegetation—(*Hooker*). A mucous and sometimes slightly astringent principle prevades the Order. None of the species are of any agricultural value; the two following are noticed for their beauty.

WILLOW HERB, EPILOBIUM, *Linnœus.* (Name compounded of three Greek words meaning *violet on a pod.*)

There are five native species.

Willow Herb, French Willow, Fire Weed, Rose Bay, *E. augustifolium, L. Perennial. Stem* four to six feet high. *Leaves* two to five inches long, with purple veins. *Flowers* numerous, pink-purple, very showy, in a large, terminal raceme.

This species is abundant on low, waste grounds, especially on newly cleared lands, recently burnt over—whence the name *fire weed.* When the flowers are expanded in July and August the plant is showy and attractive. It deserves cultivation for ornament. There is a white flowered variety. Growing upon Mt. Katahdin is a very pretty species, eight to ten inches high, having a single large rose-purpie flower.

The Common Evening Primrose—*Œnothera biennis*—is sometimes seen in gardens. The root is said to be sweet and edible. It has large, lemon-yellow flowers, two to three inches across. This species, in common with some others of the genus, does not expand its flowers till towards evening.

"Slowly the rosy dusk of eve departed,
And one by one the pale stars bloomed on high;
And one by one each folded calyx started,
And bared its golden petals to the sky.

> One throb from star to flower seemed pulsing through
> The night; one living spirit blending all
> In beauty and in mystery ever new;
> One harmony divine through great and small."—(*C. P. Cranch.*)

PARSLEY FAMILY—ORDER, UMBELLIFERÆ.

A large and well defined order of herbs, having small flowers arranged in umbels, and an inferior fruit of two seed-like, dry carpels, cohering by their inner faces. The Umbellworts are chiefly natives of the cooler portions of the globe, most abundant in the south of Europe. About fifty-eight species are found east of the Mississippi, of which sixteen are considered natives of this State. There are several introduced species that are rank, homely weeds. Many plants of the order are poisonous or have narcotic properties. The aromatic fruit of Caraway is used to flavor bread and cheese. The Parsnip and Carrot have nutritious and edible roots. In medicine many of the species are highly valued. A few are grown for their ornamental foliage.

GINSENG FAMILY—ORDER, ARALIACEÆ.

A small family, chiefly natives of the tropics. They are closely related to the *Umbelliforæ*, and have little value except in medicine. The flowers are small, and in our species are disposed in umbels. The English Ivy—a member of this order—is highly prized as an ornamental plant. The genus *Aralia* is the only one native to Eastern North America.

Common Wild Sarsaparilla—*A. nudicaulis*—is a very common plant, having a fragrant and aromatic root which is sometimes employed as a substitute for Sarsaparilla—*Smilax officinalis*. Ginseng—*A. quinquefolia*—has been so highly esteemed by the Chinese as a panacea that it has been sold for its weight in gold. It is not a common plant in Maine. It has been found at Orono. The Ground-nut—*A. trifolium*—has a round edible root.

DOGWOOD FAMILY—ORDER, CORNACEÆ.

Shrubs or small trees, rarely herbaceous plants, with simple, mostly opposite leaves, and small, perfect flowers. Calyx and corolla, each four-parted. Fruit berry-like, mostly two-celled and two-seeded.

The Cornels are very rare except in the northern hemisphere, they especially abound in the cooler parts of North America, thirteen species (including the genus Nyssa) being found east of the Mississippi. Some of the species are of repute in medicine, having bitter and astringent properties, and tonic action. The bark of *Cornus florida* yields a principle sometimes employed as a substitute for quinine. None are poisonous.

"The wood of the Cornels is hard and close-grained, and is used in Europe for cogs in mill-wheels, and for other small articles formed by the turner; and in this country as a substitute for Box-wood."—(*Emerson*).

Nearly all the sorts are ornamental, and with us are chiefly valued on this account. Eight species are said to occur in this State.

The genus Cornus, a Latin word meaning a *horn*, and probably applied to these plants because of the extreme toughness of the wood, is the type of the order. The species are all hardy and some of them are highly ornamental. They readily multiply from seed, suckers, layers or cuttings. The limits of this paper will only allow a brief notice of the more deserving species.

The Dwarf Cornel or Bunch Berry—*C. Canadensis*—is an herbaceous plant, growing to the height of four or eight inches, from a woody, underground *stem*. The *leaves* are opposite and clustered near the summit of the stem. The *flowers* are quite small and are arranged in a terminal cluster. Surrounding the flowers are four large, white and showy involucre leaves. The Dwarf Cornel is a common plant in low woods, etc., and is well known to the young folks by its pretty bunches of bright red and edible berries, which ripen early in autumn.

Flowering Dogwood, *C. florida, L.* (Fig. in Darlington's Weeds and Useful Plants, page 158 ; Michaux, Sylva, I, pl. 48; Bigelow's Medical Botany, Plate 28).

A handsome, small tree, the most beautiful of its genus.

Stem 10 to 20 or 30 feet high, the largest specimens attaining the diameter of 9 or 10 inches. *Leaves* ovate, entire, 4 to 5 inches long. *Flowers* 12 or more in a head surrounded by four large and showy, white floral leaves (*involucre*). *Fruit* bright red, ripe in October. Rich, rocky woods. *June.*

This species of Dogwood is said to be found in this State, though the writer has never seen the living plant. It is frequent in Massachusetts, but occurs in the greatest profusion in the Southern States bordering the Gulf, where it sometimes exclusively occupies tracts of many acres in extent. The flowers of this species are its chief attraction. The bright red clusters of fruit displayed in autumn, as well as the beautiful autumnal colorings of its foliage, add much to the charms of this tree. Downing, referring to this species in his *Landscape Gardening*, says that "in the early part of the season, the Dogwood is one of the gayest ornaments of our woods. It is seen at that time to great advantage in sailing up the Hudson river. There in the abrupt highlands, which rise boldly many hundred feet above the level of the river, patches of the Dogwood in full bloom, gleam forth in snowy whiteness from among the tender green of the surrounding foliage, and the gloomier shades of the dark evergreens, which clothe with a rich verdure the rocks and precipices that overhang the moving flood below"

Darlington in his *Flora Cestrica*, says that "the wood of this small tree is very close grained and firm, and valuable for many purposes in mechanics. Cabinet-makers sometimes employ it in the manufacture of small articles of furniture, in which it is considered very beautiful. The woodman selects it as the best material for wooden wedges. The young straight stems make good hoops for the cooper. * * The bark is an excellent tonic—almost rivalling the *Cinchona* in efficacy."

For its many virtues this tree is deserving of more attention than it has received by our cultivators. Its ornamental character renders it most desirable for the lawn or yard; its practical utility alone renders it worthy of cultivation.

Our other species of Dogwood are all shrubs excepting an occasional form of the Alternate-leaved Dogwood, *C. alternifolia*. This species is remarkable in having its leaves alternate. It often attains the height of fifteen feet or more, and has a wide-spreading, flat summit. It is common on dry hillsides, etc., and in the latter part of June is showy with broad cymes of white flowers. The fruit is deep blue, ripe in October. For ornament this species ranks next to the Flowering Dogwood. It grows from Canada to Carolina and west to Kentucky.

The Red-osier Dogwood, *C. stolonifera*, is a species frequent in very wet places. It occurs in Orono, Manchester, and Waterville. The name "Red-osier" is appled to this plant on account of the very bright red color of the bark of the annual shoots. The *flowers*, though not numerous, are attractive. The *fruit* is white or lead color, and, according to Nuttall, was eaten by the savages of Missouri. It is at all times a handsome shrub. In wet soil it propagates most readily by suckers.

Silky Cornel or Kinnikinnik, *C. sericia*, also inhabits wet places, growing to the height of from three to ten feet. It is distinguished by its purplish branches, silky-downy, and narrowly ovate or elliptical pointed leaves, and pale blue fruit. The bark of this species is little inferior to that of the Flowering Dogwood in its medicinal properties.

The Round-leaved Dogwood, *C. circinata*, has greenish, warty-dotted *stems*, and large, round-oval *leaves*, two to five inches broad. It is quite common along the borders of rich woods, etc. It is deserving of a place in the shrubbery.

TUPELO, NYSSA, *Linnæus.* (The name of a Nymph; so called because it [the original species] grows in the water.)

Tupelo, Sour Gum-tree, Snag-tree, Horn-Pine, Pepperidge and **Hornbeam,** *N. multiflora, Wanggenheim.*

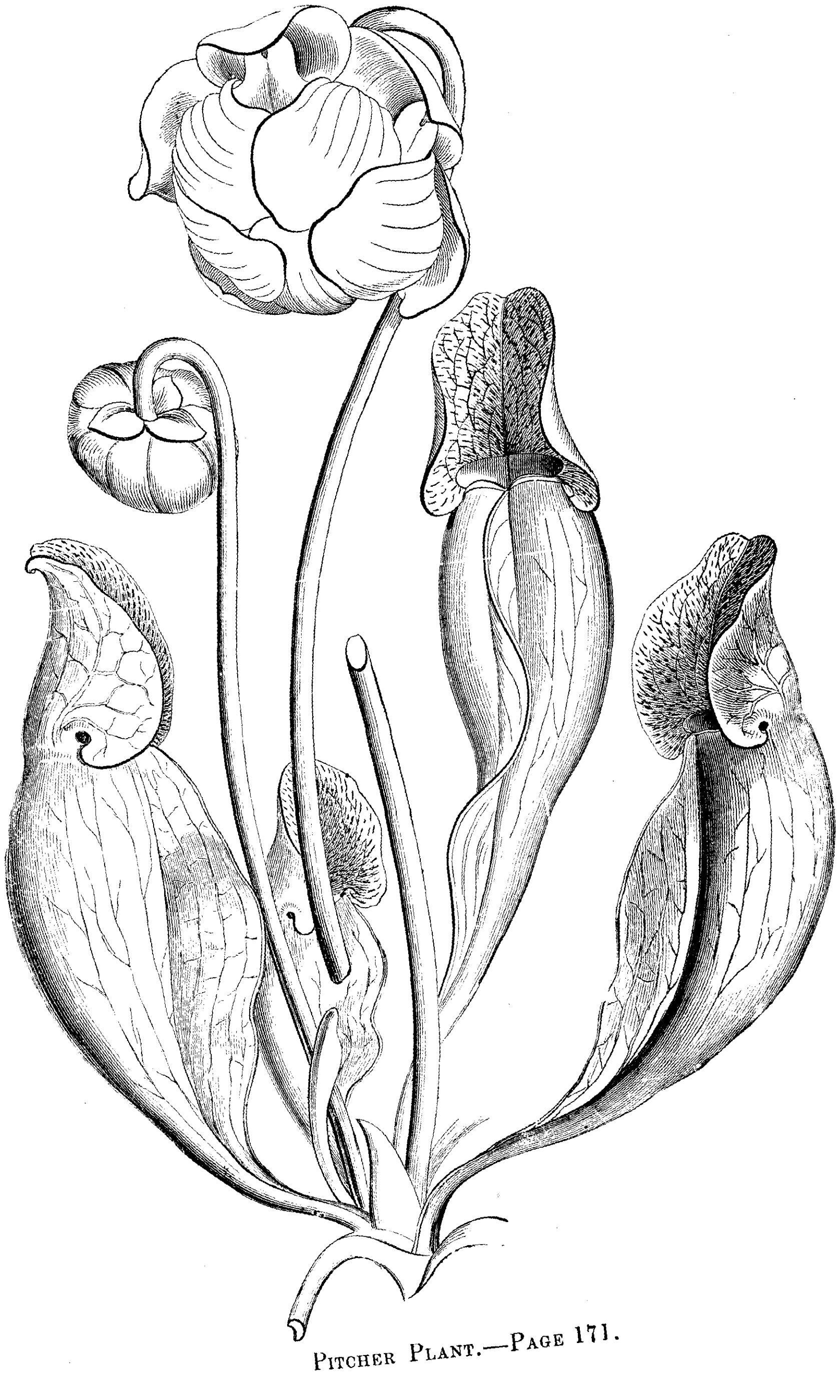
A middle-sized deciduous tree, having glossy foliage, irregular branches and usually a spreading, flat summit.

Stem 40 to 50, rarely 70 or 80 feet high; *trunk* 10 to 18 inches in diameter, covered with an ashen gray bark much furrowed longitudinally. *Leaves* alternate, oval, smooth except when young, upper surface glossy. *Fruit* blue-black, about one-half inch long. Rich soil, generally where moist. *May.*

This is not a common tree in Maine, being found only in the extreme southwestern part of the State. It is often met in Massachusetts, but is most abundant in the Middle States, and occurs as far south as Georgia.

The wood of the Tupelo (the name applied to the tree by the aborigines) has a yellowish hue when freshly cut; it splits with the greatest difficulty, owing to the peculiar arrangement of the fibres, which are united into bundles and interwoven like a braided cord. On account of its liability to decay the wood is little esteemed. Bowls and trays are made of it, and it is sometimes used for the hubs of wheels. For the latter purpose it is not so lasting as the elm, though less liable to split. It burns slow, giving out much heat, but from the extreme labor required to work it up, it has little value for fuel. It is recommended for aqueducts as it does not require hooping.

The chief value of this tree is for ornamental planting. Owing to its irregular and unique growth it forms an object of much attraction. For picturesque effect and to render rude and wild scenery still more wild and rude, there is no more appropriate tree than the Sour Gum. "There is no other tree, not excepting the Oak, that will compare with it in certain excentricities of habit. * * * The spray is different from that of other trees. Every important branch is covered all round, at top, bottom and sides with short twigs, at right angles with the branch."—(*By-Ways of New England.*) Downing says that the Pepperidge, when of moderate



Pitcher Plant.—Page 171.

size, is not difficult to transplant, and we consider it a very fine tree, both on account of its beautiful dark green and lustrous foliage in summer, and the brilliant fiery color which it takes when the frost touches it in autumn.

The Tupelo is propagated either by seeds, layers or cuttings. The seeds should be sown in spring or as soon as they are mature. The soil in which they are placed must not be allowed to become dry, else the seeds will not germinate.

DIVISION II.

GAMOPETALOUS EXOGENS.

Flowers furnished with both calyx and corolla, the latter having its parts, the *petals*, more or less united into one piece.

HONEYSUCKLE FAMILY—

ORDER, CAPRIFOLIACEÆ.

Climbing or erect shrubs, rarely herbs, with simple, opposite leaves, perfect, and generally sweet-scented flowers, and berry-like or capsular fruit. The juice of some of the species is bitter and astringent, so that they are included among the plants used in medicine.

To the florist this order presents very many elegant plants, prized for their ornamental habits and the beauty and fragrance of their flowers.

TWIN FLOWER, LINNÆA, *Gronovius.*

(This flower was the favorite plant of the immortal Linnæus, and was named in his honor by his pupil Gronovius.)

Linnæa or **Twin-flower,** *L. Corealis.*

Stem very slender, widely creeping. *Leaves* evergreen, small, of a rounded oval shape. *Flowers* in pairs on thread-like stalk, terminating the upright leafy branches, nodding, very fragrant. Mossy woods and bogs. *June.*

In June, the woods where this charming little evergreen plant abounds, are filled with the delightful perfume exhaled from its pretty rose-purple flowers. There is not in all our flora a sweeter or more pleasing little shrub than this. The Snow-berry is a more delicate vine, but is inferior in the modest beauty and fragrance of its blooms. In habit the Twin-flower is beautiful, forming a slender trailing vine, its rich and shining leaves covering with an evergreen verdure many a mossy knoll. Upon the bleak and dreary table-lands of Mt. Katahdin, where is only moss, a few sedges and a stunted growth of fir, the writer has seen this hardy little plant in full flower past the middle of August, brightening the solitude and giving to the chilling winds its sweet odors.

HONEYSUCKLE, LONICERA, L. (Named in honor of *Lonitzer*, a German herbalist of the 16th century). Climbing or erect shrubs with opposite entire leaves, and often fragrant and showy flowers.

The Trumpet Honeysuckle, *L. sempervirens*, native from New York southward, is well known in the gardens. The American Woodbine or Sweet Wild Honeysuckle, native of the Middle States, is also cultivated for ornament. There are numerous beautiful exotic species familiar to all.

Native with us are two quite attractive, erect shrubs—the common

Fly Honeysuckle, *L. ciliata*, and the **Mountain Fly Honeysuckle,** *L. cærulea*.

The first is common in all deciduous, rocky woods. It grows to the height of from three to five feet, and has a rather straggling habit. The pale yellow, tubular flowers are nearly an inch long and grow in pairs. They appear with the leaves in May. The berries are bright red.

The second species is less common than the first. It is a more northern plant, found in "Mountain woods and bogs from Rhode Island to Wisconsin and northward." It is distinguished by its low growth, being from one to two feet high, its strictly upright branches and oval leaves, which are covered with a close down when young. The flowers of this species also grow in pairs; the ovaries of each pair are united in fruit into one, blue berry. Both these plants make pleasing additions to the shrubbery.

BUSH HONEYSUCKLE, DIERVILLA, *Tourn.* (Named by Tournefort in honor of *M. Dierville*, a French surgeon, who first sent him the plant from Canada.)

Low shrubs, of upright and slender growth. The *D. Japonica* and *rosea*, or Weigelias, from Eastern Asia and Japan, are among the most beautiful of our hardy garden plants.

Common Bush Honeysuckle, *D. trifida, Mœnch.*

Stem 2 to 3 feet high, branching. *Leaves* 2 to 5 inches long, oblong-ovate, taper-pointed, on short petioles. *Flowers* yellow, generally three in a cluster in the axiles of the upper leaves. Borders of woods and rocky fields. Common. *June, August.*

Though not especially attractive, this shrub is deserving a place in every collection. It transplants readily.

The ELDER, SAMBUCUS, *Tourn.* (From the Greek, *Sambuke*, a musical instrument, said to have been made of Elder wood.)

Mostly shrubs, having a large pith, and emitting a rank odor when bruised. The leaves are opposite and pinnate. The flowers are usually white and arranged in large compound cymes. The genus contains some twenty species, of which two are common to this State.

Elder-bush, Common Elder, *S. Canadensis, L.*

So common and well known is this shrub, that to describe it is unnecessary. It lays small claim to beauty, and is seldom classed among the ornamental shrubs; yet one cannot deny its attractiveness, when, in July, it is covered with its large and fragrant clusters of white flowers, or later in the season, when the blooms have been succeeded by rich masses of dark-purple fruit. Were it a plant from foreign lands, or even less common here, one could not be too lavish in its praises.

With good farmers the Elder has a bad reputation, as it often becomes troublesome along field borders, the long roots spreading extensively, resisting almost every effort for their destruction.

If for no other reason, the Elder deserves notice for its economic values, which are thus enumerated by Emerson: "An infusion of the bruised leaves is used by gardeners to expel insects from vines. A wholesome sudorific tea is made from the flowers. The unopened flower-buds form, when pickled, an excellent substitute for capers. The abundant pith is the best substitute for the pith-balls used in electrical experiments; and the hollow shoots are in great use with the boys for pop-guns and fifes." A good domestic wine is largely made from the expressed juice of the berries; and the medical action of the bark is purgative and emetic.

The Panicled or Red-berried Elder, *S. pubens, Mx.*

Is a more pleasing bush than the last, and in fruit is far more showy. The flowers appear in May, and instead of being in broad flat cymes, they are arranged in convex or pyramidal clusters. The bright red fruit is ripe in June. The pulp of the berry is yellowish and of an unpleasant taste. This species is of little or no value except for ornament.

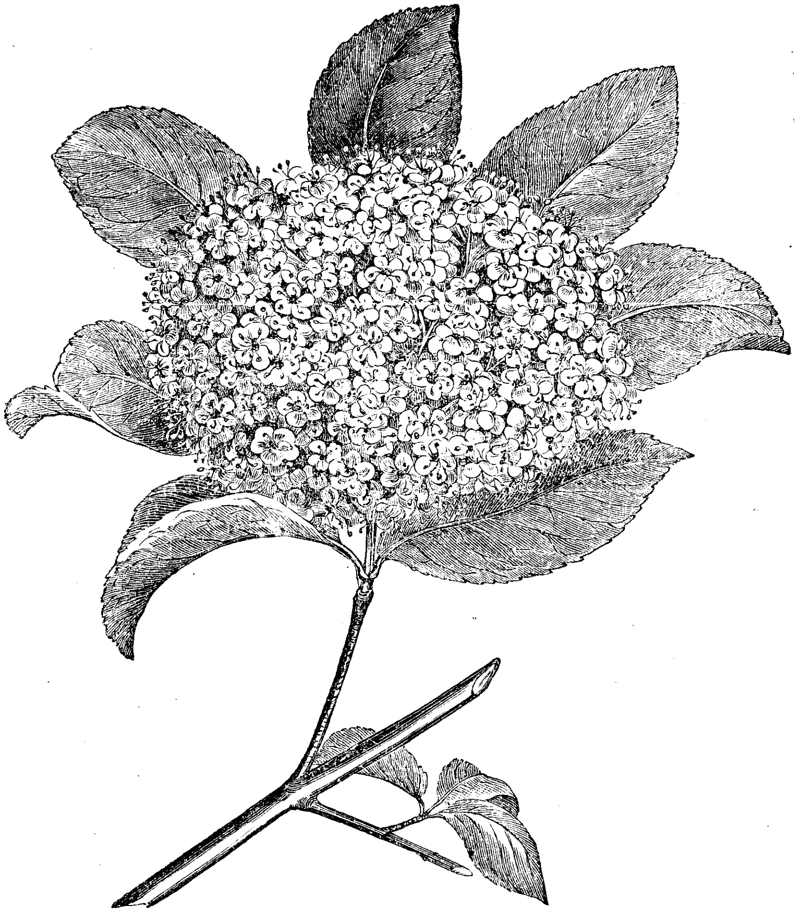
VIBURNUM, ARROW-WOOD, VIBURNAM, L. (The classical name of unknown meaning.)

Our native plants of this genus are all shrubs of more or less ornamental character. Some of the foreign species are arborescent, and a few are evergreen. The leaves are simple and petiolate. The flowers are small, arranged in flat, compound clusters, cymes, as in the Elder. The genus numbers some fifty species, of which six are found in Maine.

Sweet Viburnum, Sheep-berry, *V. Lentago, L.* (Figured below.)

Stem 10 to 20 feet high, much branched. *Leaves* 2 to 4 inches long, lance-ovate in outline, long-pointed, with sharply serrated margins; *petioles* about one-half an inch long, wavy margined. *Flowers* white, showy, in terminal, sessile cymes. *Fruit* quite large, at first scarlet changing as it matures to a bluish black, sweet and edible.

Common from Canada to Georgia. *June.*



Sweet Viburnum.

This is one of the most beautiful as well as the most hardy of the Viburnums. It often assumes an elegant tree-like form and is especially suited for small grounds. It is very pleasing when planted beside the walk or carriage drive, and when grown in clumps upon the lawn it forms an object of constant delight.

Handsome in flower, it is scarcely less attractive in autumn when loaded with its scarlet, or finally rich blue fruit, hanging in abundant clusters from every branch. The unripe and ripened fruit are often mingled together, and their appearance among the leaves already assuming their pleasing autumnal colorings, is extremely fine. The Sweet Viburnum generally has a thick and well rounded head, and owing to its great vitality, resisting the frequent browsing of sheep and cattle, it has been highly recommended for a hedge plant. A writer in the *American Agriculturist* remarks that "it is certainly one of the best of all deciduous shrubs for that (the hedge) purpose, and nothing but its commonness and cheapness can prevent it from having a rapid run and wide spread popularity for hedges." This same writer goes on to say that this plant "in the hands of the gardener is as plastic as the Box or Yew, and may be moulded into any desirable shape. Planted in good soil and properly trained, it makes a thick hedge, impervious to the light and strong enough to turn cattle. It is easily multiplied from the seed, old pastures and woodlands abounding in young plants that have been sown by birds and cattle. In the neighborhoods where the plant is already established, plants suitable for hedges are readily procured from the pastures. Those growing in the open ground, and that have been subjected to the severe cropping of the sheep and goats, are to be preferred."

Cranberry-tree, High Cranberry, *V. Opulus, L.* (Figured on page 236.) *Stem* shrubby, 3 to 10 feet high, branching. *Leaves* broadly wedge-shaped, 3 to 5 inches in diameter, strongly lobed. *Flowers* numerous, small, except the marginal ones, which are large, showy and sterile. *Fruit* spherical, bright red, pleasantly acid, remaining on the plant through the winter. Meadows and along streams from Maryland northward. *June.*

This is another highly ornamental species, and may be grown from seed or transplanted directly from its native haunts, or it may be propagated by layers or cuttings. It prefers a moist soil, but does exceedingly well where the land is dry. This is a more bushy shrub than the last, seldom growing more than six or eight feet high. The flower-clusters are three or four inches in diameter and are rendered especially showy by the large sterile florets which surround them.

In the Guelder Rose or Snow-ball Tree of the gardens, which is but a cultivated state of the High-Cranberry, *all* the flowers of the cluster are sterile, that is destitute of both stamens and pistils, and consist only of the enlarged, five-lobed corolla. The wild species, though less showy while in bloom, is far more attractive later in the season, and even through winter when ornamented with its fine scarlet fruit clusters. This fruit has somewhat the appearance and acidity of the common Cranberry, for which it is

HIGH CRANBERRY.

sometimes employed, whence the common name applied to this shrub. It makes an inferior substitute for the latter named fruit, as it has a bitter taste mingled with its acidity, and besides, the pulp is largely filled with the seeds. The fruit may possibly be improved by careful cultivation, but at present this shrub is of little value except for ornament. "A case has recently come to our knowledge in which a tree peddler took orders for cranberries for upland culture, and supplied plants of this shrub. As this swindle may be tried elsewhere, our readers should be on their guard."—(*American Agriculturalist.*) The leaves of the High Cranberry have in summer a more lively green, and the autumn foliage is more brightly hued with crimson than in our other species of Viburnum. The attractiveness of this shrub at all seasons of the year strongly recommends it to the attention of every one who wishes to beautify his grounds.

The two species above described are those most worthy of attention; there are several others, however, which deserve a brief notice.

The Maple-leaved Viburnum, *V. acerifolium, L.*,

Seldom grows more than five feet high. It is a slender shrub, common in rich rocky woods, and is remarkable for its beautiful maple-like foliage, the leaves closely resembling in shape those of the Red Maple.

The Arrow Wood, *Viburnum dentatum, L.*,

Is a common species, growing on low wet grounds. The long and straight branches are extremely tough, and were formerly used by the Indians for making arrows, whence the common name applied to this species.

The Hobble-bush, *V. lantanoides, Mx.*

Is another common and well known species, growing in rich woodlands. It is often called Moose-wood, but this name properly belongs to the Striped Maple. The flowers are in very large and showy, flat cymes, the marginal flowers being sterile and most conspicuous, as in the High Cranberry.

SOME NOTES ON MAINE CATTLE.

Through the efforts of prominent gentlemen, interested in agricultural improvement, Maine—long before it became an independent State—was one of the earliest sections of the New World to attempt an improvement of its breeds of cattle by the introduction of thoroughbred animals from other countries. As early as 1791, cattle were imported from England by Maine farmers, and so late as 1836, Maine farmers sent breeding animals of thoroughbred stock to Vermont, Massachusetts, New York, and even to Ohio. Considering these facts, and also considering the fact that the history of these transactions has never been so fully or completely recorded as it should be; it has been believed that some materials towards a history of these importations, with an account of their progeny, some mention of the men engaged in these early stock transactions, as well as notes of the different breeds of cattle at present kept in Maine, might be of interest as a part of our agricultural history. In the following pages an attempt has been made towards carrying out this plan.

EARLY IMPORTATIONS OF CATTLE INTO NEW ENGLAND.

It has been noticeable in the history of all past events that occupants of land, farmers, have made the procurement of better stock, cattle, sheep, horses, one of the first objects of their attention after the more simple and immediate wants have been supplied.

At first the settlers of any new country must perform those duties which concern daily subsistence; following these comes better dwellings, and then almost invariably, as the land becomes cleared,* better farm stock. An example of this kind is now found

*"It is a somewhat curious fact that the modern improvements in cattle in England did not begin till after the systematic culture of the higher qualities of natural grass. It is not strange, therefore, that the colonists here, who had vastly greater hardships to encounter in the practical operations of the farm, were slow to recognize the possibilities of improvement, or that their cattle, poor as they must have been at the outset,

in our own State—for while in the older portions the improved breeds of neat stock largely predominate, in Aroostook county the settlers have but recently, and even now only a few of them, turned their attention to breeding choice cattle of the various thoroughbreds. And while the first settlers of Maine made fishing and lumbering their principal business, they early gave attention to rearing and grazing cattle.

Capt. John Mason, who with Sir Fernando Gorges had several grants of land on the Piscataqua river—a part of which territory is now within the limits of this State—introduced cattle on their plantations as soon as they could obtain forage enough, by clearing and cultivating, for them to subsist upon. The present towns of Kittery and Berwick were included in the large plantation of Capt. Mason, and by him the first cattle were brought into that section, in 1631; although it is quite possible there might have been a cow or two imported prior to this date, for the purpose of furnishing milk to the fishermen. During the years 1631, '32 and '33 frequent importations of bulls, oxen and cows were made for the purpose of stocking his manor, known as "Mason Hall." In 1634 Capt. Mason had, by purchase, become sole proprietor of the "Piscataqua Patent," and had imported numbers of Danes, and Danish cattle for the purpose of establishing a permanent colony. The cattle were imported by Capt. Mason on account of their capacity for labor and enduring the rigors of our climate. They were large in size, of powerful make, and yellow color. Previous to the death of Capt. Mason, which occurred in 1635, there were some three hundred cattle upon his plantations, and they were chiefly Denmarks.

There are preserved in the office of the Secretary of State, for the State of New Hampshire, the originals of two curious depositions which substantiate the above statements; and as the facts contained in them relate directly to the early history of our Maine cattle, they are copied in full; having been originally published in the Transactions of the New Hampshire Agricultural Society for 1854.

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continued rather to depreciate than to improve in quality until sometime after the Revolution. The number increased, however, as the range of pasturage or browsing grounds was comparatively unlimited, so that the keeping of stock may be said to have assumed some importance in the older settlements, by the middle of the last century, when it had become comparatively safe from molestation."—*Chas. L. Flint's Hundred Years' Progress of American Agriculture.*

DEPOSITION OF FRANCIS SMALL.

Francis Small, of Piscataqua, in New England, planter, aged 65 years, maketh oath, that he hath lived in New England upwards of 40 years; that he very well knew the plantations Capt. Mason had caused to be made at Piscataqua, Strawberry Bank, and Newichewanock, and was well acquainted with all the servants employed by Captain Mason upon the said plantations, some of whom are yet living; and that there was *a great stock* at each of these plantations. And this deponent doth very well remember that Captain Mason sent into this country eight Danes to build mills to saw timber and tend them, and to make potashes; and that the first saw and corn mill, in New England, was erected at Capt. Mason's plantation at Newichewanock, upward of fifty years, where was, also, a large house, with all conveniences of out-houses, and well fortified with store of arms. That about forty years since the said houses and buildings were burnt to the ground, but by what means this deponent doth not know. *That about the same time this deponent, with others, was employed by Capt. Francis Norton, (who then lived at Capt. Mason's house at Piscataqua, called the great house,) to drive about one hundred head of cattle towards Boston, and the said Capt. Norton did goe with the cattle; that said cattle were there usually sold for five and twenty pounds, the head money of England.* And the said Norton did settle himself at Charlestown, near Boston, and wholly left Capt. Mason's plantation, upon which the other servants *shared the residue of the goods and stock among them, which were left in that and the other Plantations,* and possessed themselves of the houses and lands, *and this deponent doth verily believe that from the cattle sent thither by Capt. Mason, most of the cattle in the provinces of New Hampshire and Maine, have been raised, for this deponent doth not remember or heard that any one person else did bring over any.* That Thomas Wannerton, a servant to Capt. Mason, and lived in a fair house at Strawberry Bank, about the year 1644, did carry goods and arms belonging to Captain Mason's plantation, and did sell them to the French that did inhabit at Fort Royal, where the said Thomas Wannerton was slain. That some time after one Sampson Lane came over from England, with power, as he pretended, to look after and take care of the aforesaid plantations, and did settle himself in the great house at Strawberry Bank, and made additions thereunto, where he continued about three years and then returned for England, upon whose departure

John and Richard Cutts got into possession of the aforesaid house and lands at Strawberry Bank, but by what right this deponent never heard, and have sold several tracts, upon which many houses are now built and possessed by the relations of the said Cutts.

FRANCIS SMALL.

Sworn before me the 8th September, 1685,

R. CHAMBERLAIN, Justice P."

The facts sworn to in Small's deposition are corroborated, and the origin, extra size and color of these cattle, are given in the

DEPOSITION OF NATHANIEL BOULTER AND JOHN REDMAN:

"Nathaniel Boulter, aged 60 years, and John Redman, aged 70 years, of the town of Hampton, in the Province of New Hampshire, Yeoman, make oath that they were two of the first planters that did sit down at Hampton, aforesaid, about forty years since by the authority of the Massachusetts General Court, which gave power to some few persons (called Sellectmen) who came likewise to inhabit in the said town, to grant or sell land to others as they thought fit. That upon these deponents first settling at Hampton several of the servants of Capt. Mason or his heirs, came from Piscataqua to Hampton, and did forbid these deponents and others from settling in the said town without a license from the proprietor or his agents, and paying a quit rent. But these deponents and others of the inhabitants being backed by the authority of the Massachusetts government, which had declared those lands to be in their jurisdiction, no regard was had to the prohibition by Capt. Mason's servants. And these deponents do very well remember that Mr. Mason had made a great plantation at Piscataqua and Newichewanock, *where there were a great stock of cattle, and much land improved—and these deponents about forty years since, did see a drove of one hundred head of great cattle, or thereabouts, that came from off Capt. Mason's plantation at Piscataqua, and drove through the town of Hampton, towards Boston, by Capt. Norton and others, the servants of Capt. Mason or his heirs, and there sold and disposed of (as these deponents were informed) by the said Capt. Norton, who did then settle himself in or near Boston, and deserted the plantation at Piscataqua, and these deponents do further testify that such cattle were commonly valued at five and twenty pounds the head, being very large beasts of a yellowish color, and said to be brought by Capt. Mason* *from Denmark*. And these deponents say, that soon after Capt. Norton's going to Boston to inhabit, the Massachusetts government did lay claim to the whole province of New Hampshire, as pretending it to be within their patent, and did accordingly exercise a jurisdiction therein and required those inhabitants to take an oath of fidelity to them.

NATHANIEL BOULTER,
JOHN REDMAN.

Sworn before me the 6th of November, 1685,

R. CHAMBERLAIN, Just. P."

THE NATIVE, OR OLD RED CATTLE OF NEW ENGLAND.

Much discussion has been had as to the origin of the Old Red Cattle or native stock of New England; and many attempts have been made by different writers to show that such and such foreign breeds formed the basis of our native cattle, by basing their assertions upon the fact that the inhabitants of certain sections came from particular districts in the mother country and would be most likely to bring with them cattle of the particular breed that abounded in their own localities. Thus Mr. Alanson Nash, in an original and entertaining Memoir of the Origin and History of American Cattle, states that the inhabitants of Salem, Mass., are descendants of Dorcestershire, settlers who would of course introduce Devons; that those of the town of Rowley are descendants of Yorkshire, colonists who came from England in 1638, bringing with them the old Yorkshires and the old Shorthorns; that the people of Lynn came from Lincolnshire, bringing with them the old Lincolnshire cattle, and that the people of many of the towns in Connecticut came from Kent and Surry by way of the Bristol channel, bringing with them cattle from Sussex and Hereford, and above all, Devons in great numbers. It is true, no records have been found upon which to base such statements, but the inferences are very clear and the general assertions such as seem well founded. In commenting upon these opinions of Mr. Nash, Mr. Solon Robinson, one of the prominent agricultural writers of our county, in a valuable series of articles in the *New York Tribune*, on "Breeds of Domestic Cattle," thus speaks of the origin and characteristics of the "old red stock of New England:"

"We think Mr. Nash lays too much stress on these localities as proving the species of cattle imported from them at that early date.

Lincolnshire was supplied with Longhorns it is certain from the small and remote district of Craven, on the opposite coast of the island, and far to the north of England. They gained ground but gradually and slowly, and the southern coast of Lincolnshire opposite to Norfolk would have been about the last place they would have reached, as it is in fact the extreme southern limit of their district in England. There is, in fact, no reason for believing—but rather the reverse—that there were Longhorns in Lincolnshire at the period of the embarkation of the Pilgrims. Now, however, there has grown up, and within a few years grown into great consideration, justly, a peculiar breed of oxen known as the red cattle of New England. Their characteristics—in first, their color, which being pure red decidedly negatives the probability, if not the possibility of any Shorthorn cross, since white, either pure or spotted with clear blood red is, as has been before demonstrated, an original Shorthorn color, derived not from the Chillingham or Cadgow-park wild cattle, with which it is not probable that they were ever crossed, but from the original imported Danish stock brought into England prior to the Norman invasion. This white color would indubitably break out if it existed dormant in the red cattle of New England, while the form of the Yorkshire horn would unmistakably show itself in any cross breed of which the Shorthorns formed a constituent part. From a very early date these red cattle have existed in New England, but they have been recently greatly improved, and have assumed new characteristics. They were formerly, we understand, of the light red color peculiar to the Sussex cattle; had characteristic horns, somewhat coarser and less tapering than that of the Devon, and showed a good deal of the Sussex coarseness and weight about the forehead. They have now returned nearer to the rich blood color, deeper almost than blood bay of the Devons and old Herefords before the white faces and bellies were introduced among the latter, probably from their neighbors the Montgomeries. They have gained a horn much larger it is true than either Devon or Sussex, but of the true Devon form, delicate, tapering finely to a point, and of a clear, waxy color, white at the base. Lastly, they have got rid of the weight and coarseness of the Sussex shoulder, and have all the freedom from inferior beef in the fore-quarter, with all the agility and quickness at work of the Devonshire, which in that character excels all the English cattle. They are fair milkers, though not equal to the Shorthorn or Yorkshire stock, which prevails in other parts of New England. They are hardy, docile, and excellent workers, attain to a great weight, fattening easily, and not forming like the new Longhorns immense masses of useless tallow, but giving a finely grained and beautifully marbled beef.

They are in all respects a highly valuable and excellent breed of cattle, and admirably adapted for the country in which they are produced, the cold, hilly and backward pastures of New England. It is certain, however, (or as certain as anything can be which is predicated on a consideration of effects, not on a foregone knowledge of causes) that there is no Yorkshire nor any Shorthorn blood whatever in the Red Cattle of New England, how much soever there may be in the red and white breeds kept for milk in the same regions. There may be, and we will say most probably there is, a Longhorn cross, whether that came only from the old Leicestershire Middlehorns which had always a tendency to make longer horns than the rest of the family, or, as we believe to be the case, chiefly from their size, which is far superior to that of the pure Devon or Herefords, from a far more recent admixture within the last fifty or sixty years of the improved Bakewell long horns. The tendency to the long horn formation among these New England red cattle is particularly conspicuous in the oxen, and breaks out, as has been observed, in the neat stock of all the States originally settled from New England, very remarkably. So is that of Ohio, among the cattle of which State it is common to see light red, and even brindled oxen, which might pass for real Leicester Longhorns. The true base of the breed is, in our idea, unquestionably Sussex, and the improvement recently effected in it has been probably brought about by a careful selection of native parents on both sides, according to individual qualities and judicious breeding, back to the best imported Devons, to which they owe their color, lightness of form, docility, freedom from offal when slaughtered, and pure grain of their beef.

Mr. Nash claims for these cattle nothing less than that they are the best in the world for all purposes. He alleges that they not unusually weigh from 3,500 to 3,600 pounds, dead weight, and that he has heard of one which weighed 950 pounds per quarter, or 3,800 per carcass. This at the rate of 64 lbs. to the 100 would give the prodigious weight of above 5,900 pounds for the live weight of the animal. The largest animal ever slaughtered in England, and he a prize beast, fattened for exhibition, weighed but 3,080 pounds. He also claims that their beef is finer grained, finer marbled, and finer flavored, than any that is found abroad. In neither of these points can we agree with his conclusions. We believe that the weight, even as a maximum, much more as an average, is greatly exaggerated, and we know that English beef is imported by every steamer, finer grained, better marbled and higher flavored, and therefore commanding a higher price in eating houses than any domestic beef; all the other merits of this admirable breed of cattle we readily concede. Their remarkable union of good qualities, their singular adaptation to the climate and constitution of hill countries, the great amount of work they will do and quantity of milk and beef they will yield on scanty fare and in a rugged district, are not to be disputed, and this granted they will have enough to recommend them even though we do not admit them to be the best cattle in every possible respect and for every possible purpose in the known world."

We deem these remarks of so able a writer as Mr. Robinson, worthy of permanent record, but think it must be admitted that the Denmark cattle introduced by Capt. Mason, which were distributed throughout Maine, New Hampshire and Massachusetts, and which became mixed with the cattle that had been imported into the Plymouth and Massachusetts colonies—and which were mainly Devons—formed the cross or breed of cattle that are generally known as natives, or the "old red stock of New England."

From the time of Capt. Mason to the year 1791, nothing is definitely known in regard to the importation of cattle into Maine; although it is probable animals were occasionally brought in by shipmasters who traded with different parts of Europe and with the West Indies.

THE VAUGHAN IMPORTATIONS.

The County of Kennebec has long been known as a section of Maine famous for its superior cattle, and it is to residents of this county that belong the honor of having introduced the first imported cattle into Maine. This was done in the year 1791, by the late Mr. Charles Vaughan of Hallowell, who with his brother Benjamin Vaughan, LL.D., had some years previously migrated from England and settled in that town. This importation consisted of two bulls and two cows. The cows were selected from the London dairies; and as the Holderness or Yorkshire breed was then that from which the milking stables of the English metropolis were mainly supplied, the cows selected for Mr. Vaughan were probably of this variety. The bulls were selected from the famous Smithfield market, according to points laid down in the order given the purchaser; points which would fit the draught stock for a hilly country, and also to be well fitted for the dairy. These bulls were of the Longhorn breed, though it has been doubted by so good an authority as the late Mr. Sanford Howard—who at one time was foreman of the Vaughan farm—that they were of that particular family which Bakewell bred with so much care. On the passage to this country—the animals having landed at Kennebec river in November of that year—one of the cows dropped a bull calf, which, in August of 1792, was presented to Hon. Christopher Gore, afterwards governor of Massachusetts, and became the progenitor of the cattle which became so much talked of for years in that State as the "Gore breed." At the age of nine months this bull girthed four feet seven inches. Mr. Capen of Cambridge, Mass., had two oxen of this breed, which he called Magnus and Maximus, that weighed over 6,000 pounds when slaughtered. The progeny of the cattle imported by Mr. Vaughan were as famous for their dairy as their working qualities. In 1807 five cows of this breed, during the six months from November 1st to April 1st, furnished for sale 2,998 quarts of milk, two gallons of cream, and eighty-four pounds of butter, besides the cream and milk used in a family of eight persons. From six cows and three heifers that calved in the spring, was produced in six months, from April 1st to November 1st, 745 pounds of butter and 1,476 pounds of cheese, besides the milk, butter, cheese and cream used in the same family. These were fed on straw, turnips and meadow hay until one month of calving, then with the best of hay. Another cow produced from the 16th of August to the 2d of September, a period of eighteen days, 245 quarts of milk, producing 23 pounds of butter; and from Sept. 3d to Sept. 20th, eighteen days, 246 quarts of milk, yielding 23 pounds 1 ounce of butter. A bull calf out of this cow was sent to the island of Jamaica. The Longhorn cattle of Mr. Vaughan's importation, like their ancestors, were very long lived, and this quality was strikingly manifested in the descendants of Mr. Vaughan's bulls. Many of the cows continued to breed till eighteen years old, and the oxen were noted for their vigor, strength and hardihood. The bulls imported by Mr. Vaughan were used in a way to benefit the settlers of Maine as much as possible. It was his custom to keep one of them at Hallowell and the other at different points in the valley of the Sandy River, changing them accordingly. By this course their progeny soon became numerous, and quite widely spread. The Messrs. Vaughan continued to breed their stock, without crossing, until after the importation into Massachusetts of the Shorthorn bull "Young Denton," in 1817.

LATER IMPORTATIONS.

All writers on our agricultural history, unite in saying, that about 1814 an English vessel was captured near Portland by an American Privateer, which had some cattle on board of it, and that a bull from this lot stood in different parts of Kennebec and Cumberland counties, known as the "Prize bull." Mr. Sanford Howard, writing in 1865, says of this bull: "I have been informed by various persons who had seen him, that he was called a 'Bakewell bull,' and that his points corresponded to the Bakewell variety of Longhorns. I remember to have seen several animals that were said to have been got by him, which would pass very well for half blood Longhorns." The venerable Friend, Samuel Taylor of Fairfield, however, gives the following version of this transaction. Under date of 11th mo. 1872, he writes:

"The Peter Waldo stock was so named from the fact that they were brought to this country in a vessel named 'Peter Waldo,' a British vessel bound to St. Johns, New Brunswick, during the war of 1812.* The vessel had on board a Methodist minister and his family, and they brought with them a bull and cow. This vessel was captured by an American cruiser and brought into Portland, Maine, the stock and other things sold. The bull and cow went either to Westbrook or Falmouth, and there remained until after the close of the war, when the good minister sent to Portland and purchased them back again. I have a very distinct recollection of some of the progeny as early as 1817, when some of them found their way to the towns of Sidney, Fairfield, and what was then Bloomfield. They were heavy in the fore and hind quarters, rather long on the back, a little saddled, and slow in their movements. Their name was Holderness. We never had on the Kennebec any but grades or half breeds. Some of them grew to be very large and heavy. Some of the grade heifers two years old would

*"Brig Peter Waldo, from Newcastle, England, for Halifax, with a full cargo of British manufactures, clearing for the captors $100,000, sent into Portland in August 1812, by the Teaser of New York."—*Coggeshall's American Privateers and Letters-of-Marque, page* 47.

dress 700 pounds or more. The greatest objection to the grades was, that many of the calves have monstrous hips and shoulders. The cows were fair milkers, and when well fattened would weigh from eight to thirteen cwt."

EARLY VIEWS OF PEDIGREE AND HERD BOOKS.

In the second volume of the MAINE FARMER, (1834), the editor, Dr. E. HOLMES, published some sketches of the celebrated bulls and cows of the Durham breed which had been or were at that time kept in Kennebec county; and from these articles, from his report as Secretary of the Maine State Agricultural Society, in 1855, and from private letters, a list of the noted animals of Kennebec county has been compiled—it being borne in mind that this county has been from the time of the Messrs. Vaughan the leading section of Maine in the matter of improving its neat cattle, and in their dissemination into other parts of the State and of New England. The list embraces the names of many animals famous in our early agricultural history; and we preface it with the following remarks of the late Dr. HOLMES, on herd-books and the value of pedigree, copied from the MAINE FARMER of February 21, 1834, in order to show what at that time was the opinion of this leading writer and advanced thinker upon this subject:

"The Herd Book is a book containing the pedigree of the different Improved Durham Shorthorns in England. It now makes two large octavo volumes—and none are admitted but those whose pedigree on the father's and mother's side can be traced back to some of the best bulls of the race, especially to Hubback. Now we do not attach quite so much importance to the Herd Book as some of our Western brethren do. We are willing to allow that an animal bred from a long line of ancestry will have certain points so firmly fixed as to become a distinct variety or breed; but every animal that is recorded in the Herd Book is by no means a good animal. We speak with all due deference to wiser heads—but still facts must be believed in preference to mere opinion. And it is a fact, we verily believe, that some miserable animals have been immortalized on the same pages with your Comebs and Hubbacks, Foljambes and Favorites. We are ourselves decidedly of the opinion that the best breeds of cattle that we have is the half blood Durhams; although there is occasionally some miserable beings among these. Now to insure a good breed of half bloods, we must have two things, viz: a good many first rate native cows, and a few first rate full-blooded improved Durham bulls. These should be put together judiciously, not at random; for even the best breed on earth is in danger of degenerating, and has often degenerated under the most skilful hands. It has been whispered, though we to be sure, at this distance both of time and place cannot vouch for its truth—but it has, nevertheless, been whispered, that the celebrated English breeder of Improved Durhams, Collings, whose famous race of Herd-Book cattle sold for such great prices, found it necessary to mix in a little common blood slyly, to preserve the form and vigor of his herd."

LIST OF EARLY BLOODED STOCK IN MAINE.—BULLS.

DENTON * was the first thoroughbred Durham or Shorthorn ever brought into the State. His color was white, neck and shoulders of a dark chesnut color, with patches of the same on other parts of his body. He was brought to Gardiner in November, 1827, having been presented to Dr. E. Holmes, by Stephen Williams, Esq., of Northboro', Mass., by whom he was imported in 1817. While he stood for service in Massachusetts, he had, from October, 1818 to November, 1824, 284 cows, which came from a stretch of country extending from Philadelphia to this State. In August, 1821, he measured as follows: neck back of horns, 4 feet 4 inches: girth over the brisket, 8 feet 9½ inches: girth back of fore legs, 7 feet 10¾ inches: length from rump to insertion of horns 8 feet 9½ inches. He weighed in December, 1822, 2,700 pounds. Dr. Holmes says: "His stock was highly prized, and readily bought up by the farmers of the adjoining States; $200 for a half blood bull calf being considered cheap." In 1828, Denton stood in Gardiner; in 1829 in Starks, Somerset county, where he died of old age, April, 1830.

YOUNG CŒLEBS. Bred by Col. Samuel Jaques of Charlestown, Mass.; got by Cœlebs, imported by Col. Jaques; dam, an imported Durham cow owned by William Gray, Esq. Brought to Hallowell in 1825 by Gen. Jesse Robinson, and by him sold to

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*The following is the pedigree of Young Denton, as given in the second volume of the English Herd-Book (Coates'):—

(693) YOUNG DENTON. Roan, calved 1816, bred by Mr. Wetherell, Kirby Malery; sold to Samuel Williams, merchant of London: owned by Stephen Williams, Northboro', Mass., U.S.A.; got by Denton (198), d. Cora, by Baronet (60), by Cripple (161), by Irishman (329), by Hubback (319).

Mr. John Kezar of Winthrop, and commonly known as the "Kezar bull." His color was white, with patches of dark color intermixed. Dr. Holmes says of him: "He was a large, vigorous animal, with excellent quarters. He had a hollowness or sinking down behind his shoulders, which injured his appearance, but his stock, or but few of them, had this defect. Some of our best oxen descended from this bull, and some of our handsomest cows were sired by him, and in general they are good milkers."

HERCULES. Bred by Samuel Lee, Esq., of Massachusetts. Brought to Pittston in 1826 by Gen. Henry Dearborn, where he stood for several years. Afterwards he stood in Winthrop. Got by Cœlebs, dam an imported cow owned by Mr. Lee. Color white, intermixed with occasional spots of dark color. "A large, robust animal, with good quarters, well ribbed, with a good loin and shoulders, but sinking a little behind them. The getter of some good stock, both for the yoke and dairy."

JUPITER. Bred by Col. Samuel Jaques of Charlestown, Mass. Got by Cœlebs, dam Flora. Brought to Hallowell in 1826 by the late Mr. John Davis. He was kept in Readfield, Winthrop and Wayne; and also in Starks, Somerset county. "A valuable, but in his lifetime a despised animal. He had good quarters, and in general was well made, but not so straight in the back as that breed generally is. He left some first rate cattle behind him. The oxen got by him are handsome, strong and active, and some of the cows excellent milkers. But he was despised by most of our farmers on account of his color (pure white), and little patronized. He accidentally broke his neck in the fall of 1830, and his loss, like that of the Kezar bull, is now (1834) much regretted."

ARGWASUC. Bred by J. Davis, Esq. Sire, Jupiter; dam Europa. He was purchased and carried out of the county by Mr. Rangely, of No. 3, on Lake Argwasuc; and we have ventured to call the bull by that name till we shall know more about him.—*Dr. E. Holmes, in Maine Farmer, March 7th,* 1834.

DARLINGTON. Bred by E. Holmes. Color roan; got by Jupiter, dam Europa. Calved April, 1829. Kept in Readfield.

MAINE DENTON. Bred by Robert Conforth of Readfield. Got by Imported Denton; dam Durham Beauty, by Jupiter; grand dam Europa by Cœlebs, great grand dam Flora, imported by Col. Samuel Jaques of Massachusetts. Calved April, 1830; color, red and white. Owned by Thomas Pierce of Readfield.

HANSON. Bred by E. Cushing, Esq., of Hanson, Mass. Got by Pilgrim. Brought into Kennebec county by E. Holmes, in 1830.

BANQUO. Imported from England by John Hare Powell of Virginia, and introduced into Winslow in 1828 by R. H. Greene, Esq. Color, red with some white spots. He stood in Winslow three years, in Winthrop one, and in Augusta one. In a letter from Mr. Greene, under date of April 17th, 1873, he says: "Although my price for the service of Banquo was only one dollar, but very few persons took advantage of this opportunity of improving their stock."

TURK. By Jupiter, out of a thoroughbred cow. Owned by Robert Conforth of Readfield, in 1830. He was afterwards kept in Vienna, and in Anson, where he stood eight or nine years.*

SIR ISAAC, (Hereford). Bred by Hon. John Wells of Boston. Got by the imported bull, Sir Isaac. Brought into Hallowell by Sanford Howard in 1830. Calved in 1827.

NORFOLK, (Hereford). Bred by Hon. John Wells of Boston. Got by the imported bull, Admiral; dam by Sir Isaac; grand dam by Holderness. Introduced into Hallowell in November, 1832, by Sanford Howard. Color brindle.

WALDO. Bred by Mr. Young of Jackson. Got by the imported Durham Shorthorn bull Lyman Durham. Calved March, 1833. Brought to Winthrop in 1834 by Elijah Wood, Esq. Color, red.

TASSO. Calved in 1829. Got by a bull bred by John Hare Powell of Virginia; dam, imported cow Judy; color, white. Brought to Winslow by R. H. Greene, Esq.

BONNIVET. Got by Banquo; dam, imported cow Sally Richards; color, red with some white spots; calved 1833. Owned by R. H. Greene, Esq., Winslow.

URANUS. Got by Maine Denton; dam by Darlington, calved August, 1833. Owned by Thomas Pierce, Readfield. "Dam, a first rate cow of native breed."

GOLD-FINDER. Got by Maine Denton; dam, Flora by Jupiter; grand dam by the King bull. Calved December, 1833. Owned

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*In speaking of the descendants of this bull, D. H. Thing, Esq., of Mt. Vernon, says, in Agriculture of Maine for 1870, page 14: "His descendants are now to be seen and readily recognized in that part of Somerset county where he stood so long. Some fifteen years since, in passing through that vicinity, I was struck with the familiar appearance of their stock; especially on one farm where there were kept about fifty head. On inquiry, I learned they were descended from the above named animal."

by Thomas Pierce, Readfield. "Flora was a cow of great milking qualities, and in form equal to any other cow."

YOUNG FITZ FAVORITE. Imported by Robert B. Minturn, Esq., of New York, June, 1830, from the stock of Mr. Ashcroft, one of the leading cattle breeders in the west of England. Got by Fitz Favorite; his dam, Ellen, by George, he by Favorite, 2d, by Favorite the sire of Comet, Favorite by Bolingbroke, dam by Foljambe. Brought to Winslow in 1834 by R. H. Greene, Esq., and exchanged by him in 1837 with Charles Henry Hall, Esq., of New York, for a bull bred by him and called

YOUNG COMET, after the celebrated bull Wye Comet. He was kept by Mr. Greene, at Winslow, two years, and sold to Colonel Samuel Butman of Plymouth.

In addition to the above, mention should also be made of the following thoroughbred bulls introduced into Maine, and about which definite information as to pedigree is wanting: ALBANY, (Hereford) purchased of Messrs. Lotham & Corning, in 1844, and brought to Hallowell by J. W. Haines; the "King bull," sent by Gov. King of Bath to Kingfield in Franklin county; "Fillebrown's brindle bull," kept at Readfield, and a bull kept at Pittston by Gen. Jesse Robinson, who afterwards removed to Waterville; the latter a very fine animal, with good points.

The bull Spotted Leopard, which was brought to Fayette about 1842, by J. H. Underwood, and which was also kept in Fairfield by Capt. Henry Lawrence and in Skowhegan by A. Crawford, was said to have been got by a thoroughbred bull imported from New York into Hallowell by J. W. Haines. D. H. Thing, Esq., of Mt. Vernon, in a private letter, says he was "a full blood Durham, red and white, rather spotted than mixed, tall, long, very stylish, and altogether one of the most splendid looking animals I ever looked upon. He was a getter of superior stock, particularly oxen."

Cows.

DAISY. Bred by Col. Jaques of Charlestown, Mass.; imported into this State by the late John Davis of Hallowell. Got by Cœlebs, dam, imported cow Flora. Color mostly white.

EUROPA. Bred and introduced by the same; got by Cœlebs, dam, Flora; color red.

EASTERN CHERRY. Red; bred by E. Cushing, Esq., of Hanson, Mass. Got by Pilgrim; dam, an imported Shorthorn cow. Introduced into Maine by the late Dr. E. Holmes, and owned by A. Tinkham of Anson.

JUDY. Imported by Henry De Groot, Esq., of New York. Introduced by R. H. Greene, Esq., of Winslow.

PEGGY. Got by Banquo; dam, Sylvia. Color red and white. Bred by Mr. De Groot, and introduced by Mr. Greene.

SALLY RICHARDS. Imported by Mr. De Groot, and brought to Maine by Mr. Greene.

CHESTNUT BEAUTY. Brought to Maine in 1830, by Sanford Howard, Hallowell. Sold to Sumner Bixey of Norridgewock.

DAFFY. Brought to this State in 1833 by Sanford Howard of Hallowell. Was the mother of the bull Young Sir Isaac.

It is an important fact, that the bulls Denton, Young Cœlebs, Fitz Favorite, Banquo, Comet, Foljambe and Wye Comet, mentioned in the preceding list, are all found recorded in the early volumes of the English Shorthorn Herd Book—Coates'—the first of which was published in 1822, the second in 1829, and the third in 1836:—thus establishing beyond a doubt the purity of the blood of these early bulls, the progeny of which formed the basis of the farm stock of the county of Kennebec, from which they were widely disseminated throughout the State. In a few instances, where known, some individuals of the Hereford breed have been indicated. The above list is believed to be a more complete register of the early blooded cattle of Maine, than any ever before published.

EFFORTS OF EARLY BREEDERS IN DIFFERENT PARTS OF THE STATE.

It is very interesting to trace the spread of these early animals from the county of Kennebec, which was from 1792 to 1835 the centre of enlightened farming and intelligent stock raising in Maine. The gentlemen who were interested in improved farming and cattle breeding at that time, were among the leading citizens and business men of the day in this portion of the State; and they were often brought into contact with the leading business men in other parts of Maine. Through this means the highly prized bulls which had been imported and were owned by residents of this country, were sent into other portions of the State to improve the cattle there. Generally these animals were not sold, but were leased or hired out by their owners for a term of one or two years.

Occasionally animals were purchased by prominent business men in other counties; who, while being interested in farming, were also generally more largely engaged in trade or lumbering. So we find that at an early period choice blooded bulls were kept in Waldo, Somerset and Franklin counties, and from these points they wrought improvement in the cattle of the contiguous territory. In Somerset county we find the bull Young Denton as early as 1830, upon the farm of the late Dr. E. Holmes in the town of Starks. Arial Tinkham and Luke Houghton of Anson were also early interested in the improvement of stock in Somerset county, having purchased several animals of the produce of the bulls Denton, Jupiter, Hanson and Darlington, and the cows Sophia, Eastern Cherry and others of the pure blood Durhams introduced by residents of Kennebec county. We are informed by Hon. Asa W. Moore of Anson, that at the time of the death of Mr. Tinkham he left some twenty head of choice animals bred from the above stock. He also writes: "The grades from this stock have been widely dispersed throughout western Somerset, and even beyond the limits of the county. The benefit derived from the introduction of this stock cannot be easily estimated, but it is safe to say that the farmers of this section have realized thousands upon thousands of dollars therefrom." His son, Col. S. W. Tinkham, and the Messrs. Hilton of Anson, continued to breed from this stock for years, and they are known to have had some of the finest stock, especially of large oxen, in Somerset county. The southern and central portion of this county was also one of the first sections out of Kennebec to receive an impetus in its breeding operations, through intercouse with the leading farmers and breeders in the county last mentioned. Col. Reuben H. Greene of Winslow was among the foremost to engage in the breeding of thoroughbred stock in Maine, and many of his animals were sent into Somerset county. On preceding pages mention has been made of some of the animals introduced by this gentleman, who was actively engaged in breeding from 1829 to 1855, and who is still living in the enjoyment of a hale old age. In a letter under date of April 17, 1873, Col. Greene gives an interesting account of his breeding transactions, in which he says: "My first thoroughbred calves at six and eight weeks old sold at $50, which at that time was considered a great price, although in New York they were selling for $300. My first sale was of Banquo stock—one bull and five one-year-old heifers to Abel Shorey of St. Johnsbury, Vt., for the sum of $300. As they passed through Augusta, they were noticed by many and much admired, and could have been sold at an advance of $15 each. The remark was then made, 'It is a shame to have such animals taken from the State.' I sold a bull calf by Fitz Favorite, to the Messrs. Burrell of Newport, and when three years old they sold him to go to Ohio. He was a splended animal, and was shown at a cattle show in Massachusetts while being driven to Ohio, and received a premium of $20." Col. Greene has furnished a list of his early stock sales—not by any means complete—from which it appears that aside from the above named animals sold by him, he sent a bull and cow to Springfield, Mass., a bull to Cincinnati, Ohio, and other animals to the following towns in Maine, viz: two to Augusta, nine to Waterville, two to Hallowell, five to Lewiston, five to Thorndike, three to Newport, twelve to Vassalboro', three to Bloomfield, two to Carmel, two to Portland, two to Albion, two to Bridgton, and one each to Scarboro', Saco, Fairfield, Canaan, Pittsfield, Clinton, Norridgewock, Dresden and Anson. A large number of these were thoroughbred animals, and the list shows how extensively they were disseminated throughout the State. Mention has been made here of the efforts of Col. Greene, as he resided so near the limits of Somerset county as to be more identified with its farming and its business than with his own county of Kennebec. Capt. Henry Lawrence of Fairfield, who was born in 1791, was one of the first in the southern-central portion of Somerset county to engage in the improvement of the breeds of cattle. According to the recollection of Friend Samuel Taylor of Fairfield, Capt. Lawrence and his brother had early given great attention to breeding, and he says in a private letter: "They were famed for their excellent stock as early as 1800. Nothing but a red calf had any chance of life with them." These efforts at improvement, prior to 1800, were made with the kinds of cattle then kept, through careful selection, and Friend Taylor observes that previous to 1800 many of the farmers in portions of Somerset county had by this means greatly improved their farm stock. He says: "They were generally red in color, with long, slim horns, straight backs, and were a very great improvement to the native breeds then in the country."

Some of the best farmers in Kennebec and Somerset counties had succeeded in raising up some most splendid cattle; red or brindled, and nearly as valuable as the thoroughbreds. But in

1823 Capt. Lawrence attended a cattle show at Augusta, and there purchased a bull which was called the "Bakewell breed," and was probably a descendant of the animals introduced by the Vaughans from England. Mr. Hall C. Burleigh of Fairfield, in writing his recollections of the early stock breeding operations in Somerset county, says: "This bull brought from Kennebec county by Capt. Lawrence was of a chestnut color, and was probably the first 'blooded' bull ever brought into this county. Capt. Lawrence kept him a number of years, and he left a beautiful lot of young cattle—in fact his calves might be said to have been the foundation stock of this section. But he was a very cross and vicious animal." Preceding next in order of time, Mr. Burleigh says: "The next blooded bull of which I can get any account was being driven to some town farther up the river and stopped over night at Mr. Samuel Burgess'. Mr. B., having a cow in heat, got a heifer calf by this bull—which was called the 'Holderness' blood. Capt. Lawrence bought this heifer calf and stinted her to his bull, and he succeeded in raising a bull from her which he saved for a future sire. About 1832 Capt. L. bought another blooded bull at a cattle show at Readfield, which was called 'Brighton.' In 1839 he hired the bull Banquo of Col. Greene of Winslow, and subsequently purchased the famous Butman bull from Dixmont (a monster for those days, said to weigh 2500 lbs.). This bull left the largest boned, and coarsest stock of any bull ever in this section. But to remedy this, Capt. Lawrence and Allen Jones, in 1843, purchased the bull Leopard, of Daniel Lancaster of Gardiner. He was a beautiful animal, spotted, and made a splendid cross with the large, coarse cows left by the Butman bull. It was the results of this cross that made this section of Somerset county so celebrated for its large and excellent oxen." Capt. Lawrence certainly deserves to be remembered as the pioneer in the improvement of neat stock in this portion of Somerset county. He was a good farmer, and also largely interested in lumbering. He died in 1857. The late John Otis, also of Fairfield, was famous as a breeder of large cattle in early years. Of his transactions Mr. Burleigh writes: "He kept a large herd—as many as fourteen breeding cows at a time. I heard him say, when he was over fifty years of age, that he never killed a calf in his life. He kept a team of large oxen all the time. But I think Mr. Otis failed in judgment in selecting heifers to breed from. He thought large boned animals the best—and I might say, indispensable as breeders—and the result was what might be reasonably expected, viz: a very large, coarse herd of cattle, very unlike Capt. Lawrence's herd, although they often used the same bulls. To the credit of Mr. Otis, here let me say, he always patronized the best bulls within his reach, (and he would reach a good ways to get a good bull), and paid generously for their services."

In the list of early blooded bulls, previously mentioned, is the bull which Dr. Holmes ventured to call Argwasuc, got by Jupiter, by Cœlebs, out of Europa, bred by Col. Jaques, which was taken by Mr. James Rangely to Franklin county. Mr. Rangely was an Englishman and moved to the township (of which he was owner) now called by his name, about 1824. He built roads and dwellings, constructed a dam at the outlet of Rangely Lake, and built a saw and grist mill, both of which were of great value to the settlers in that section. In 1828 he opened a road through the north part of Madrid, Township No. 2, and into the interior of Rangely—a distance of about twenty miles—then a forest the whole distance. He also carried with him to this place a small herd of cattle, "then called Durhams, or Grizzly Durhams." Concerning them (the above named bull being no doubt the head of the herd), Sewall Dill, Esq., of Phillips, writes: "They were in color mixed red and white. Their progeny became very numerous among our farmers; the cows were excellent milkers, the oxen good workers. I remember distinctly about them, as I was engaged in buying and driving cattle to Brighton, from 1835 to 1850. I sold one of these grade cows to Mr. J. H. Bigelow of Livermore, and she proved so well that he continued to purchase of me till he had obtained eight or ten heifers from this blood. They proved so good that his whole dairy was at one time made up of cows from this source." Mr. Rangely's business transactions were continued here for many years, when he moved to Portland, and subsequently to the state of Virginia, where he died a few years since. The animals he carried to Franklin county from those imported into Kennebec, laid the foundation for the improved farm stock of that section of the State.

Through the efforts of Messrs. Thorndike, Sears and Prescott, proprietors of the Waldo Patent, choice blooded stock was early introduced into that section of the State. These gentlemen were wealthy land proprietors, and had a farm of one thousand acres in the town of Jackson, which they carried on as a mere pastime.

The operations upon this "great farm" were something magnificent for the time and place, and deserve more than a passing notice. The buildings were large and expensive, food for animals was cooked by steam, some twenty-five to thirty men were employed upon the farm and in the garden,—but the whole establishment was never a paying concern, and was carried on solely for the pleasure and amusement of its proprietors. My friend, Prof. Samuel Johnson, formerly of the State College, and a native of Jackson, has kindly furnished the following account of this famous farming enterprise, which, although lengthy, will be read with interest:

"Israel Thorndike, Sen., became wealthy by his commercial transactions, and in connection with Prescott and Sears, purchased of the heirs of Gen. Knox what is known as the Waldo Patent. The title to the farm in Jackson was, however, always entirely in the Thorndike family, being purchased by I. Thorndike, Sen., and I. Thorndike, Jr. from time to time, of the first settlers, who generally obtained their titles from Gen. Knox. The farm at first contained five or six hundred acres, but additions were made to it, till in 1830 it extended two miles from the centre of the town southwardly, on both sides of the road, and contained about 1,600 acres. It was first commenced, I think, by Israel Thorndike, Sen., and the house and old barn built by him in 1815 or 1816. The house is two stories in front and three stories back, with a long L containing a large kitchen and wood-house, and in the extreme eastern end a room which John Davis, Esq., a graduate of Harvard, used for a store. This was the first store in Jackson. The house contained 15 or 16 rooms, and cost $15,000. The bricks for the chimneys were made in the eastern part of Maine and shipped to Boston. They were then purchased by Thorndike and re-shipped to Belfast, then carted 15 miles over a very rough, hilly road to Jackson. At the death of Israel Thorndike, Sen., I. Thorndike, Jr., a graduate of Harvard, became sole owner. The Thorndikes were on the farm but a few months in the year, using it only for a summer residence.

"My memory of this farm extends back to 1824. At that time Timothy Thorndike, Esq., of Brooks, had charge of it. There being no lack of means, the farm continued to flourish till 1835, when Israel Thorndike, Jr., became so deeply entangled in land speculations that he failed. Since that time the farm has been changing owners, and retrograding. It was evidently the intention of the Thorndikes, regardless of expense, to make this in every respect a model farm. The methods adopted were many of them English, and there were many failures. In the garden there was a well educated English gentleman, Mr. Rhienier, an old bachelor, who with his exquisite neatness and profusion of flowers was the centre of attraction for all visitors. The orchard contained about 15 acres of the choicest fruit. In the flock of sheep, numbering at one time fifteen or sixteen hundred, were to be found imported rams from Saxony, costing two or three hundred dollars each. When these sheep were troubled with foot rot, a Polish gentleman was employed to care for and doctor them. Believing that turnips might be as profitable a crop here as in England, a skilled Englishman was hired one summer who raised a very large crop. In the hog-house were about fifty swine, of different breeds, from the extremely fine-boned, delicate Chinese, up to the ponderous Berkshire and Chester. Here, too, were the best appliances known for cooking and steaming food for the swine. In the stable was the imported horse, 'The Pheasant'; and although he was fine looking and thorough bred, his progeny was a disappointment to the community. Here were imported Jacks, and quite a number of Mules raised by the farmers around there and sold to Thorndike when four months old. In the large poultry yard were a great variety of fowls, including domesticated wild geese, peacocks, and guinea hens. To make the whole establishment seem more foreign,—more like England,—it so happened that Mr. Timothy Thorndike was fond of fox hunting, and had a few well trained hounds. These, in the fall of the year, after the leaves fell, he would put with Mr. Pilley's of Brooks, and then the woods for miles around would for a few weeks echo and re-echo with their lengthened yelp.

"This expensive establishment served to gratify the taste of its owner, and was indirectly a benefit to the farmers around it. They could with little expense improve their breeds of cattle, and could witness the expensive experiments going on at the farm unharmed. But it is much to be regretted that with all this profusion of means so little was accomplished; that there was so little weighing and measuring; no record of facts kept. Perhaps such another opportunity for exact experiment may not occur again in this State during this century. For twenty years money was lavished upon this farm, and the result seemed to be of little permanent value. Go into the piggery and ask Mr. Gilman how much pork a bushel of potatoes or a bushel of corn would make, or the relative value of the several breeds of swine, or how much more nutritious cooked food is than uncooked, for swine, and he would know little about it. And so it was all through the various departments. They could only give opinions, guesses—not figures, facts. Thus this great outlay continued, almost through one generation—was mainly lost because there was not connected with the estate one enquirer after truth who could make a record of what he learned.

"Timothy Thorndike, Esq., was a man of excellent judgment and good sense. Many years after he left the farm he said, while conversing with him about stock, that large breeds of cattle required so large an amount of nutritious food to keep them up that he doubted if they were any more profitable than smaller breeds, or so well adapted to the general wants of this State.

"Israel Thorndike, Jr., would come from Boston annually, with his family, his rich coach and his beautiful span of dappled bays, and receive in the halls of his noble mansion many distinguished guests. Daniel Webster spent a short time there one summer, and angled in the farm brook. But now, how changed! The beautiful garden, the piggery and the poultry yard, all gone! The orchard but a remnant. The buildings in a most dilapidated state. The old lead aqueduct, that brought spring water a half a mile to the buildings, taken out and sold. The large lightning rods attached to the barn and house, and put up in accordance with Franklin's most approved plan, torn down and sold for old iron. It seems like some great banquet hall deserted."

The first bull introduced by them was got by the imported bull Denton. He was a red-grizzle in color, and according to the statement of Mr. Henry Butman, of Gardiner, "was confessedly the finest bull ever introduced into eastern Maine." The next was a bull known as "Sore-chops," a pure blood Shorthorn, imported by Theodore Lyman, of Boston, from the herd of the celebrated English breeder, Mr. Witherell, of Kirkly, Leicestershire. This was imported about the year 1832. He was mostly red, and his stock was celebrated for oxen rather than for cows—though the latter were not complained of. At that time, however, when butter and cheese sold slowly, and large, well matched oxen were in great demand for the woods, the milking qualities of cows were not much regarded. The oxen were majestic and stately, and would sell for from one-fourth to one-third more in price than other oxen of the same girth, on account of their beauty. But somehow his stock was not at first duly appreciated by the farmers in that section, and after a few years' service he was sold, and stood in towns in Penobscot county. He was gone some two years, and meanwhile his stock had proved so good that he was afterwards bought back by Timothy Thorndike, Esq., agent of the proprietors, and died upon the farm. His stock became disseminated all over Waldo and Penobscot counties, and formed the basis of the best cattle in those districts. This bull had a scrofulous, never-healing sore on his under jaw, and always went by the name of "Sore-chops." Another bull placed upon this large farm, was a full blood Hereford, obtained from the Vaughan farm in Hallowell about 1835. The oxen from this bull were stout and lusty, and the cows large and fair. He was afterwards sold to Dea. Joseph Rich of Jackson. Mr. Samuel Johnson, writing concerning this stock in 1872, said: "The stock of this bull was very celebrated in all that region, almost as much so as that of 'Sore-chops;' and so strongly marked was it, that even now his white-faced descendants may possibly be found in some of the herds in that vicinity. The grade Herefords made very fine looking, salable oxen, and were excellent for beef." In addition to these animals, the proprietors of the "Great Farm" made a direct importation of some Dutch or Holstein cattle, consisting of a bull and two or three cows: one of the cows dropping a bull calf either on her passage or soon after landing at Boston. These cows were noted as milkers, though the milk was not rich in quality: but the amount given was so great that the breed went by the name of "Fill-pail," in all that section. As the value of this breed was not then known, the bull was kept but a few years, when he was castrated. "But even in the few years he was kept," writes Mr. Johnson, "he made his mark—starting a race of black, and black and white cattle, that had quite an influence upon the herds in that vicinity for many years. This Holstein stag, named 'Goldin,' was long, bony and muscular, and on being put to work his strength was Sampson-like, almost miraculous. There was such a singular mixture of black and white in his color, that he was called blue. The grade Shorthorn that worked with him girted over seven feet, yet his office seemed rather to be that of an attendant to carry the long end of the yoke. For years it was 'Gen.' Witham's business to feed and drive this yoke of cattle, and he was as proud as a prince of his position. At the barn haulings, the first call was always on Gen. Witham for the farm team, the old blue stag and his mate being put next to the building. Then we boys would gather round, entirely confident that when Gen. Witham swung his white oak goad, saying, 'haw Goldin here,' and the stag bending forward to the bow began to strain his powerful muscles, the building would tremble and move. Boyish fancy probably clothed Goldin with powers that did not belong to him, but I fully believe that he was the most powerful ox we ever had in that region. Though some of the cows from this strain of Dutch blood were very good, so good that it was a disputed point which was best, these or the Shorthorns, yet it was chiefly valuable for oxen. I can myself recollect two yokes very remarkable for strength. One of these logged at Lake Baskahegan in 1834, and were called by those who knew them, the strongest yoke of oxen on the Penobscot." In 1834 Israel Thorndike, Esq., also introduced a full blood Devon bull, which was procured from the celebrated Patterson herd of Baltimore, Md.

Among those gentlemen early identified with the improvement of stock in the eastern section of Maine, was Henry Butman, Esq., who was born in Worcester, Mass., in 1793, and who came to Dixmont in 1822. He took up a farm of 300 acres, and resided on it from this period to 1869, being also largely engaged in lumbering and mercantile pursuits. He procured, about 1828, a bull got by the celebrated "Sore-chops," to which reference has just been made—and soon afterwards one sired by the bull Hercules, (see page 250), which weighed at four years old 2,500 pounds. He was called Young Hercules; was a deep or mahogany red, and after keeping him some five years, he was sold to Capt. Henry Lawrence of Fairfield. The cows of his get were good milkers, and the oxen large and lofty. Next Mr. Butman obtained a full blood Durham bull of Messrs. N. & L. Burrell of Newport, who obtained their stock of Col. Greene of Winslow, and who paid great attention to breeding choice cattle. This bull was not purchased, but was kept a few years, and then returned to them. He was got by Fairfax, out of an imported Durham cow. Mr. Butman subsequently purchased of William Cooper of Montville, a full blood Durham bull, color red and white, called Prince Albert, imported in a ship owned by William Bradstreet of Gardiner. He was a stout, stocky bull, the cows of his get being fair milkers, and the oxen strong and hardy. This bull was afterwards sold to Mr. Samuel Butman of Plymouth, who was quite a breeder of good cattle. Henry Butman, Esq., after having pursued a long and successful business career is now residing in the city of Gardiner.

Before leaving this period of our history, it should be mentioned, that as early as 1816, Mr. Thomas Payne of Standish, Mass., moved into Unity, in Waldo county, bringing with him a bull and cow, purporting to be direct offspring of stock imported in the "Peter Waldo," before referred to. They left some good descendants, which, in the hands of the late Thomas Fowler, of Unity, and Jonah Crosby of Albion, made a marked improvement on the cattle of that section. In 1843 Capt. Phineas Pendleton of Searsport imported from England a Hereford bull and cow, the progeny of which were somewhat extensively disseminated throughout Waldo and Kennebec counties. So early as 1830, the late Dr. Ithemar Bellows of Unity, introduced into that town a Shorthorn bull, presented to him by a friend in Massachusetts, and some of the best cows now found on the farms in that part of Waldo county may be clearly traced back to this bull. The late Mr. Jesse Wadsworth of Livermore, early engaged in the breeding of Shorthorns, ranking among the most intelligent of our early breeders. His son, Elijah Wadsworth, is still engaged in the business, and has kept up the herd founded by his father, by adding new strains of blood from time to time.

In 1838 a thoroughbred Durham or Shorthorn bull was introduced into Houlton, from a herd of seven animals of this blood which had been imported into New Brunswick, and was taken across the lines by Mr. Zebulon Ingersol, who was the principal owner of the bull. Mr. Francis Barnes of Houlton, of which this information is obtained, writes: "This bull has passed into history as the Ingersol bull. He developed into a large, well proportioned Durham, and his stock became noted for size and working qualities. The cross with him and the native cows produced some most excellent milkers. There are cows now in this town which have descended from this bull, and without exception they are good milkers. His stock, though much mixed up now, have lately been crossed with the Jerseys, and the heifers seem to promise superior to all else we have had." Mr. J. W. Haines also carried a thoroughbred Durham and a thoroughbred Hereford bull to Aroostook county about 1843. The latter was highly esteemed, and his stock remains trustworthy to this day. The offspring of the Durham had not the qualities which belonged to those of the Ingersoll bull, and his stock as a distinctive family have been lost sight of.

About 1843, John A. Harris introduced a thoroughbred Durham into the southern part of Penobscot county, from Massachusetts, who left good stock. A few years earlier one had been introduced into the town of Windsor, by J. B. Swanton. In Cumberland county, the farmers, with a few recent exceptions, have paid but little attention to the improvement of the breeds of cattle. Quite early, the late Dr. Southgate of Scarboro', bred the Ayrshires; and the brothers Warren, of Gorham, have for many years been famous for their large and fine oxen, but I can give no particulars as to the source of their blood.

LINE OF BREEDING—COLOR—LATER EFFORTS.

The above notes bring down our narrative to about the year 1843 to 1845—there being a degree of uncertainty as to some of the dates given. Within the period embraced above, it will have been observed that the efforts of breeders were constantly put forth in the direction of producing large oxen, of a uniform color. Little attention was paid to breeding for the dairy, although a few instances occur where superior milch cows were produced and continued to be bred for years in spite of any real designs to this end. The conditions of the country were such that heavy oxen were needed for farm work and draft purposes, and the breeders of the period had a pride in producing cattle of this class. Considerable prejudice also existed in regard to color, and some of the best bred bulls were not used simply because their color was objectionable. Some of the best bulls early introduced, were nearly or all white, and were not patronized by the farmers simply on this account. Red was the favorite color, and many farmers made a practice of killing all calves that were not thus marked, and by this course a race of red cattle became the common stock throughout many portions of the State. For ten years succeeding the period last named, but few new efforts appear to have been made to introduce fresh blood from abroad into the State—the cattle bred being descended from those brought in and bred in the different sections of which an outline has been given. From this time (about 1850 to 1855) down to the present day, great activity has been manifested by our breeders, and in order to give a succinct and condensed view of these transactions, the facts are given in order under the breed of cattle introduced.

HEREFORDS.

The late Mr. J. H. Underwood of Fayette, to whom the farmers of Kennebec county are so largely indebted for his efforts at improving the cattle of his section of the State, was one of the first to engage in the breeding of this class of stock. In 1852, Mr. Underwood purchased of Capt. Pendleton of Searsport, a bull and cow from his imported stock, from which he bred for a few years, and then purchased in 1859 the bull Cronkhill, 2d, of the Messrs. Clarke of Granby, Mass. In 1865 he introduced into his herd the bull Wellington Hero, purchased of the celebrated breeder, Frederick William Stone of Guelph, Ontario. Since the death of Mr. Underwood, Sr., his sons, G. & G. Underwood, have kept up the herd which their father founded, adding new blood as necessary to maintain its character. The bulls Ontario Chief and Ontario Boy, together with several cows from Mr. Stone's herd, have been purchased by them, from which they are now breeding. Of the Herefords these gentlemen write: "We esteem the Herefords above all others, for various reasons. They are vigorous and hardy, and will withstand the extremes of heat and cold better than any others. They are active and powerful in the yoke, and will endure more labor than any other breed we have ever used as working oxen. They are the very best feeders, and consequently accumulate flesh and fat very rapidly. We have made but one test to learn the amount of growth of a calf in a given time. This calf was dropped the 26th of February. He was allowed the milk of his dam and some provinder, and what hay he would eat, until he was turned to pasture, 26th of May. His dam was turned out with him, and I think neither of them were taken out of the pasture until the 26th of September. And neither of them had provinder of any kind whatever while at pasture. At the latter date he was weighed, and it was found that his average daily gain was a little better than 2⅔ lbs. from the time he was dropped. We are satisfied that this is not an exceptional case of the rapid growth of Hereford calves, although this is the only test of the kind we have made in our herd."

In 1869, Messrs. H. C. Burleigh of Fairfield and Geo. E. Shores of Waterville, purchased the entire herd of Herefords belonging to Hon. M. H. Cochrane of Compton, P. Q., then and for a long time previous regarded as the most famous herd of Herefords on the Continent. The herd consisted of eleven animals, including the bull Compton Ladd, together with four cows and six heifers. These gentlemen continued to own and breed the animals in common for two or three years, when the herd was divided, and now forms the distinct herds under the separate management of each owner. Mr. Burleigh has practiced in-and-in-breeding in his herd to some extent, concerning which he says: "I have bred Compton Ladd to his sister Verbena 2d, six times, with the very best results. I have also bred him to Verbena 5th, and she is by him out of his sister, ten times—and have raised ten of the finest calves I ever saw. With such results, I shall continue to breed in this way as long as Compton Ladd retains his constitutional vigor. I consider one perfect bull, bred in this way, worth infinitely more than a bull with out-crosses as a stock getter. In regard to breeding, I will say: never breed from an animal of imperfect form, although he have a pedigree as long as his tail; and never breed from one who has not a pedigree, if it can possibly be avoided; both are needed to insure success, the good animal and the perfect lineage." Mr. Burleigh, before his purchase of Herefords, had been engaged in breeding other classes of thoroughbreds, but became convinced that the Herefords "were a better breed of cattle for the thin soils and rigorous climate of New England than any other," and hence his course in deciding upon them as the cattle for him to keep. Among other breeders of Herefords in Maine, are Wm. P. Blake of West Waterville, Moses B. Bailey of Strong (who has imported some animals from the Canada herd of Mr. Stone), Col. John P. Perley of Bridgton, who has also purchased animals of Mr. Stone, and D. R. & J. W. Wentworth of Skowhegan, who obtained their animals of H. C. Burleigh.

JERSEYS.

William S. Grant of Farmingdale was one of the first, if not the very first to introduce and breed the Jerseys in this State. His stock was purchased in 1852 or '53, of Samuel Henshaw of Boston, by whom it was imported from the island of Jersey. The bull Old Duke (which figures quite largely in the pedigrees of much of the early Jerseys kept in Maine) was purchased by him of Mr. Henshaw, also one or two heifers.

The Jerseys introduced into Winthrop by the late Dr. E. Holmes, were the bull Butter Boy and cow Pansy 3d, both obtained of Mr. Henshaw; the latter having been imported by him, and the former from imported stock. The bull was brought into Winthrop in July, 1855, and the cow Pansy 3d in August, 1856, being then three years old. The sire of Pansy 3d was Sailor Boy, her dam Pansy. At the time these animals were introduced into Winthrop, but very little was known of the breed, and the plan of introducing them into this State was ridiculed by many as a wild and visionary one. In 1856 Pansy 3d dropped Jessie Pansy, whose sire was an imported bull belonging to Mr. Henshaw, and was the first pure blood of this breed dropped in Winthrop. When ten years old she was sold for $175, and went to Albany, N. Y. Pansy 3d dropped seven heifer calves in succession, some of which have ranked among the best cows in the State. Buttercup, calved in 1854, was one of the famous Jerseys in this part of Maine. She was imported in her dam from the island of Alderney, by Mr. Thayer of Brookline, Mass., and was purchased of him by W. S. Grant of Farmingdale, and by him sold to W. H. Chisam of Augusta. Mr. Chisam also purchased direct from Mr. Thayer the heifer Belle, in 1855, who was then seven months old. The cow Buttercup was afterwards owned by the late Dr. Holmes and by him sold to A. Robinson of Winthrop. Afterwards she was again sold to Massachusetts, at the age of 16 years. Her stock was superior, and, a good authority says: "Four quarts of her milk would make a pound of butter; and she was not dry for a number of years—making seven pounds of butter per week from the time of going to the barn up to the time of calving." Lilly, imported by George Brown of Boston, was purchased by Greenlief Smith of Winthrop, in 1863, and was one of the best butter cows ever brought into the State, having yielded 17½ lbs. of butter per week. Fanny 2d, owned for a number of years in Winthrop, made 16 lbs. of butter per week. At the age of ten years she had been dry but few times, and farrow but once, and had given from four to six quarts per day at the time of calving. Lloyd H. Snell of East Winthrop was at one time largely interested in the breeding of Jerseys, and owned the cow Victoria Pansy (now owned by C. S. Robbins of Winthrop) which was from the Henshaw stock; and also the cow Buttercup, of which mention has been made. Mr. Snell formerly had a herd of some seven or eight animals, but has recently given less attention to breeding than formerly. In and about Winthrop, the Jerseys bred from the above animals have been largely disseminated, and the cows have had a somewhat noted record as milkers. They have been sold at high figures, and even grades have brought from $100 to $150—this being considered an ordinary price. For pure bred cows sales have been made at $150 to $240 each. In 1870, Mr. A. Robinson sold these animals, which were taken to Nebraska, and others were sent to Massachusetts, Vermont, and New Hampshire. In 1872 one car load of fifteen pure bred Jerseys from this town were sent to Denver, Colorado, having been purchased by Rev. W. Scott of that place. The Jersey breeders of Winthrop have formed themselves into an Association of Breeders, and keep a MS. herd-book of all the pure blood stock of this breed raised in town.

The first Jerseys owned in Sagadahoc county were purchased in 1859, by Rev. S. F. Dike of Bath, of Mr. Grant of Farmingdale; and subsequently Mr. Dike sold animals to Hon. C. J. Gilman of Brunswick and M. E. Rice of Stetson. About the time that Mr. Dike purchased his animals of Mr. Grant, Maj. Thomas Harwood of Bath imported two cows and a bull from the island of Gurnsey, which were bred with care for some years, and disseminated somewhat throughout that section of the State. George Sampson of Bowdoinham, some years since had a herd of five or six Jerseys, obtained of stock purchased of Thomas Motley of Roxbury, Mass., and bred to the Harwood bull before spoken of; but at present the herd is not kept up. Mr. Edward K. Whitney of Harrison has a herd of Jerseys, bred from stock obtained in Winthrop. James W. North, Jr., of East Jefferson, purchased his first cow of P. H. Holmes of Augusta (a descendant of the Henshaw importation) and a bull of Dr. Boutelle of Waterville. He has also purchased other animals of Dr. Boutelle, and has a small herd which he is breeding with much care. G. J. Shaw of Detroit commenced his breeding operations with this breed of stock in 1866, by purchasing animals of M. E. Rice of Stetson and A. Robinson of Winthrop, the latter being the bull Champion, descended from the Henshaw blood. In 1871 Mr. Shaw purchased the cow Clover, (recorded in the Jersey Register of the Association of Breeders of Thoroughbred Stock, No. 270), and also other animals from other parties, with which he kept up his breeding operations until the fall of 1872, when he purchased the bull Nutshell, and two heifers, of Col. G. E. Waring of the Ogden Breeding Farm, Newport, R. I., all the animals being recorded in the Register of the American Jersey Cattle Club. The "Millbrook Herd" of Dr. N. R. Boutelle was commenced in 1865, by the purchase of animals in Winthrop which descended from the Dr. Holmes or Henshaw stock. "The animals," says Dr. Boutelle, "not meeting my expectations, and having no evidence of purity of blood, were disposed of the following season." The next purchase was of animals of doubtful blood, although reputed to be thoroughbred. Being satisfied this was not the proper course of breeding to establish a herd, Dr. Boutelle purchased a bull and two cows in 1867 of C. Wellington of Lexington, Mass. One of the cows was subsequently sold to the Insane Hospital at Augusta. In 1869 animals to increase the herd were purchased of Col. Waring of Newport, R. I., and also of F. E. Bowditch of Framingham, Mass., from stock of his own selection on the island of Jersey. Subsequently some of these animals were sold to H. H. King of Calais. Some choice animals were in 1870 obtained from the herd of Thomas Motley of Jamaica Plains, Mass.; and in 1871, Dr. Boutelle visited Canada and purchased six animals from the famous herd of S. Sheldon Stephens of Montreal. Since that time this gentleman has been studiously engaged in managing his choice herd; has been a constant exhibitor and high winner at the State and New England Fairs, and has made many sales throughout Maine and in other States. He is aiming "to breed animals of good size, combining improved shape, desirable color and first class dairy qualities." In carrying out the extensive breeding operations at the National Soldiers' Home at Togus, near Augusta, the Manager decided upon the Jerseys as one of the breeds to be kept—the foundation of the herd being animals from the herds of Benj. E. Bates, Thomas Motley, R. L. Maitland and John S. Barstow, all selected with reference more to their purity of blood and good milking qualifications than to their form and color, although the latter qualities were by no means overlooked. In recent years animals have been imported directly from Jersey by the Governor of the establishment, Gen. W. S. Tilton. The herd now comprises about twenty animals, all registered in the Register of the American Jersey Cattle Club. The head of the herd, Maharajah, now three years old, is by Rajah out of Fleur de Lis (614), and is one of the best bulls of this breed ever brought to this country. Messrs. J. & N. Dane, Jr., of Kennebunk, commenced the breeding of Jerseys in 1874, by the purchase of cows from Benj. E. Bates of Boston (from imported stock), and others out of imported animals of the Motley stock, so that in all, these gentlemen now have a choice family of some six or eight animals, from which they intend to build up a herd. The State College of Agriculture and the

Mechanic Arts, at Orono, also have some fine animals of this breed, which are kept mainly as means of illustration and training in connection with its course of practical instruction. It has in addition, good specimens of the Ayrshire and Shorthorn breeds, and will add others as opportunity offers.

DEVONS.

This breed of cattle have not been very widely disseminated in Maine, notwithstanding from the time Mr. Thorndike introduced them upon his farm in Jackson in 1834, to the present, full bloods have been kept in the State by different persons engaged in breeding. They are a "beautiful, compact breed, well adapted to most of the purposes of a grazing country," but our farmers generally have been more anxious to breed larger animals than they generally make, for workers and beef; while in recent years they have run to other breeds for special uses—as for the butter and cheese dairy. Among the earlier breeders of Devons were Mr. Butman of Dixmont, the Messrs. Percival of Waterville, Mr. Harris of Dixmont (whose animals were obtained from the herd of William Buckminister of Framingham, Mass.), and Joseph Tufts of Paris, who obtained his stock from the herd of the Messrs. Hurlburt of Connecticut. The above named gentlemen were engaged in breeding previous to 1855; but their operations were limited and they did but little comparatively in the way of disseminating pure bloods. Allen Lambard, Esq., of Augusta, was one of the first in the State to engage largely in breeding Devons, his herd having been started in 1859 by the purchase of the bull Rob Roy, with three cows of Joseph Burnett of Southboro', Mass. The following year he purchased the bull Kentucky and cow Helena 3d, of S C. Wainwright of "The Meadows," Rhineback, Duchess Co., N. Y. With these animals he commenced the breeding of Devons in a systematic and thorough manner, and has continued his operations until the present time. In the first volume of the Devon Herd Book, Mr. Lambard had recorded eight bulls and nine heifers; in the second, four bulls and six heifers, and in the third, eight bulls and six heifers. Mr. Lambard esteems the Devons as being well adapted for all purposes. The cows are good milkers; the oxen good workers, quick walkers, docile, kind, and small eaters. They are hardy and fatten easily; and Mr. Lambard says, with the Devons he can make three pounds of beef as cheaply as he can make two with the Durhams. The name of Hon. John F. Anderson of Maplewood Farm, South Windham, first appears as a breeder of Devons, in the second volume of the American Devon Herd Book, published in 1868. But he had previous to this been engaged in breeding Devons, having about 1856 obtained some animals of the Messrs. Percival of Waterville. In this volume Mr. Anderson had recorded the pedigrees of thirteen bulls, and thirty-seven cows and heifers. Many of these animals were obtained from E. H. Hyde of Stafford, Conn., and are traced back to the celebrated Patterson Devons of Maryland. From the fact that Mr. Anderson's name does not appear as a breeder of Devons in the first volume of the American Herd Book, published in 1863, five years before the issue of the second volume it would seem that he came suddenly forward as the leading Devon breeder in Maine, about the years 1865–'68. He made large sales throughout the Provinces of New Brunswick and Nova Scotia, and sold also to parties in our own State: among them to S. B. Page of Winthrop, Gen. G. G. Cushman of Bangor, Oliver Pope, Windham, Geoorge E. Hall, Dresden, Edward Davis, Burnham, Isaiah Wentworth, Poland, and other parties. He also made extensive sales to parties in other States, and is the only breeder of Devons in Maine who has had animals recorded in the English (Davy's) Devon Herd Book. Mr. Anderson has been engaged in active business, and the duties of public stations in recent years, and has allowed his breeding operations to absorb less of his time, although he still keeps up his "Maplewood Herd" at South Windham.

SHORTHORNS.

The Shorthorns, or as they were formerly called, the Durhams, have been more widely disseminated in Maine than any other breed. Animals were brought into the State by different parties, from other States, and leading breeders of this breed in our own State have sent animals into almost every section. From this fact, as well as from the fact that responses to the call for information, gave, with the exception of but few instances, only general statements—omitting such details as the year certain animals were introduced, the names of the animals, the herd from which they came—it will be impossible to supply these points. If in this division of the subject, breeders names are omitted and dates not given, it will be understood to arise from this cause.

The largest breeder of this class of cattle is Hon. Warren Percival of Cross Hill, Vassalboro'. His first purchase was made of W. S. Grant of Farmingdale in 1859, consisting of six cows bred by George Butts of Manlius, N. Y. A few years later the bull Duke of Manlius, and two heifers, were purchased of Paoli Lathrop of South Hadley, Mass. These were fine animals, from imported stock. Next, the bull Gen. Smith was bought of Mr. Lathrop, and following that a bull from the herd of Mr. Fletcher of Lee, Mass. Later, a bull and some cows were purchased from the herd of Augustus Whitman of Fitchburg, Mass. Other animals from some of the best breeders in Massachusetts have been purchased from time to time, in order to improve and keep up the purity of blood of his own herd; and sales have been made by him into all parts of the State and throughout the Provinces. His herd now comprises about sixty animals, and in the last published volume of the American Shorthorn Herd Book, (1874), he had recorded the pedigree of twenty-five animals, the result of one year's breeding. The herd of Hon. Charles Shaw of Dexter, was commenced in 1866, by the purchase of two cows of H. G. White of Framingham, Mass., the bull Duke of Grafton and two cows of F. M. Wood of Grafton, Mass., and one cow of Warren Percival. In 1868 he purchased other animals of Geo. T. Plunkett of Hinsdale, Mass., and in 1869, at the auction sale of the herd of H. G. White of Framingham, Mass., he purchased (in connection with Levi A. Dow of Waterville) some five or six choice cows and heifers. He has now a herd of fifteen animals. Levi A. Dow of Waterville, obtained a bull of T. S. Lang of Vassalboro'—from the stock of Paoli Lathrop—and subsequently animals were purchased of W. Percival, H. G. White, Framingham, Mass., and other breeders. He has bred quite extensively in former years, but is not now so largely engaged in the business as formerly. The Messrs. Lang of Vassalboro'—John D. and Thomas S.—started a small herd in 1860, but disposed of it a few years later, in consequence of turning their attention to another class of stock. Their stock came from Paoli Lathrop of Massachusetts, and Samuel Thorne of New York, and in selling it to close out, some of the animals found their way back to Massachusetts again. Friend J. D. Lang, it should be mentioned, was one of the early breeders of thoroughbreds of this class, and some twenty-five years ago bred quite largely of stock obtained from Col. Greene of Winslow. Messrs. Howard & Ellis of Fairfield Corner, commenced their herd in 1869 by the purchase of some cows of Henry Taylor of Waterville. Mr. Taylor had for a few years previous been engaged in breeding, having purchased in Massachusetts some animals bred by R. A. Alexander of Kentucky; but discontinuing his operation, his animals were sold. In addition, these parties also purchased animals of L. A. Dow, Waterville, Charles Shaw, Dexter, and other parties. They have bred with care, and have a choice herd of about twenty animals. Elijah Wadsworth of Livermore is one of our oldest breeders of Shorthorns, his father, the late Jesse Wadsworth, having obtained his animals from Col. Greene of Winslow, and at his death his son continued to give some attention to breeding, purchasing a bull formerly owned by the Messrs. Lang of Vassalboro'. He subsequently purchased a bull of A. M. Winslow & Son of Vermont, and is still engaged in breeding. His herd has long maintained a good reputation, and many good animals have gone out from it. Peter W. Ayer of Freedom, commenced a herd of Shorthorns in 1870, by purchasing the bull Knight of Geneva, and two heifers, of Augustus Whitman, Fitchburg, Mass. From these he is now breeding. E. E. Parkhurst of Maysville, Aroostook county, purchased animals of Warren Percival, and also of the Agricultural Society of Woodstock, N. B., and has a herd of a dozen or fifteen thoroughbreds. Mr. Parkhurst has made some sales in his county, and the thoroughbred animals of this class in Northern Aroostook have done much to improve the farm stock of that section. Some years since the late Samuel W. Coburn of Skowhegan had a considerable herd of Shorthorns, which he bred with success for many years, but I am unable to say from whom his animals were obtained. Since his death the herd has not been kept up, although many nice grades in that section of the State are found as the result of his efforts. Among other breeders of Shorthorns, whose animals have been purchased within the State, may be named Jos. Sanborn, Webster; A. L. Barton, Dexter, (who had a bull from the herd of Benj. Sumner of Woodstock, Conn.), W. H. Haynes, Smithfield; Z. A. Gilbert, East Turner; Luke Hilton, Skowhegan; A. C. Chandler, New Gloucester, and M. L. Wilder, Pembroke. These gentlemen are not breeding thoroughbreds to any great extent, but have by their efforts assisted very materially the improvement of the stock of the State in their several localities—the character of the grades having been brought up largely by the introduction and dissemination of pure bloods, through their agency.

HOLSTEIN, OR DUTCH.

But few pure blood animals of this breed have ever been introduced into Maine. The first was the bull Duke of Holstein, from the stock of W. W. Chenery of Belmont, Mass., brought to Vassalboro' by Thomas S. Lang of North Vassalboro', in 1864. He remained there for several years and got some good grade stock. The next was the bull Opperdoes 16th, purchased of Mr. Chenery by Gen. W. S. Tilton of Togus, near Augusta; but he very soon died, leaving no progeny. In 1871 Gen. Tilton imported direct from East Friesland, the bull Pleon, and cow Itzehoe. The bull Denmark, imported in the cow Itzehoe, was calved in October, 1871. From these, several thoroughbred Holsteins have been bred, and also a number of very promising half blood heifers. William R. Hersey of Lincoln, has a herd of grade Holsteins, which he esteems highly, regarding them as "superior animals, good feeders, and good breeders." His grade bull at 22 mos. old weighed 1,450 lbs., a pair of steer calves at 5½ mos. old weighed 970 lbs., and a cow owned by him gave 39 lbs. of milk per day for seven days in succession, in September, on pasture feed and four quarts of oat and pea meal per day. He says: "I like the cattle; they are bright, active and intelligent, and take well in this section." Grades of this blood are also owned by Robert Huston, Falmouth, Milton Shaw and Joshua Fogg, Greenville, Mr. Plaisted of Stetson, Mr. Robinson of Weld, and Moses Getchell of Winslow. They have as yet hardly been bred long enough to render a full verdict as to their merits as a breed for our farmers to keep.

AYRSHIRES.

Those who made early trial of the Ayrshires in Maine, were John D. Lang of Vassalboro', Timothy Boutelle of Waterville, and Hiram Pope of Gardiner. These animals came from the herds of J. P. Cushing of Watertown, Mass., and Capt. Randall of New Bedford, Mass., who both imported them from Scotland. It is probable that those who first engaged in breeding them did not take great pains to preserve the purity of the blood, as the breed did not for years make much progress in the State. About 1858 S. L. Goodale of Saco imported some Ayrshires from New Brunswick, which were very fine animals. How long they were bred by this gentleman I am not able to say, but my impression is that the stock was not very widely disseminated. One cow of this stock was purchased by Rev. S. F. Dike of Bath, who speaks of her as a very remarkable milker, giving 49 lbs. of milk per day for thirty consecutive days during the month of June. "She was a small cow, beautifully made, round as an apple, and one of the best of feeders." The leading breeders of Ayrshires are now Messrs. J. & N. Dane, Jr., of Kennebunk. Their herd was commenced in 1861, with the bull Oswald, (imported by H. H. Peters of Southboro', Mass.), and several cows. These animals were purchased of R. Gray, Fredericton, New Brunswick; and subsequently several fine animals were purchased in that Province and in this State. The bull Brewster was next purchased of H. H. Peters, and in 1871 the bull Harry from the herd of Walcott & Campbell of New York. Two imported cows from Sturtevant Brothers, Framingham, Mass., were added to their herd in 1873, and they now have fourteen or fifteen animals. Frank Buck of Orland, commenced breeding Ayrshires in 1866, and in that year introduced the first thoroughbred cow into Hancock county. This was from the stock imported by Mr. Goodale. In 1870 he purchased the bull Norval and some cows from the stock of Mr. Gray of Fredericton, N. B. From these he continued to breed for some years, and then made additions to his herd by purchases from T. S. Gold of West Cornwall, Conn.

It should be here mentioned, that in the above record of herds and breeders, it has not been deemed advisable to give the names of those who only have one or two full bloods, or who may be keeping a thoroughbred bull. Such a list of names would swell the length of this paper and serve no useful purpose.

STATISTICS OF THE CATTLE HUSBANDRY OF MAINE.

The following statistics regarding the numbers and value of the cattle of Maine at different periods, have been compiled from the reports of the U. S. Census:—

Year.	Milch Cows.	Working Oxen.	Other cattle.	Total value of Live Stock.
1850	133,556	83,893	125,890	$9,705,726
1860	147,315	79,792	149,827	15,437,533
1870	139,259	60,530	143,272	23,357,129

The increase of milch cows is due to the greater interest in the dairy, and the decrease of working oxen to the fact that horses have been gradually superseding oxen as a team for doing farm work. The column of values of course embraces all the live stock kept, including horses.

RECOLLECTIONS OF A DROVER.

From thirty to forty years ago large numbers of cattle were collected in this State and driven to the cattle market at Brighton, near Boston. This was usually done before "housing time" in the fall, and immense quantities of cattle were carried from this State to supply the Boston market. Now, such a thing is of very rare occurrence, in this State; the transportation of cattle by rail having done away with the practice of "driving." Among the materials received for this paper was a sketch of the early practice of driving cattle, furnished by Seward Dill, Esq., of Phillips, who was himself engaged in the business as early as 1835. His recollections, as given below, will be read with interest, as furnishing a chapter without which our cattle history would by no means be complete:

"My first drove was picked up about this vicinity, and collected at this place, Phillips, in the fall of 1835; and I continued in the business about twenty years, driving from one to three droves a year, which was done the latter part of summer and fall, in droves of from fifty to two hundred head—a large proportion young cattle, one, two, and three year-olds, the balance oxen and cows. These cattle were of as many colors as Jacob's—red, white, black, brown, lined-back and spotted; some with high horns, and low horns, some up and some down, and others with none at all. The prices paid for the two first years were, for one-year olds \$3 to \$5; for two years old \$7 to \$10; for three years old \$10 to \$15; cows \$10 to \$12; oxen \$35 to \$40 per pair, for six feet in girth, and sometimes six and a half feet at that price—and 6½ feet were considered pretty large here at that time. In those days, selling cattle in Brighton was dull and hard business for "greenhorns"; many drovers lost money, myself among the rest. Two-year olds were often sold for \$7, and sometimes much less. In 1837 and 1838 prices went up with a rush. For two years cattle had been so low that but few calves were raised in Maine, New Hampshire and Vermont. We poor drovers, who purchased our droves early in 1837, then got even with the Brighton sharpers, and some one year old heifers sold as high as \$24 each, two-year olds \$30 to \$35, and oxen from \$35 and \$40 up to \$80 and \$90. In 1840 cattle were low again, but not down to the prices of 1835. I have purchased 7-feet oxen in the towns of Livermore and Turner at \$50, (what we called mess and market beef), driven them to Portland and Brighton, and then sold at a very small profit.

"Drovers sometimes took cattle "on drift," at $2 per head for driving 200 miles and selling. That was not a good way, for a drover had rather drive his own cattle for one dollar than to drive them for others for twice that. Then there is no chance to find fault, let them sell high or low. The custom was, to go over the towns among the farmers, and purchase the cattle, to be delivered on a certain day; and when the time arrived it was all commotion and excitement: cattle coming in from every direction, upon the run, lowing and bellowing, men and boys screaming and whipping, crowding them into a yard—when there would be fighting, hooking and jumping. All were then to be branded or marked with scissors, and after all preparations are made they were turned out and driven to some field or pasture for the night, where they were guarded till the next morning by two men, so that the unruly should not break away and let the whole drove out. They were now ready for a fourteen days' tramp to Brighton; and turned into the road by five or six men on horseback, with long whips, the journey began, with such yelling and whipping as was seldom heard. After one day's drive, and the cattle in the road got used to the business, the extra men and horses were sent back, leaving three to take the drove along. The practice used to be to rush all day, seldom stopping for dinner or allowing the poor creatures a moment to even bite the grass by the way-side; so when we arrived at Brighton, our cattle were lank, rough, foot-sore and weary—the picture of a hard journey. We always sold all we could on the way, and when we arrived at the market-yards were obliged to sell at what we could get—often at a big loss. The object at that time, of driving cattle, was to make collections where we had trusted out merchandise, and many times we paid much higher prices than we should if we had paid cash. After driving a few years we made some improvements in managing the creatures on the road. Instead of six men on horseback to drive the first day, three could do the work, and without whip or much noise. The second day two men with horse and wagon could get along quite comfortably, although if the drove was large three were better. At noon we usually looked up a good field to turn into, or get a foddering of corn stalks or hay for a baiting, and let them rest an hour or more, while we baited old Dobbin and refreshed the inner man. In this way our cattle stood the journey much better, and looked first-rate when we arrived at Brighton, and sold more readily both on the road and at market. If we found the sales dull and low, we put them on the road again for Bridgewater, Fairhaven, and along the Cape, where we sold them as best we could."

PORTRAITS OF ANIMALS.

It seemed desirable that representative animals of the several breeds of thoroughbred cattle should form the subjects for illustrations to this paper, and for the purpose of accomplishing this, correspondence was early engaged in with several breeders. While they admitted the desirability of having this done, the difficulties in the way were considerable. Nothing is so difficult a subject for correct illustration as an animal, and especially animals generally so hard to manage as bulls. Breeders, of course, were not willing to put up with an imperfect or unsatisfactory picture—a correct and truthful one being the only one that would give satisfaction. In many of our herd books, and in agricultural journals, the portraits of animals are too often but little better than caricatures—one would answer about as well for one animal as another, or for one breed as another. Nothing seemed to promise satisfaction but the photographic illustrations, with which some of the herd books are now illustrated, and these came so high in price that it was found impossible to obtain them. So, while it was hoped at one time to be able to have some portraits accompany this article, it was upon the whole deemed advisable to omit them entirely, rather than have those which would not be good representations of the animals figured. This will explain why what was at one time considered quite certain in regard to illustrations, it has been found best to abandon as impracticable.

SOME CONCLUDING REMARKS.

A review of the subject which has been presented in the preceding pages, will show many points of interest to the practical farmer; the first of which is in regard to the purity of blood of the animals early introduced into Maine, and the judicious and intelligent manner in which the early breeders carried on their operations. We doubt, if in any other State in the Union, at so early a period as marks the introduction of Denton and the bulls which were imported from 1826 to 1833, can so large a number of pure blood bulls be found to have been introduced, as were brought into this State. The breeders interested in them were also men of high standing and intelligence, and not only selected the best animals to breed from, but bred with much care and in a manner to maintain the purity of the blood and the value of the animals. They laid the foundation for the superior cattle which thirty and forty years ago gave Maine the reputation of producing some of the best stock found in the Union; of large size, fine workers, excellent beef animals, and which as stock getters possessed remarkable staying qualities. The testimony of many who were familiar with these animals, is to the effect that they added thousands of dollars in value to the farm stock of certain communities, and that even now the good results of particuar strains of blood, thus early introduced, may be clearly traced. It is also plain to notice the good work done by those pioneer farmers and breeders for the improvement of our stock and our agriculture, (for, in reality, our agriculture is founded upon, and depends upon our farm stock for its advancement), and which was done at a time when they were surrounded by discouragements, and when every inch gained was the work of actual effort against prejudice and often against ignorance. Even now the results of their efforts are plainly visible, and we are led to rise up and honor their work and their memory. The change in the character of our cattle, in their adaptability to certain uses, in their money value as compared with those kept generally in the State before the labors of these pioneer breeders were commenced, is also a consideration of great importance. The cattle were brought up from poor, small, scraggy animals, giving little milk and being of very little worth, to those finely proportioned, well developed and valuable. And the efforts of breeders in more recent years have steadily been in the same direction, adding not only cash value but desirable special qualities to certain breeds; until now, to say nothing of the herds of full bloods of the different breeds which we have in the State, and of which some outline has been attempted, (which will compare favorably with those of any breeders in any State), our general farm stock in all parts of Maine has been improved to a great extent, and the grade animals found upon all our farms are generally very valuable animals, often of high grade, and as satisfactory for all purposes—except breeding—as full bloods. Another conclusion presents itself in regard to the absolute necessity of cattle in our husbandry. We cannot carry on our farms without them; they do our work, furnish our meat, supply our butter and cheese, and provide the manure by means of which our farms can only be brought up to a profitable degree of fertility. Therefore cattle should be kept, and may be kept at a profit in Maine. Our farmers can, by providing plenty of pasturage, good hay and an abundance of turnips, grow beef at a profit: while our cheese factories, of which we now have a large number—so many in fact that the plan of associated dairying in this State may no longer be looked upon as an experiment—will demand that more and better cows be kept. In order to accomplish this good bulls are needed, the best calves must be raised, and as a consequence the numbers of our cattle will increase. As this comes about, more hay will be consumed upon our farms, more manure made and better crops the result. Altogether, it seems that cattle husbandry in Maine has now a more encouraging look than for many years. Some considerations on breeding, feeding, and general management, were intended in this connection, but it is a broad subject in itself, and is reserved for future treatment.

REPORT OF THE ORONO MEETING.

In accordance with a vote of the Board, the semi-annual meeting was held at Orono, the seat of the State College of Agriculture and the Mechanic Arts, on the 27th, 28th and 29th of October. The first day was spent at the State College, during the forenoon of which the members attended the various recitations of the classes at the college, including that in chemistry to Prof. Aubert; in mathematics to Prof. M. C. Fernald; in engineering (strength of timbers) to Prof. Pike, and in comparative anatomy, and elements of agriculture (manures) to Prof. C. H. Fernald. During the intervals of the several class recitations, the members visited the various public rooms in the college buildings, including the laboratory, natural history room, library, model room, and chapel, together with several of the students' rooms. The collections in the several rooms were attentively examined, and the gentlemen expressed great interest in the several departments. At noon, by invitation of President Allen, the members dined at the college boarding house, which is under charge of the steward, Rev. A. W. Reed, partaking of a substantial and well served dinner. In the afternoon the barn and farm were visited, the stock and implements looked over, and the work of the students who were engaged in performing their assigned task of manual labor, examined. At 4 o'clock there was an exhibition drill given by the cadets, to the number of about eighty, under the direction of Prof. W. S. Chaplin, Professor of Modern Languages and Military Tactics. The drill was witnessed by a considerable number of spectators, and was a highly interesting exercise. After it was finished the members repaired to their quarters at the Orono House, Orono village.

EVENING.

The Convention met in the Town Hall at 7.30 P. M., and was called to order by Z. A. GILBERT, ESQ., President of the Board, who said:

Gentlemen: We have come together in obedience to a call of the Maine Board of Agriculture, as we and our predecessors have met many times before, for the purpose of laboring in the interest of the cause which we have been selected to represent. We have come from every section of the State; we are representatives of the different and distant sections of the State, as well as of this immediate vicinity. We invite to associate with us in these labors and to labor with us on this occasion, the farmers interested in the cause in which they are engaged. We desire them to meet with us and assist us in conducting these meetings. While we represent individually different sections, we are all laboring or undertaking to labor for the agriculture of the State of Maine, and not for any particular section which we may individually represent; we labor for the interest of agriculture in our broad State. Whether these labors shall be promotive of good, depends very much upon those with whom we associate, those whom we invite to assist us. Although we may thus reach many interested farmers, we also expect that our labors will become known to others through the printer's art, through the Reports of the Board of Agriculture, which go out into every corner of the State from our Secretary. In this way nearly all the farmers in Maine may have the advantage of the ideas which we hope to disseminate, and we believe that most farmers do reap some advantage from these efforts. At any rate, we labor in the full faith that the cause needs our efforts, and to the extent of our abilities we are willing to give our efforts to the State in this direction.

The exercises of this evening are merely preliminary to those which are to continue during the two succeeding days, and will be opened with an address of welcome by Hon. CHARLES BUFFUM of Orono, whom I now have the pleasure to introduce to you.

THE ADDRESS OF WELCOME.

Mr. President and Gentlemen of the Board of Agriculture:

In behalf of the citizens of Orono, I welcome you to our town. While lumbering is the leading pursuit of our citizens, agriculture is a distinctive feature of Orono. We trust when you have had an opportunity to examine the farms and farm-buildings of our town, you will find they do not suffer in comparison with those of other towns in our commonwealth, and that the manner in which they are conducted is a guarantee for the good sense and intelligence of our farmers.

We are not unmindful of what has brought you to this place: We know it is not so much the *town* as it is the institution of learning here located—the State College of Agriculture and the Mechanic Arts—an institution that, if it continues to receive the fostering care of the State, which it so richly deserves, and the judicious management of the trustees and faculty, which it has always had, will very soon become the leading college in our State, giving to our young men and young women a liberal education, and fitting them for the practical duties of life.

Gentlemen, we are pleased to see you, not only from a personal interest, but more because you are the authorized representatives of the State of Maine for that important branch of industry which, if wisely attended to, will make our inhabitants prosperous and happy. We have a high appreciation of your ability and the efforts you have made and are still making to advance the agricultural interests of our State, and under your wise counsel and careful management we may confidently expect your efforts will be crowned with success. And now, Gentlemen, I once more welcome you to our beautiful, but quiet town, and to the hospitality of our homes.

President GILBERT responded:

In behalf of the Maine Board of Agricultue, allow me, sir, to thank you for the kind welcome which you have thus extended to us. We come here, not as orators, nor as presidents or professors of agriculture, but as practical farmers. We come from our farms, and our labors here will relate very much to the operations of those farms. We shall be happy to meet your citizens and your farmers. We are always glad to meet practical farmers, men who are engaged in the occupation in which we ourselves are daily laboring. It affords us pleasure to exchange cordial greetings with them.

Allow me to say, that the brevity of this response does not by any means fairly represent the measure of our gratitude or our thanks which we wish to extend to you for the kind welcome you have just tendered. The remainder of the evening will be devoted to the reading of papers and to discussion.

The Secretary then read a paper prepared for the Board by B. F. Hight, member elect from the Maine State Society, which was followed by one presented by SAMUEL WASSON, member from Hancock county, which in his absence was read by D. M. Dunham, one of the members at large.

NO CATTLE: NO CROPS.

BY SAMUEL WASSON, MEMBER FROM HANCOCK COUNTY.

"No cattle, no crops," has become a time-honored axiom in our farm literature. The lesson it inculcates is that cattle husbandry is indispensable to a paying tillage. In Japanese husbandry the saying is reversed, and "crops without cattle" is their theory and practice, which for centuries, with their cheap labor, cheaper subsistence and puddling with liquid night soil, has preserved an undiminished fertility. But, in the present light of our farm economy, and with a hard and uncompromising soil, *without cattle, without crops*, is safe agricultural orthodoxy.

Venerable with age as the saying may be which couples farming success with the keeping of cattle, whether such be kept to "eat to live," or to "live to eat," seems to have come to be regarded as a distinction without a difference. We have been trained thus to think, as the champions of the prize ring are trained to fight.

Ostensibly, domestic animals, that form so large a part of our material wealth, are kept for a two-fold purpose—for profit, and as a necessity.

Labor, physical or mental, is a necessity imposed on a majority of the human race, which is compensated for in the comforts and conveniences of life. To the farmer, the compensation for his labor comes first in the crops which his soil has been induced to yield. Unlike the most of life's activities, that of the farmer's requires him to employ his labor to create the raw material and to re-employ it to transform it into finished products before he can command that compensation which is to reward him for the double labor. How does this compensation compare with that received for labor in other industries? An expert in statistics gives the sum of $15 per month as the average wages of farmers—a fraction less than 58 cents per day, or about one-sixth of the per diem pay of first class mechanics, or a small advance on that *doled* out to the "bog-trotters," in Ireland. If such expert's showing be a truthful revelation, it remains a complex problem no longer why farm labor, thus fettered, is so unremunerative, or why farmers, whose per diem wages are but 58 cents, must dwarf themselves and families—pecuniarialy, politically and intellectually—into a compass which 8 and 50 cents can cover. Whether this number of cents is the actual sum accredited to farm labor, that the sum is meagre and poverty-pinching small, is shown by the fact that few farms only are worked by hired help, because that "help" can command better pay than the farmer can afford to give.

As the compensation which labor receives is the base of the whole industrial fabric, so the wages allotted to farmers for *their* labor is the foundation whereupon to build agricultural success and whether that success be "coliseum" in size or "seven by nine," is determined by the supply of wages to the builder.

In agriculture, labor has two values, a nominal and a real. The crop produced represents the nominal value, but the price at which it can be sold, the real. Farm stock, regarded as a necessity or as "no cattle, no crops," have no real value, or rather the labor required to grow them, abstractly considered, has no other than a nominal value. A cow which yields only butter sufficient to pay her keeping, has only the nominal value of a necessity, and it is these which is "playing the deuce" with farmers' wages.

Returning to our theme, "No cattle, no crops," an inferential deduction is, the necessity of cattle in farm economy. That with the existing method in farming, keeping and feeding of cattle, will not be questioned. It is the best way, until the "mother of invention" brings forth a better. Regarding it as the best known way, and it becomes big with importance to rightly determine the better way to convert a necessity into an advantage, for that farmer whose cattle are tolerated as a sheer necessity and which simply "eat to live" disposes of his labor at the lowest market price. He walks in the pathway of those who "work hard and live poor"—poor in purse, poor in position, poor in influence and poor in social classification.

That there may appear a clear exposition of this matter, facts and figures are appealed to. The mean or intermediate price of butter for the year 1870 was 35 cents. The average weight of butter per cow was 83 lbs., at 35 cents, are $29.05. Calling the average price of hay $15 per ton and the average live weight of cows 700 lbs. and 3 per cent. of their live weight for their daily sustenance, are $32 per cow, the cost of keeping for 200 days, the period of winter feeding, which gives this summary:

Cost of cow, for hay and interest..........	$34 22
Income of cow, from butter and manure....	32 05
Cow in debt to her owner..............	$ 2 17

Milk for the family and "bonny clabber" for the pig are not passed to the cow's credit, but offset for pasturage and the pleasurable job of churning.

The ninth census determines the number of cows in Maine at 169,000. It being impossible by accuracy of estimate or statistical data to enumerate the number exceeding or falling below the average, and wishing to avoid the labor of churning out mathematical precision, one-half of the number will be assumed as under average, or 69,000 cows in this State kept and cared for in obedience to the behest of grim necessity—69,000 inexplicable enigmas, the entire sum of whose cost of $150,000 has been wrung out of labor that oppresses the body and mind of their owners. Of course, as a cow, if her product falls below the average, she in reverse ratio adds to her cost of keeping. Thus, if she be one-fifth under average, or down to 71 lbs., her keeping is increased one-fifth, or from $32 to $41.

Were one inclined to discredit the assumption that any considerable number fall below the average of 83 lbs., the last decennial census comes to the rescue and asserts that the cows, by counties, fall in Aroostook 11 lbs. below; in Androscoggin, 13 lbs. below; in Cumberland, 4 lbs below; in Franklin, 4 lbs. below; in Hancock, 1½ lbs. below; in Oxford, 13 lbs. below; in Somerset, 12 lbs. below.

Thus, if the average be 70 lbs. in two counties, one-half of the cows in those two counties must yield considerably less each week than 70 lbs. Such cows are worth their hide and horns, unless they are kept too long. The point which I here wish to enforce is, that every cow kept for butter whose product is not up to the average of 83 lbs. is a bill of cost, a non "right of redemption" mortgage, and all the labor which such require or receive at his hands is lost labor, squandered labor, with so much of his muscular manhood expended without compensation or equivalent, unless there is fun in the thing, to enjoy which the man who "pays the bills" must have a wonderfully depraved fancy.

Those 69,000 "awful goddesses" are to their owners what the Fates were to the Greeks. Instead of being regarded as machines to convert raw material into finished products and by mechanical skill make themselves useful in the world, have been considered and employed as mere necessities, whose "chief end" was to "rough it for a living" or experimented with to test with how little food they could be kept alive.

It is related in story of a test to see with how little food a horse could be kept alive for 20 days. The first day he was given a pound of hay, the fourth a turnip, the eighth a potato, the twelfth an apple, which, the horse not being hungry, refused, when, on the thirteenth day, as the test was progressing finely, the animal "took sick" and died. Could the cattle bones which bleach and whiten on "May-hill" be made to speak, they would tell of having been "took" with the same disease.

It is one of the most unaccountable things in industrial economy, why so many farmers, the meagre fruits of whose industry require them to study and practice rigid economy, men who can illy afford to misapply their labor, persist in investing their hard earnings in this animal machinery, when they fail year by year to run it with profit. If this thing has so crystalized itself upon our farming that it cannot be broken, or the necessity so interwoven its fangs into our tillage that it can be disengaged only by abandonment, let farmers make haste to "pack up" and abandon, leaving to the "sons of the forest" to re-inhabit.

"Friends in Council" makes Melverton say: "a fool does not choose a fool for a favorite. He knows better than that; he must have something to lean against." So farmers have this to "lean against," that the keeping of cattle is not a necessity *per force*— for whenever and wherever rightly employed as instruments of transformation, supplied with an abundance of raw material of good quality, this specialty of dairying has more clean money in it than in any other in all the wide range of farming. In such cases milking time is the money-making time, and

"As the early dews are falling,
Is heard cheerily his cattle calling—
'Co' boss, co!"

In this State, at least, there is a growing conviction that the dairy interest is undervalued, and its importance from many standpoints is being strongly impressed upon the attention of farmers.

The advantages for producing the raw materials for beef, which the vast, uninclosed feeding grounds of the West possess, are such, and so vastly override those possessed by us, that we can hardly maintain the rank of third rate competitors. That we are "flanked" in our efforts in this direction, is too patent to call for continued comment. To transform the raw material of our soil into wool, we must go down to the low level of the "condemned to Botany Bay," or cheapen our cultivated land to the government price of the almost limitless areas of the Rocky Mountain and Pacific slopes. The first, would be death to our civilization and moral manhood; the latter, abject poverty and social suicide.

Would we plan profitable results in growing wheat, until we have learned the laws and conditions which govern its growth and how to fit and feed the soil, fatality stamps itself upon the planning. Thus some weapon is ever and anon coming to the surface to lop off branch after branch of our husbandry which heretofore have employed our labor with satisfactory compensating reward, and we are being pushed back, like a retreating army, to our stronghold, that of *dairy farming*, the management of which, while we have had so many burning irons in the fire, has been burning too.

Of the many out-looks from which we can inspect the importance of dairy farming, the occasion will admit of the enumeration and discussion of but a few.

1st, *Cattle as a necessity*, which means, not discussion, but assertion. They afford the most direct, the cheapest and as at the present advised, the only agency to stay sterility of the soil and keep it productive.

2d, *Cows possess superior advantages*. A combination of causes has given the pre-eminence to cows, not because their droppings are of superior value, for that of cows in milk is inferior in quality, but because they can be made to pay a larger dividend for their keeping than any other kind of stock and the labor which their keeping induces is more remunerative than that of any other branch of cattle husbandry, or may be.

3d, *They excel as machines or instruments of transformation*. Not that a cow *per se* is gifted to excel in the process of transformation, but that the product which she "turns out" is at less cost and of superior value. A large portion of farmers are too far from market to transport bulky and weighty products, like hay and hoed crops, and hence the value of cattle to reduce the bulk and of cows to increase the value of the concentrated product, that there be no loss of value to the article in bulk and compensation for the transformation; in other words, that the value of the milk, cheese or butter shall equal the value of the hay, together with the cost and labor of dairying. There is another phase of the case which strikes deep-rooted in this matter. In a soil like that of Maine, which must be fed to keep it fruitful, it is soil murder in the "first degree" to market raw material, working as sure and certain ruin as it would to cart off the enriched surface soil and dump it into the ocean; but by converting it into some animal product, the same material may be marketed, the fruitfulness of the soil preserved and increased.

4th, *The possibilities of a cow.* The amount of savory cheese or of "gilt-edged" butter which a cow can be made to produce in a given time, or rather which they have produced, almost surpasses belief. The noted Oakes cow, a native animal, in Massachusetts, yielded in one season an average of 18 ounces of butter per day for 215 days, or 467½ lbs., which at 35 cents is $162.62, or $134.57 more than the average of our cows. Numerous instances are on record of per annum yield of 1000 gallons of milk, or of 780 lbs. of cheese. These are some of the "possibilities," and while such may be rare and extreme cases, they show a defect somewhere, when the average falls to 80 or 90 lbs The mill is not kept grinding. It is the machinery which is stocked to its fullest capacity which turns out the big profits. If, as the old German proverb says, "the cow milks only through the throat," the defect in our cows is that they are *empty-throated.*

Were I to elaborate on the value of milk as an article of internal commerce or the vast quantity of butter demanded for family use—in 1872, New England made more than 49,000,000 lbs.—or the endless details of the feeding and treatment of dairy stock, my paper would swell into a

Ponderous volume of *butterous* hue.

Fortunately for your ears and my lungs I shall "let loose" in no such "milky way," but discuss the *strippings* in the case.

When it is so apparent that dairy farming, the manufacture of cheese and butter, is to become to a great extent a specialty of our husbandry, a better feeding or supplying the best of raw material, and to the fullest extent, is a subject big with interest to every man who has the throat of a cow to fill. His first study should be to secure the best approved animalized machine, be it a thoroughbred with a lineal line longer than the equator, or a grade whose legitimacy might be endangered by inquiries for its sire. While the agricultural press, writers and speakers, are endlessly extolling the prime virtues of thoroughbred cows, no man can afford one who cannot make a native pay. For no matter how good or how poor, if she be all breed or no breed, long horns or hornless, 4 teats or 24, good care and good "keep" will make her better. While the breed is an element of merit which should not be disregarded, breed combined with a total disregard of all well established rules of feeding is of no value, nor can breed fill the belly or eke out a subsistence in worn out pasture land. It is deplorable indeed when farmers seek in breed to cover their defects in feeding and like Fanny Fern's ignorance as to the style of preface, "at a lapse of time find themselves not a whit the wiser."

Neither account nor emphasis is required to give stress to the self-evident fact that grass in summer and hay in winter is the natural food for cows, whatever else may be supplied comes in as an adjunct or to supplement shortness of supply. Their organs of digestion and secretion are especially fitted and adapted for bulky and not for concentrated food. At no time will a cow give so great a flow of milk, thick with clogging cream, as when having a range of good pasture, where she can select palatable and nutritious grasses; hence, when the winter's stores are cut and cured, to preserve the sweetness and succulence of grass in its natural state, so far as possible—other things being equal—it is the natural food, as it is the *only* food desired. Hay for milch cows should be cut earlier than for oxen, horses or sheep. Grass, just before it blossoms, contains its maximum of butter making elements, or its greatest quantity of curdy and creamy matters which may be appropriated by the animal which consumes the food.

Were it practically possible for the every-day farmer, having two parcels of hay, the one cut just before its blossom, the other after it had passed that period, by factitious separation to determine the butter or cheese making constituents in each, they would be surprised at the "bigness in the difference." But one need not resort to analytical test, a "one-sided partnership,"—as some old maid has said of matrimony,—for in their own barns, with their own cows and hay, can they determine the difference, with sufficient exactness, and greater satisfaction. Great as is the importance of cutting grass at the proper time, the way it is cured is of no less importance, for, if cut at the right time, and over-cured, or damaged by too much sunshine or exposure to rain, or housed with any moisture than that of its own juices, a rapidly damaging process sets in, doing its first and greater injury to the easily damaged cheese and butter constituents. Every one knows how quickly fresh fish, exposed to the sun, becomes tainted and offensive. This is the first step in the work of decomposition, having its ending in rotten fish. No less quickly is the same taint imparted to grass, over-cured or wrongly cured. It is the same in kind, if not in degree.

Just as fast, and perhaps no faster, as the importance of dairy farming impresses upon farmers the question, How hay for cows can be made to pay the best return? will the importance of cutting grass at the proper time, and curing it in the best way, force itself upon the system of haying, and thus develop how readily the cows will respond approval by doubling their yield.

Kindness. Kind and gentle treatment may be considered as one of the cardinal points of successful dairy management. Few are fully aware how small a slight disturbs the quiet of the animal and works injury, or how that her nicely adjusted nervous organization is as easily disarranged by misuse as the time-keeping exactness of a chronometer. Harsh treatment by word or blow drives back the flow of milk, to be re-absorbed into the system or solidify into troublesome garget. Yet how common the occurrence, when she exhibits an unfeminine display of temper, with the toe of the boot to *round her vp* to amiability and with the milking-stool "round" her back again, with these or with other sorts of masculine comicalities *coax* her into lady-like obedience. Worrying by dogs, fast driving, scolding or anything which irritates, tends to diminish the quantity of milk. In short, with any other treatment but that of constant gentleness, Dame Fortune turns up the "unlucky side" of the wheel.

The barn, which in this latitude cattle occupy the greater part of the year, the conditions of shelter, good air or bad, which it affords is a dairy management of the first magnitude. How few of them are arranged in a manner suitable to their health and comfort, or are warm and well ventilated; or rather, how many with their *openwork* walls are so much of a good thing as to be positively bad. The style of finish will of course depend on the means of the dairyman, yet any one with mechanical "gumption" enough to hammer a nail instead of his fingers can "board up" the exposures. The cost of wintering in a barn modeled after the wicker-work, Puritan style, is one-third more than in one of modern finish, an item of loss which aggregates in the "long run" to a big figure.

No good reason can be shown, because none exists, why dairying operations are virtually suspended during the wintry months. Why this *is* so is because the tie-ups are cold, frigidly cold, combined with lack of judgment and want of care in feeding. Societies for the "Prevention of Cruelty to Animals" would find such arctic atmosphered barns chilly missionary ground. It is within their province to "interview" and *abate* them.

No man, diseased with fashionable laziness, should enlist in dairy farming, for the care and feeding of dairy stock to be a paying pursuit requires close attention and patient labor. It is a branch of business which cannot be conducted at "arm's-length," or kept at a distance like a fashionable bonnet, "that never a string can keep within hailing distance of the head;" but with every new day, brings anew its duties and demands. With all its "outs" it is becoming a source of revenue to a greater extent than ever before. The springing into life of flourishing cheese factories is evidence of this. Cattle offered for premium at the fairs, fat and plump, with "nothing to eat," are disappearing, because it is now known that it is what goes through the throat that makes the "plump and fat." The breed may be the best in the world, or the worst, yet success depends upon the treatment. What is the best breed, and what the best crosses, are practical questions, to be answered by one's surroundings—the milk pail, cheese tub, and butter bowl. "What is one man's meat, is another man's poison," is clearly and yearly verified by *blood* stock. That which is the best for A, may be altogether the worst for B. The scanty or abundant subsistence which one's pasture affords, whether one's means are limited or ample to bridge over a short hay crop, or whether it is a matter of fancy, or the necessity of dollars and cents, are some of the questions which come up for investigation, over which one's likes or dislikes have no control. All the elements of uncertainty cannot push error into the calculation, unless there be a near-sighted observation.

If the same law was applied to the actual owner, which forbids manure on a farm at a time of sale from being removed, or taken off by the out-going tenant, unless so stipulated in the bargain—

that is, which makes the manure a part of the farm—the exhaustive practice of selling off the hay, straw, potatoes, and other raw material crops—a process equivalent to removing and taking off manure—this terribly deteriorating system of cropping, would be stopped.

None but those of defective vision can fail to see that cultivated soils in the older portions of the State have, or are becoming, non-productive of many of the staples for which they were celebrated in the days of the fathers, and that uncertainties of yield multiply like house flies, year by year. This soil-despoiling process has been continued so long that it ceases to yield any equivalent, and much of the labor and expense bestowed in its cultivation "passes into nothingness." Our State may never be entitled to rank as a first-class agricultural district, in the common signification of that term, but its agriculture can be made to occupy a proud and a paying position, if we rightly employ the *recuperative* powers of dairy stock.

It is true that this branch of business, like that of any other, has its ups and downs,—is subject to the law of supply and demand. Seasons will come when the plagues of "strip and waste," are unrestrained in their work of trespass. Droughts or deluge will blast the crops. Fierce winds and blighting frosts unbidden come. Epizootics will ravage the herds and flocks, and with lesser evils will yoke themselves to the agricultural pursuit. Yet other evils, no less in magnitude, no less devastating, picture their semblance on the pathway of every other industrial enterprise.

With a *skimming* synopsis, I close. Taking for granted that cattle keeping and successful farming are allied in meaning, one must begin at the beginning to terminate a successful ending. He must know from the first that dairy farming is an art with many practical details.

Underlying individual success are:

1st. One's personal self and surroundings. 2d. The purpose for which dairy stock is kept. 3d. That milk is made when the mill is grinding. 4th. The better the grain, the better the grist. 5th. When thistles grow figs, woody fibre grows butter. 6th. Like prize-packages, the big gift is in the last pound. 7th. The best hay and hoed crop storage-house, is the dairy room. 8th. Cold barns save the cost of ledger and bank book. 9th. Cleanliness is godliness in dairying.

Guided by these oleaginous proverbs, found neither in the Old Testament nor the New, nor from floating particles congealed by some unpatented premium churn, he who labors to reduce them to practice in his business, and trusts to that business to pay him for his labor, will

> "Win the garland, and the gold
> That cannot change with time."

The President then invited a discussion upon the topics suggested in the foregoing papers.

Mr. COLBURN of Kennebec. I am very glad to hear you say that we come here as farmers, to talk as farmers, and that those who come in to listen will not expect us to speak with the eloquence of the President and Faculty of our college, but as farmers—to talk as farmers. When I got up I thought I would make some remarks in regard to dairying. There may be some lumberman, some mechanic or merchant here present, who has been thinking of going to farming, has got an idea that he had to give so much for his butter that he would keep a dairy. There are some ideas advanced in one of the papers just read, which would be rather discouraging to such persons. If a cow would make only 85 lbs. of butter in one year and that sold for 35 cents a pound it would not encourage the butter making enterprise. From the little experience I have had in dairying, I find it quite otherwise. I consider a cow rather a poor one who will not make 200 lbs. of butter annually, and that she must be kept very badly if she will not do better than that. Thirty-five cents a pound, too, is rather a low price for butter. I think most any cow will, even with poor keeping, pay the farmer from $40 to $60 a year profit. That has been my experience.

The statement that on the average the cows of Maine do not make but 85 lbs. of butter per year, is not correct. It was got from the census where the assessors go around and enquire of people how much butter their cows produce. It is astonishing to see how low people estimated this amount, some even as low as 40 lbs. a year, sometimes. There is not one in fifty of the farmers in Maine who really know how much butter they make. It is all guess work. That is not a fair way to ascertain the average production of a cow. I will venture to say, that those dairymen in the State who have been making butter for the last ten years, and have kept an account of the proceeds of their dairies, will tell you that the average profit on each cow, clear of their keeping, is as high as $40 a year. I consider dairying the most important branch of farming, and in my opinion there is nothing about farming that pays so well with so little expense involved. The State of Maine has been for the last year rushing into cheese factories. Why? Because our wives do not want the trouble of making butter; its too hard work, they cannot stand it. It does not follow that a man's wife must do all the work if he keeps a dairy. Yet I am in favor of cheese factories, though I believe in making butter myself, and stick right to it. I find that every cheese factory that is started increases the price of my butter, and the more factories the better the cheese, and the higher the price it will bring in the market.

Mr. Dunham of Bangor. The gentleman says his cows average over 200 lbs. of butter yearly. I hope he does not want to be satisfied until his cows come up to 475 lbs., the amount produced by the celebrated Oakes cow.

Mr. Colburn. I think that if we expect to bring our cows up to that point we shall be disappointed. They fill up the tub in the newspapers, but they will not do. it when the actual test is applied.

Mr. Barrows of Oxford County. It does not appear generous in the absence of a writer, to undertake to criticise his position, still there may be some gentleman present who will agree with him and come to his defence.

It seems to me that the general topic "No cattle, no crops," cannot be sustained, although it may be true when applied to New England farming. I think we shall all of us be ready to admit that in the direction of Western farming this does not hold good, for we are very well aware that large crops have been produced from land where there has been no aid at all from barnyard manure. That simple fact alone is in opposition to the broad statement of the paper. Then again, I presume most of the gentlemen here have seen within a few months, accounts in the papers from English sources, showing that this matter is tested very thoroughly in that country. I have noticed statements from two gentlemen, Messrs. Prout and Middleditch, who for ten or fifteen years have been cultivating their land without any aid from cattle at all and have succeeded in producing very large crops, which they have sold upon the ground, without harvesting them themselves. They returned nothing to the soil from any animals of their own, but kept the land in good condition entirely by commercial manures. As the statement was given in the papers, the inquiry arose "How long will this last? Will there not be an end to it sometime?" The gentleman said it had held good in his case for thirteen years and he had no kind of doubt but it would hold good during his life and the lifetime of his son; that the crops of the present year were quite as good as at any previous time. It seems to me that facts like these go to show that the generel assertion "No cattle, no crops" cannot be maintained in all respects, although—as I have already said—without doubt, so far as New England customs are concerned, we rely mainly upon barnyard manure.

Mr. Shaw of Hampden. "No cattle, no crops," I think, holds good for the section of country which that paper was written for. I do not understand that the author was writing for the West, nor was he writing for England, but for the State of Maine more particularly than any other part of the United States. And I presume the gentleman last up will not undertake to say that here in Maine we can raise crops unless we keep stock or supply barnyard manure very extensively. It looks to me as though we must put the ground in proper condition to raise crops, if we are going to be successful, and I know of no other way with our soil here except to apply manure. If we have not got stock enough to do this, we must buy the manure. If we do not apply the manure, we shall not have crops; and I think that was the idea of the writer, and that he intended to apply this idea directly to Maine, not to England, with her different soil and climate, nor to the West, with her different soil and oftentimes different climate. As regards dairying, I presume that any one who will take pains and study the matter, as Mr. Colburn has, will make it successful; but, so far as my observations extend, among the masses it is not successful under the system on which it is now carried on. In the first place, I think that 85 lbs. of butter a year comes nearer to the average production of a cow among the majority of farmers than the two or three hundred pounds he mentions. To be sure, if a man is a practical dairyman, he knows how much butter his cows make and how much milk they give; but go through this county, or this State, and how many farmers can give you any idea of the quantity of butter which their cows make or the amount of milk they give? It looks to me that if we are to be successful in dairying, we have got to make it a study and ascertain which cows are the most profitable to us. I dare say that most of us keeping a number of cows have some very poor and some very good ones. To ascertain these facts, I think that the scales are the best test. If we take pains, it will be but little trouble to weigh each cow's milk at every milking, and we can soon tell which gives the most and the best milk. By looking back over the account during the year, we can see how many quarts or pounds each cow produces. If that course is pursued, I have no doubt that dairying can be made a successful business. If we supply the cheese factories, there we know which cow gives the most milk, and it saves, to be sure, the weighing at home; but to follow the thing up and make it practical, a man has got to devote his time and attention to it. I am in favor of cheese factories. Not but that the ladies may help make the butter, but as a general rule I think that with the large families which many farmers have, their wives work hard enough without making a great deal of butter. If we can throw off the work by putting the milk into cheese factories and at the same time make it produce more money than it will worked up into butter at home, I think it is far more desirable.

Secretary BOARDMAN. It does seem manifestly unjust, as the member from Oxford has suggested, to criticise the positions taken by a writer, in his absence. At the same time, if any paper is presented before the Board, becomes the property of the Board and is by consent of the party read in his absence, it is open to criticism and comments. But it seems to me that the statements made by the member from Oxford and the statements in the paper by Mr. Wasson, perfectly harmonize; that if a person raises crops upon his land and sells the crops raised for manure to come back in some form upon that land, it is equivalent to keeping cattle. And therefore, "No cattle, no crops" is certainly correct. He gets the manure from the products of the soil and returns it in abundant measure, so that the fertility of the land is kept up. I have a single thought in relation to the product of cows. I am not able to state the fact with a great deal of exactness, but it will furnish an idea for some farmers to think about. A farmer had four cows and was making the product from the milk, in his own family, into butter and cheese. He thought they were all very good cows. Some one suggested to him that he had better try them separately and see what the product of each would be in a given time. He did so, and to his surprise found that he received nearly all the profits from two of the cows and that he really had two good and two pretty poor ones; that he could dispose of the two latter, save their keeping and get very nearly as much profit from the two good ones. This was mentioned to me some years ago by a farmer, and was brought out by the remarks of Mr. Shaw in reference to keeping a separate account of each cow.

Mr. PERCIVAL. I admire consistency and harmony; and while Mr. Wasson is absent and his paper presented here, the question comes up, What is the legitimate inference to be drawn from the reading of the paper, "No cattle, no crops"? Is not that true? What are his ideas, and what idea does he intend to convey to us? That the products of the soil must be consumed upon the soil or returned to the soil in order to get a crop. Hence, "No cattle, no crops:" no consumption of products returned to mother earth, of course no crops. Does not that rule hold good everywhere? You cheat mother earth, and she is sure to cheat you; pretty soon you will find that she will throw up her head and defy you. We must return the products of the soil or its equivalent, and keep the land which God has given us in its original fertility, in order to produce crops. Now, one word as to the products of cows. I regard the cow as a machine. You supply the raw material to any machine and what is the result? You get the product, do you not, in proportion very much to the material you supply? Some machines will use up more material and give you more product than other machines. Some cows are machines for laying on fat, some for making milk. Some cows, as everybody knows who has kept them, will yield a larger proportion of cream than others. Suppose you have a cow that converts everything you give her into milk; that milk will be very rich, and will give you a large amount of butter and cream. Another will give you a large amount of caseine for cheese, while another will not give much of anything. You put very fine wool into the loom and it will come out broadcloth, very coarse wool and it will come out something else. Now, you feed this machine, this cow, with materials, and the result is very much according to what you put into that machine. Hence, it looks to me that there is harmony, only just get at it. The substance of all is, feed mother earth and she will feed you; feed your cows, and your cows will feed you. The more nutritious the food, the more butter you will get. The less butter you get the more your cow will fat when well fed. Reference has been made to presidents and professors. I am very happy to say, that we have a president and professors in our Agricultural College. I am happy to feel that I am here. I am, perhaps, a little on my dignity, because I have been up to the Agricultural College this afternoon.

President ALLEN, of the State College. The doctrine of the paper that has been discussed, I think is generally correct. Yet there are certain exceptions to the law, as there laid down, not merely in the West, nor in England, but in the State of Maine. There are some farmers that are making money, doing well, where they do not depend upon the keeping of cattle, where they sell their hay and yet do not impoverish their farms. I refer to those farmers near the sea-coast. They do feed the soil, but they do not feed it from the barn-yard, and they keep up their lands, their fields, and maintain a high state of fertility without the use of barn-yard manure. The ocean supplies them with marl and shells from the shore and banks, and keeps their land in good condition if it is not cultivated at all. Year after year I have seen lands producing splendid crops of grass that had not been plowed for more than twenty years. This is no violation of the general principle of the paper, for these are exceptional instances. The great truth there stated still remains clear and plain, that generally throughout the State the barn-yard is the source of revenue for the farmer, and there is where he must go for his fertilizers. Commercial fertilizers will not answer. There is another thought that has been suggested, which is, I think, very important: that we cannot depend upon the returns made by the assessors in regard to the amount of the crops and farm products. A single instance occurs to me. My father, who was an assessor for a score of years, was, I believe, as careful and accurate as any assessor would be likely to be, and I know in regard to the returns made by him for his own family, that we were not in the habit of weighing butter made in the house. He put down what he supposed was a fair estimate, 50 lbs. We kept only one cow, and used the milk for the table. That was more than the general average given in town, and I thought when I saw him put it down that he was rather extravagant. But when we came to weigh the butter carefully, we found that one cow made 212 lbs. in one year, besides supplying the family with the necessary milk. I find the scales tell a very different story from the estimate, though almost always in other matters it is in the opposite direction from this. I am quite sure that the products as returned are not to be depended upon when they are merely estimated by farmers.

President GILBERT announced the programme for to-morrow, so far as it had been made up, and that there would be an exhibition of fruit and vegetables in the Town Hall by the citizens of Orono and vicinity. The meeting then adjourned until 10 o'clock A. M., Wednesday.

SECOND DAY.

The Board met at 10 A. M., in public meeting, in the Town Hall.

The first exercise of the forenoon was the reading of a paper entitled,

HINTS ON DAIRY FARMING.

BY J. E. SHAW, MEMBER FROM PENOBSCOT COUNTY.

There are many things the dairy farmer has to look after, if he would make dairying a success—and we suppose that is the object of all dairymen. I shall in this paper mention a few of the things I have learned from observation and experience, that I find necessary to be looked after, to make my dairy profitable.

CARE AND FEEDING. We frequently see farmers and their boys driving their cows, that are constantly throwing clubs and rocks at them, or teasing them with viscious dogs, and thereby meet with a great loss in the profits of their dairy; for the dairyman should never allow his cows to be driven faster than they naturally walk. I believe every farmer, to make dairying profitable, must treat his cows at all times with kindness, whether in the stable or pasture. They will show by their pleasant eye and gentle low the pleasure they enjoy from his kind words and acts. I think the dairy farmer can realize only a small profit, if any, if their cows are in constant fear of a booting or thrashing from the person that has the care of them, and any person of that class should never have the care of any dumb animal. The dairy farmers, to make their dairy stock pay the greatest profit on the feed consumed, must have regular hours for feeding and watering, for if we do not, they are always restless if any person enters the stable. If the dairyman is feeding for the milk or butter dairy, to make it profitable, should feed liberally at all seasons of the year, for if cows at any season are allowed to fall off in their flow of milk, it is very hard work to get them up again to the former flow.

Dairy stock should be kept in warm, well ventilated stables in cold weather; it makes a great saving in the feed required to keep up the animal heat. I find the care my cows receive in the winter season has a great influence on the profits the rest of the year. I think the dairyman should study the wants of his stock and make their feed palatable to them by frequent changes. He will thereby increase his profits. He should also study to ascertain what kinds of feed will produce the largest quantity and the richest milk for butter and cheese. If more experiments were tried by practical dairymen, and given to the public, it would be very valuable to all dairymen. The more study that is given this subject, the greater will be the improvements made in the manufacture of both butter and cheese, and thus increase the profits of the dairy.

As regards milking, I find the rule for feeding holds good here; we should have a regular time to milk at all seasons of the year, for if milking is done when it happens to be convenient, (or not at all) it is an injury to the cows and will reduce the flow of milk. At this time, kind treatment should always be used. A person that treats the cows harshly is not a suitable one to be allowed about the barn, and dairymen that will allow this class of persons to milk and have the care of his cows, will find the profits of his dairy will be very small, to what it should be. I find it is best for each person to have their particular cows to milk, and milk each cow in rotation at each time of milking; if we do not, they become restless and are liable to hold up their milk. The milkers should not at the time of milking engage in any conversation, but should draw the milk as quickly and gently as possible, and he should be very particular to milk them entirely dry, for the last milk drawn is very much richer than the first.

The Different Breeds of Stock. At the present time there is much written in regard to the dairy qualities of the different breeds of stock, and we presume all have some good dairy qualities and many firm friends. There are some things to be taken into consideration by the dairyman, before he should give either breed the preference. He should select that breed that is best adapted to his feed (if he is a poor feeder, scrub stock is worth the most) and will give the greatest returns in all conditions he may place them. We know that milk is the first thing to be taken into consideration; then there is a portion of the young stock that he must turn for other purposes than the dairy—for let him select any of the different breeds, there will be some heifers that will not make good dairy cows. For me, I give the Short-horns and their grades the preference. I think, taking their dairy qualities, large size and quick growth, for the amount of food consumed, compared with most of the other breeds, will give the dairyman the greatest profit.

CUTTING HAY. If we expect good cows, we must have plenty of good, early cut hay—and what I mean by that is hay cut by the time it is in blossom. I think at this time of its growth it contains more milk and flesh producing qualities than at any other. I do not pretend to say what kinds of grass are best adapted to the dairy, but think we should sow more of the different kinds than we do now. In all cases the early and late grasses should be sown separately, then the grass crop would not need cutting all at the same time: and, as most farmers are situated, a part of their grass gets over ripe before they can cut it, and from this cause meet with a loss on their stock.

OUR PASTURES. I think, in this section, dairymen should give more attention to the improvement of their pastures, and thus save labor of planting corn and other crops for soiling their cows. Most dairymen have good pastures early in the season, but after a few weeks it becomes dry and short. I think many pastures are injured by over-stocking and too close feeding, the injury being done to the grass roots.

When we seed down for pasture we do not put on different kinds of grasses enough. We should put on all we can find, both early and late, then our pastures would produce feed early and late in the season. There are many pastures that it is not convenient to plow that may be harrowed late in the fall or early spring, and sown to grass, which would prove a great benefit to them.

Following the paper of Mr. Shaw, a paper was read

ON RAISING CALVES.

BY A. L. BRADBURY, MEMBER FROM FRANKLIN COUNTY.

Shall we raise our cows or buy them? is a question often asked by dairymen, as well as by many farmers who make it a part of their business to feed for beef as well as for the dairy, and as often answered in the negative. "It does not pay to raise calves," many say, "for we can buy them cheaper than we can raise them." "There are fools enough that will raise them for us," they will tell you. Now, when all other farmers become so wise that they will not raise any calves, I should be just foolish enough to raise all I could feed, because I should rather have a few cows to sell than be obliged to buy. Our experience teaches us, that we would rather not be confined to the selections those farmers make who rear cows to sell merely, for they deem color and beauty of form better recommendations than quantity or quality of milk. Even in the isle of Jersey, it is said they are sacrificing the excellent butter quality to form and color—and such is the case the world over. Animals that are raised to sell must look well, therefore if we continue the practice of purchasing our cows it will not be long before it will take three cows to produce the amount of butter or cheese that two will now. Whereas, we should, and can by careful selection and proper treatment in raising, raise two such as will manufacture as much milk as three do now. In such a dairy it would cost nothing to raise your calves and heifers, for the feed of the third cow would more than keep your dairy good, leaving the money from the sale of old cows to be added to the products of the dairy, thereby enhancing the profits, while in the other case the sales from the old cows will not pay for fresh ones, consequently obliging us to take something from the dairy products each year to keep the number good. If in one instance we gain fifty per cent., in the other we must lose fifty per cent.

Admitting that it is better to raise our own cows, how shall we raise our calves so as to retain the use of the cow in the dairy? Nature has provided milk as the food for the young of all mammals; also, in a few weeks, when the animal has become strong, and its digestive organs have become developed by use, that it shall seek its own food independent from its dam. The carniverous seeks flesh, the herbiferous grass, &c. This change must be gradual, or the digestive organs will be thrown out of order. Some animals will admit of this change much younger than others. How soon can we begin to substitute other food than milk for our calves? Not the first week, for the calf should have the milk of its dam for one week at least. Now, if we wish to commence to substitute something instead of milk, he must be taken from the cow and taught to drink and feed the same elements of nutrition the milk contains. One quart of milk contains about 1½ oz. butter, 1 oz.

sugar, $1\frac{1}{2}$ oz. caseine, and 70 grains of bone matter. Experiments have shown that one pound of oil or fat is equal to two and a half pounds of starch or sugar, thus one quart of milk contains of flesh forming material $1\frac{1}{2}$ ozs., of fat or heat giving material $4\frac{1}{8}$ ozs., or a total of $5\frac{5}{8}$ ounces of nutritive elements. Now, if we take out one ounce of butter to a quart of milk, we shall have removed one half of its value for the calf, which we must make up in quantity by doubling up or substituting starch in the form of buckwheat flour, at the rate of two and a half ounces for every ounce of butter taken away. The better plan is to gradually substitute skimmed milk for the new by adding new milk with warm skimmed milk for its morning and evening meals, and giving it skimmed milk at noon, for it should be fed three times per day at least. When the calf is four weeks old, it will do well enough on skimmed milk alone, provided it can have enough, with always keeping good sweet hay by it. Reared in this way, we have our milk for use in the dairy, and get much better calves than in the ordinary way of letting them draw the milk themselves until they are ten or twelve weeks old, then taking them away at once. A calf should not be weaned until it is four or five months old. In a cheese dairy whey and oatmeat can be substituted for skimmed milk, after the calf is two months old, with good success.

President GILBERT. The subject of dairying and stock adapted for the dairy, in all its relations, is certainly a very proper one for consideration at the present time. It is known by all who are familiar with the agriculture of the State, that dairying is assuming a greater importance than it has heretofore filled in our husbandry. It is becoming, and it is believed that it will still further become, of vast importance to the State of Maine. It is thought by those who have encouraged its increase and the introduction of new methods of manufacture, that dairy products are to become one of the leading products of the State; that our State is eminently adapted to this branch of industry. In view of this fact, no more important topic could come up before us at this time. The subject is now open to you for discussion.

Mr. LEE of Piscataquis. It is lamentable to see so many of our best calves sent away by express to the city of Boston, whereby we lose our most valuable animals, which, if reared by us, would be of great profit to our dairy. In my section, it has become almost a thing of the past to raise calves. The butchers pick them up and send them away. Consequently the farmers are left without their best breeds of stock, for in fact the choicest calves are the ones that sell most readily. I would recommend farmers—even the small farmers who are limited in their number of good dairy cows—to purchase these calves from our villages where extra good cows are kept, and where, generally, the calves are butchered. It has been my practice to secure these calves and raise them. Many of our farmers think it too much trouble to rear calves. It is delightful employment to me, and it should be considered so when we count in dollars and cents the value that is to be gained in raising these young animals. It costs but very little, but requires care and patience. After a calf is two or three weeks old he will thrive and do exceedingly well on skimmed milk, sour milk, etc. I wish we could induce our farmers to turn their attention more directly to raising calves, instead of allowing the butchers to "gobble" them up and send them off to market.

Mr. Mallett of Sagadahoc. Inasmuch as we differ widely in our opinions of good feed, I hoped our brother who treated upon the care and feeding of milch cows, would have been more explicit and given us his ideas of good feed for such animals. I find sometimes in the statements of our agricultural fairs a great difference in the manner of feeding cows. Whether those making these statements all give the facts we have no means of knowing, exactly, but that is what we want. I believe that a cow is a machine to a greater or less extent. That there is a difference in cows we all admit. What one would call good feed another would not. Some say that grass alone is sufficient, and I presume it is, when of the right kind and in abundance. But hay, unless cut very early, is not considered good feed by many and even then not always. I wish he might explain to us, as he has not done it in his essay, what he considers good feed for milch cows.

Mr. Shaw. In writing that essay, I thought it not necessary to give the details of my experience, but as Brother Mallett requires what my ideas of good feed are, I am willing to express them here or anywhere else, when called upon. In the first place we know that we have got to feed a certain quantity to supply the wants of nature. If you furnish warm and comfortable quarters it will require less food to supply the wastes of nature and keep up the animal heat than it will in cold and exposed positions. Good feed for a cow, in my opinion, is grass that is cut before or as soon as it is in blossom, and if you add some provender it will prove a benefit at the time and afterwards. I am in the habit of feeding it to my cows more or less through all the winter season. In the summer, when there is a large crop of grass, in the height of feed, I do not think it essential to feed much of any provender and am not in the habit of feeding any myself. But after the pastures dry up I feed corn or provender of various kinds. I prefer cotton seed meal, with bran of the coarsest kind, which I think cheaper than the finer kinds, for the money we pay for it. I feed from one to two quarts of cotton seed meal and from four to six quarts of bran. This, with well cured, early cut hay, is good feed enough for any cow. If the cows are in milk it will keep up the supply, and if not, it will keep them in good flesh and bring them in all right when they drop their calves.

In the winter of 1871 I weighed my hay and gave about 15 pounds a day to each cow, and from four to six pounds of provender. I feed only three times a day. If I am giving my cattle a poor quality of hay, in the morning I make a practice of feeding twice, but not so as to have any time intervene between their eating up the first and commencing on the second, so that it virtually amounts to one feeding. I do not give the provender with hay unless I cut and wet the hay, which I sometimes do. I think a little more than 15 lbs. would not hurt cows. At the time I speak of I was rather short of hay. I sow herdsgrass, clover and redtop and am preparing a piece of ground to sow orchard-grass, which I believe to be valuable.

Winslow Arey of Hampden, said that he had found that a cow would eat 20 lbs. of hay and two quarts of meal a day, and that the same quantity would be eaten by seven sheep. He made other remarks in explanation of his system of rotation of crops, etc.

Mr. Colburn. I was unfortunately out when the papers were read and cannot take the subjects up as intelligently as I could had I heard them. In regard to feeding dairy cows, I do not suppose there is a farmer in the State who does not know that unless you give something to an animal to produce the article you want, you will not get it. As far as my own experience goes, in the summer I consider good high land feed to be all that cows need, if you wish them to hold out. When the grass dries up in the fall, if you wish to keep up the flow of milk, you will feed with roots. I had rather have beets than anything else. A few shorts and a very little meal will not hurt a cow. In winter, I know of no better food than good hay, cut when the grass itself does the cattle the most good. We know that in June, when the feed physics the cattle, some farmers will say it is too early to cut hay; that it will physic the cattle in winter. When do the cattle thrive most, in June or October? I say, cut it from the 20th of June to the 1st of July, and have it so it will come out of the mow smelling as sweet as grass. By feeding cows on that kind of hay they will produce just as good an article as they would if fed on the grass when it was cut. You will get just as highly colored butter, and just as good a grain as when in grass. I consider that about all a cow ought to have in the winter, if you mean she shall give you milk until she is twelve or fourteen years old. You can get more cream and butter by giving cotton-seed meal and the like, but it is for a farmer's interest, when he gets a good cow, to make her last, and not to drive all out of her that he can, as is the interest of those who keep cows and supply milk in the cities. I have now a cow, twelve years old, and she is as smart and young as a two year old heifer. Others not five or six, show more signs of age than she does.

Farmers are a little hasty in the spring for money, and sell their best calf for $10 or $12 in March, though it comes from the best cow, running the risk of rearing a calf the coming June, it may be from the poorest cow, as the calf in March will fetch the most money. And then again, it costs more to raise an early calf, because butter is high and the milk worth more. But it need not cost much to raise calves early. For the first week I let them have half of the milk; then I take them off and teach them to drink. I let the milk stand from 24 to 36 hours, skim it, warm it milk warm and give it to them, six quarts to a feed, twice a day for the first week or fortnight; then I increase the quantity so as to give them all that the cow will give. When they are about four weeks old I put a little shorts, oatmeal or oats, cooked potatoes or crusts of bread, in a trough where they can get at it. After they get so as to eat too much, I allowance them to about a pint and a half of oats a day, or something equivalent; and so right on until they are six or eight months old, increasing the feed. I give them milk until they are four months old. If you want to carry the calves up to great growth early, keep them up for eight months; but I usually turn them out to grass when four months old. The first winter I feed some roots with good dried grass, not hay. I have by this system of feeding matured my Jersey calves at seventeen months old. You must not let the milk sour. By this means you will have your milk and cream, and your calf too, and your own choice of calves. If I buy a cow she will probably not, during the first year, give over half the milk she has been giving, for the reason that every cow on the premises is hooking her; she is homesick, and will not eat as she would where she was brought from. Consequently I lose the first year on that cow, and it is a great drawback. For thirty odd years I have been dairying more or less, but the first good cow I got I kept her heifer calves, no matter how high calves were. It does not always follow, however, that a good cow will produce a good calf. If I rear a calf and find she is not going to make a good milker, I dispose of her. I know some men in my vicinity who are keeping twenty or thirty cows, and the calves take all the milk through the summer. You see how much could be saved by giving the calves skimmed milk.

Mr. CHAMBERLAIN of Piscataquis, (a former member). While a member of your Board I was called upon to write an article on "Stock Breeding." As I had been out of farming for seventeen years I knew very little about it; so I commenced looking around. I learned from a Scotchman, that if you wish to raise good dairy cows you must commence with the calf, and feed as you would a cow, to get the greatest quantity of milk from her. I have found from my experiments, that it requires not only a great deal of care, but it takes a great deal of brains. I had no idea until I attempted it, how much trouble it would be, but I think I have worked the thing out so that I can warrant myself in raising a good cow every time. I owned at one time a young Jersey that gave 16½ lbs. of butter a week. I saw the owner of her calf a few days ago, and he told me that through the month of June, in thirty days, he made 91 lbs. of butter. This result was no doubt due to the feeding when she was a calf. I now own a half-breed Jersey cow, from whom I have got three calves. She has paid me, in butter alone, more than the expense of raising her and her three calves, for which I have been offered $150, and refused it because I wanted to continue the experiments I have begun. I let my calves suck but four days. I then let them have new milk, all they will drink, for a week, and after that change to skimmed milk. I consider skimmed milk one of the best things that you can give a cow to make her yield milk. That has been my experience. If I have skimmed milk, I give that to my calves, if not, I give them hay tea; and as the gentleman last up remarked, I had rather cut my grass a little before than after it is in blossom, so that it is rather dried grass than hay. My calves get that and warm drink the first winter. I never allow them a drop of cold water until they take the grass the second season; and I have never seen one of my heifers shiver in the coldest weather. My two year old heifer, that I brought up in that way—two years old the 25th of last August—calved the 27th of May. The first week I milked her, which was the last four days of June and the first three of July, she made 8½ lbs. of butter. If I can increase her as I did the one before her, she will make more than 21 lbs. of butter a week. It requires nothing but careful feeding from the first start to develop their milking qualities. New milk will do for oxen, but it will develop too much fat for heifers. I have a steer three-quarters Jersey and one-quarter Ayrshire, that was fed on new milk instead of skimmed milk for the first six or eight months. He was two years old the 31st day of last April, and now girts 6 feet 3 inches. That is one of the small breeds, and cannot be made a large ox of. I have fed calves with sour milk and had them bloat up and stop growing for a month; but a teaspoonful of pulverized charcoal will prevent that. I do not give any provender to my calves when I have a plenty of skimmed milk, until they are a year old. I give them enough skimmed milk night and morning so that they require no drink during the day. In feeding young calves, a man must learn by experimenting how much to give them. I always feed a small quantity of roots in the winter.

President GILBERT. This matter of dairying, as I have before said, I am particularly interested in, for to it I am indebted for a large share of what I possess at the present time. I have experimented very much in the use of skimmed milk food as for calves and other animals. I do find it of value. Yet I am ready to say what I said last winter: that in very many cases its value is overestimated. For instance, I heard a man say, who is situated within convenient reach of a cheese factory, that he would not carry his milk there, for his skimmed milk at home was worth more than he could get for his new milk at the factory. That is an extravagant statement. I visited a distinguished butter maker, a man who is getting rich, as farmers use the term, by the production of butter. He counts largely on his skimmed milk. I asked him what he valued it worth per quart to feed to his pigs, (he feeds it wholly to them), and he said it was worth three cents. Now, gentlemen, I do not believe their stories, when people tell such exaggerated ones as that. My experience is, that when a man places over the value of one cent a quart upon skimmed milk he gives it a greater value than it possesses. I recognize in it a value, which is worthy of attention in the economy of the farm. It should be made available, and I know from experience that good calves can be raised upon it. I have good ones running in my pasture now, thus raised; but in raising them I have obtained hardly one cent per quart as the value from the food given. A suggestion was made last night that weights and measures were of value in dairying. I was sorry that this subject was not gone into at greater length. I know a farmer in Androscoggin county who has got a herd of cows. Sometime since he bought a scale and put it on a shelf at the side of his dairy-room. Any time when he wishes to know how much a cow gives, he claps the pail upon the scale and ascertains in a minute. If the dairymaid has made up a nice board of balls of butter, and wants to know how much it weighs, she puts it upon the scale and there is the record in a moment. When a fine cheese comes from the press, and he wants to know what that cheese weighs, all he has to do is to clap it upon the scales. If you weigh the milk from a cow as she gives it you know just how much she gives. If you guess at it, you do not know anything about it. If farmers will invest a ten dollar bill for a good scale, it will be of more value to them in their business than the best thoroughbred Shorthorn or Jersey raised on skimmed milk, or new milk, in the State of Maine. It shows to you at the time just what you are doing. It absolutely compels you to make improvements. And, depend upon it, all of your profits will come from good feeding and the liberal product you will obtain from your cows. With a scale, this is all pointed out to you. It shows you your errors, and detects your poor cows. It spurs you on to new efforts, and to investigation and earnestness in your work.

Mr. Barker of Aroostook. I have experimented a number of years on raising calves, and I think I can raise equally as good a calf on skimmed as on new milk. I have four oxen that I have raised, two on skimmed and two on new milk. The skimmed milk raised ones will bring the best price in market now. They have had nothing but hay and milk, have been kept in good condition, and raised in the barn. I sometimes turn them out, but usually keep them in the barn until the second spring.

AFTERNOON SESSION.

At the opening of the afternoon session, a vote of thanks was passed by the Board for the very attractive display of fruits, vegetables and flowers which had been arranged by the citizens of Orono, Oldtown, and vicinity, and which contributed in a large degree to the interest of the Convention, after which the programme of the meeting was resumed. The first paper of the afternoon was on

Co-operation among Farmers.

BY ISAAC E. MALLETT, MEMBER FROM SAGADAHOC COUNTY.

To the more thoughtful of those engaged in agricultural pursuits, it has long been evident that in many respects the farmer is conducting business on principles diametrically opposed to economy. While he works harder and more hours than any one engaged in other manual labor occupations, and with a destructive use of capital; while he is a good producer of genuine wealth, his products possessing great intrinsic value, being everywhere indispensable, he finds that for his labors and investment of capital he receives less returns than should fall to his share. In looking about for the causes of this discouraging result, he is impressed with the fact, that so expensive and complicated is the machinery of distribution by which his products are conveyed to the consumers, and his own wants in return supplied by the products of the manufacturer; that the greater share of the profits of the production is absorbed by those employed to effect the exchange.

That a large portion of humanity must be "go-betweens," to effect exchanges of the products of agriculture and manufacture, is true, but it needs no argument to show that the number engaged in mere commerce or the exchange of products should be as limited as practicable. So far only as they save to the producer and consumer time and expense in effecting exchange, are commercial agents or middle-men profitable. The speediest, most convenient and cheapest method of effecting exchanges should be sought for and adopted, and I think all will agree that such an one is that which does not unnecessarily multiply mere "go-betweens" of traffic. A distinguished writer once said: "Commerce is designed to bring the producer and consumer into relation, that is, if it has any object. But in itself it produces nothing, it adds nothing to the commodities which it circulates. It is obviously, then, for the general interest to reduce 'commercial agents' to the smallest number, and to carry over the excess to some productive employment." Is it not now precisely the contrary? The agents of commerce are multiplied beyond measure; designed only to play a subordinate part, they have usurped the highest rank; they absorb the largest portion of the common dividend, out of all manner of proportion to the services they render. They hold the producer in servile dependence; they reduce to its lowest terms the wages of workmen, and they extort from the consumer without mercy.

The truth of these words is manifest on every hand. It is found in the fact, that while the agricultural interests are wofully depressed, our great commercial centres are growing in wealth and population with almost fabulous rapidity. The butter, for which the farmer can scarcely get the cost of production, is accounted in the adjacent cities as being beyond the reach of the common people. As was said by that earnest friend of American labor, Horace Greely, "the machinery whereby vegetables and fruits, for example, are collected from the farms and gardens of the producers and supplied to the neighboring cities and villages, is nearly as expensive and rude as it was in the days of Homer and the elder Pharaohs." It is estimated upon careful calculation that fully one-fourth of the earnings of the poor in cities is absorbed by the profits of retail trade, and mainly of the trade of what they eat and drink.

On the other hand, the farmer bled in selling, is also bled most unmercifully as a buyer. Nearly every article which comes to him from the manufacturer passes through many hands, each adding to the price until the amount he pays is like the Irishman's definition of preaching, "all cost, and purty much all profit." It is safe to estimate that he pays a trader's profit of from 10 to 100 per cent. over the cost of manufacture and transportation, on nearly all that he is compelled to purchase. Submitting to this double toll, is it a wonder that the farmer, the most frugal of men, can scarcely make ends meet, and keep off the dreaded mortgage, which like a millstone drags him down to insolvency? Is it a wonder that he looks over the field with a rueful eye, when he sees but little if any added wealth as the result of his unremitting labor, and perhaps depreciated soil? It is evident that something is wrong here. The fault is not in Providence for sending poor crops, neither in the paying of high rates of tariff and freight, wholly. I believe it lies mainly in the fact, that the farmers are tolerating a cumberous, imperfect method of effecting exchanges, and are paying very dearly for it. It is a system which, while it draws legions from the productive walks of life, lacks a single element of economy, and is likened to that system of civil service which multiplies offices, and thus renders the transaction of public business tedious, complicated and expensive, for no other reason than to furnish a government an excuse to employ an exceeding great multitude of officials, which no taxpayer wishes to number. The old times of few and simple wants, have gone by. Civilization, as it advances, is constantly increasing our wants, constantly placing before us the temptation of new objects of desire. The list of articles we must purchase is almost certain to increase. It would seem then that a system should be devised by which the farmer can buy and sell to the best possible advantage. How this can be done, is a question that is freighted with much importance, and one that is worthy of patient study and careful experiment. For the accomplishment of this result, various methods have been suggested, and all proceed upon the idea of co-operation, or association in some form; and it is a modified or partial co-operation that I believe in and would encourage. I am well aware that this idea of co-operation is rather repulsive to the Yankee farmer. His social science has long been summed up in the old adage, "Let every tub stand on its own bottom." He has cherished the idea of sturdy independence and reliance upon his own resources until the thought of co-operative effort strikes him as a very thin quality of moonshine. No other class of men are so sure to have an opinion on *all* subjects as your average Yankee farmer, and none are so sure to be sure that their opinions are right. The thought of submitting his efforts to the direction of others, or investing his capital where he cannot exercise full control over it, strikes his sturdy instincts as a parting with his birthright degrading to his manhood. So marked is this dissociative spirit of the farmer, that he can hardly co-operate in the organization of a church, without losing his religion, or in the location of a school-house without jeopardizing the cause of education in his neighborhood. The establishment and direction of a cheese factory is a tremendous pressure upon his *milk* of *human kindness*, as he must unite in action with others, each sure to have a different plan of procedure, and each equally persistent that his own idea shall prevail. The county agricultural society is, through the knotty-headedness so peculiar to the farmer, a "debating club," where questions are decided after hot debate, to the satisfaction of but few, and the *lay members* generally agree only in regarding the management of the society, as a Denmark of rottenness.

Notwithstanding this tendency of the farmer to isolation and to distrust the views and integrity of his fellow-men, I shall venture to suggest as to whether the farmers of Maine may not enter into some arrangement whereby they may the better protect their interests. The present is an age of coöperation. The merchants have tacitly ceased their competition, which they find to be the death of profit, even though it be the life of trade. Coöperation crops out everywhere, as well among the rogues who form political rings and get up corners in stocks and produce, as among those more modest and less mischievous knaves who rob clothes lines and break open safes. I think we should combine in the purchase of many of what we call the *necessaries* of life, at least, and thereby secure them by paying less of *profits*.

It would cost but little to introduce and try the experiment, and it it should fail, no *great* amount of capital will be sunk in its abandonment, and I think that *some* of us, at least in my county, will try the venture, *hit* or *miss*.

It may be objected that such a course of business would tend to thin out the non-agricultural portion of the rural population. To some extent it might, but it seems to me better that the little trade nursed villages should grow less rapidly, than that the farmer's broad acres should be shingled with overlapping mortgages. It is better that less enterprise and capital were devoted to mere trade and more to manufacture, and the development of our mineral wealth and the improvement of our magnificent water powers. If fewer of our young men went to clerking in stores, and manfully turned the tape-reeling, calico-measuring business over to the girls, and went out into the ruggeder paths of enterprise, where manhood grows strong with struggling—if they sought some pursuit which brought into requisition all the grand capacities coiled up in the brain of the Yankee boy, it would be better for them and for all.

Following the paper of Mr. Mallett, the President of the Board, Z. A. GILBERT, ESQ., gave an address on "Progress in Agriculture." This being a portion of an address previously delivered by him before the Sagadahoc Agricultural Society, it is, in accordance with the wishes of the writer, inserted entire in connection with the Transactions of that society, in the second part of this volume, to which the reader is referred. At its close, Prof. M. C. FERNALD, member at large, and Professor of Physics and Mathematics at the State College, in response to a call, said,

"I do not know that I am in readiness to add very much to what has been said. I have listened with very great interest to the rich and suggestive paper presented by our President. There is one idea, however, that it seems to me will bear a moment's consideration in connection with that paper. The speaker has dwelt upon the subject of "Progress in Agriculture." He states that within sight of his own dwelling there are nine empty farm houses. Why are they vacated? Because those who occupied those houses can get larger remuneration from some other kind of business. It occurred to me to ask, What has been the character of their farming? Have not those farms degenerated in the treatment which has been adopted? There is another barrier to the highest condition of agriculture, which is not met with in more densely populated countries; and that is, there is too much area about us through which we can extend our operations. Hence, our farmers have adopted the ruinous policy of taking crops from the soil without returning an equivalent, trusting to those outlying lands for renovation. That is, they will take up a new lot of land and abandon the old. Why are so many of our farms abandoned here by individuals who go West and take up farms there? It is because they have robbed the soil here and not made proper returns. It is a standing fact, seen and read of all men, that there are numerous, yes, almost unnumbered farmers, who carry on a process of agriculture which finally leads to the impoverishment of their lands. The point I wish to make is this: We do not come up to the highest standard of agriculture until every farm in this State, and every farm in every other State, can be so cultivated, and is so cultivated, that that farm is constantly improving, becoming better and better, and yielding richer returns year by year. When our farms are so cultivated, then they will pay. The speaker has said that it is sheer nonsense to say that farming does not pay; but nothing short of good farming pays.

Nothing short of good farming will enable the farmer to compete successfully with the manufacturer and the mechanic. If a good type of farming does not pay, there is something wrong somewhere. Either farming is overdone, or a screw is loose in some place. These other industries should be carried on at the same time with farming, but farming must compete with them as all the other industries of life are dependent upon the operations of the farmer, and the prosperity of a people depends upon the united prosperity of all its interests, no less of the manufacturer or mechanic than of the farmer. When the highest condition of our agriculture is attained, I believe that the farmer will compete successfully with all of those other industries, and his farm not only yield him good returns for his investment, but be improving constantly.

There is one other point I wish to allude to for a moment. The speaker said that the farmer pays all the taxes. My sympathies are, and always have been, more fully with that idea; and yet, let us glance on the other side and see if the mechanic, if the manufacturer is doing any wrong. I simply raise the point; I will not undertake to settle it. In what way is the manufacturer to make his business a successful one? Does he not, after all, resort to precisely the same methods as those to which the farmer resorts? It has been suggested, that in making his estimates he counts in the taxes he will have to pay, and the profits. Does not the farmer do the same thing when he puts his seed into the soil? Is he not looking for a return ten fold or a hundred fold upon the amount which he there invests? It is true, there must be labor done; but is not his entire business based upon the idea of large returns for a small amount invested? Does the manufacturer, the merchant, or the mechanic do anything more than that, after all? I do think the farmer has to pay unmercifully in comparison with those engaged in other interests, and especially the capitalist. But, after all, does not the farmer look for his returns in the same way as they do? I hope this question may be discussed more fully by those who may desire to do so.

President Allen. There is one more point I would suggest by way of "progress." I think it was not alluded to in the address, and it may seem strange that I should allude to it. I refer to habits of economy. Now farmers are, as a class, I know, noted for habits of economy. And yet, in the work of the farm, in the gathering together of that which is essential for the fertility of the soil, there is a waste of material, which, if it prevailed in a manufacturing establishment would lead to ruin. The competition among manufacturers is such that only the nicest possible machinery, the best stock, the most careful and scrupulous economy can secure any profits, and that profit is reduced to a very small amount. Take it in the manufacture of shoes and boots—two cents a pair is the profit of the manufacturer in the largest and most successful establishments. Said a manufacturer to me once: "What I have heretofore saved, simply in the method of cleansing the wool and preparing it for manufacture, is more than all the profits that I am now realizing." Were it not for improved methods, and the most scrupulous enconomy in the nice details, our manufacturers would not succeed. When I was out West years ago, I noticed the way in which the farmers harvested their corn, and remarked at the time that there was enough wasted on this farm to make a Yankee farmer rich. The corn was piled up and left exposed to the weather all winter. I asked with some surprise, if all outside was not spoiled. They replied that it was, but they gave that to the hogs. And yet, Western farmers complain bitterly of middle men. Perhaps there should be some complaint at the extreme end and not all in the middle. Now, among our own farmers I must confess that enough is wasted every year of that which would go to fertilize the land, to bring our farms generally up to a much higher state of cultivation than they are at the present time. I think, Mr. President, that with your skill in working out such suggestions, that would be a fruitful thought for an extended essay—*economy.*

The Convention then adjourned.

EVENING SESSION.

President ALLEN of the State College in the chair.

Professor JAMES LAW, of Cornell University, Ithaca, N. Y., was introduced in a flattering manner as the lecturer of the evening.

BONE DISEASES OF THE HORSE.

BY PROF. JAMES LAW, OF CORNELL UNIVERSITY.

Ladies and Gentlemen:

It is due to you that I should say that I am not about to deliver the lecture that I had intended, having been dissuaded from it as one that perhaps would not be quite so interesting to my audience as the plain talk (rather than lecture) which I shall give you this evening upon subjects in which I believe we are all directly interested, if not warmly so.

Structures. First, then, in regard to the structures which we find involved in cases of lameness in horses. These structures consist of the bones, the different elements which enter into the formation of the joints, and the tendons or sinews presided over by the muscles and attaching them to the bones which they move.

Bones. In regard to the bones, we have the structure itself, which is made up of animal matter in the form of a framework of fine fibers crossing and inter-crossing, forming layer above layer, so as to build up the mass. This may be shown by steeping a bone for a short time in a dilute acid which will dissolve the earthy salts and leave a structure that has precisely the form of the original bone. Every opening, every little eminence, every little roughness, is shown precisely the same as in the original bone. To look at it, it appears to be the bone itself; yet it is soft, pliant, elastic. If a thin bone, you may tie a knot on it, as upon a cord. The earthy salts intimately united to this give the substance, the firmness and resistance to the bone. The whole is built up in the most beautiful manner around the minute Haversian canals, which are just visible to the naked eye, as very small openings on the surface. Through these canals the blood vessels enter and permeate through the structure. These blood vessels are derived mainly from an external fibrous and vascular covering which invests the bone at all points except where it unites with other bones. This covering, called the *periosteum,* supplies it with material for its growth and preservation.

By way of showing the mode by which the bone is nourished from this periosteum, I may state that experiment has demonstrated that by keeping a young growing animal, whose bones are gradually increasing in diameter by deposits upon their surfaces, upon some kind of food that has a strong coloring element in it—such, for instance, as madder—which will be deposited with these other materials in the form of bone, the last or outer layer under the vascular covering will be of the bright red color of madder, and will, as a rule, continue this color after all the blood has been removed and the bone bleached white. And if you feed the young animal for a short time upon madder, then upon ordinary food, and then again upon madder, you will have alternate layers of red and white bone. If madder has been fed up to the time of death, then the last layer will be red—that immediately under the periosteum. In a full grown animal the bone does not grow at the surface exclusively, and hence we do not have any such alternation of red and white by feeding upon madder or other colored food.

Diseases in the bone may result from injury to its covering or to the bone itself. We may have inflammation in the substance of the bone or in its covering. If this covering is stripped off a layer of bone dies and comes off. I have no doubt that some of you have seen instances of this kind, where from injury to the surface of the bone the periosteum was destroyed and the bone laid bare, either directly or by reason of subsequent inflammation, and scales of bone have come out before the part would heal up. In other cases, where the injury does not extend so far into the bone, when it sets up a slight inflammation, or an increased flow of blood to the part with a more active process of nutrition, we have an unnatural exudation or throwing out of plastic matter from the blood vessels, which produces a soft swelling in the site of the injury, and finally this swelling hardens and takes on the character of bone. This is the manner in which *spavins, ring-bones* and *splints* are formed. This exudation also takes place between the surface of the bone and the periosteum. The blood vessels that run from the periosteum into the Haversian canals are stretched or drawn out from the surface of the bone, and the cells around these blood vessels and in the raised periosteum develop bone, that being their natural functions. If we could transfer the periosteum from one part to another we could build up bone, or at all events a certain amount of bony material in altogether unnatural places. This has been sometimes done. A piece of the periosteum has been transplanted to a place where a portion of the bone has been lost, has become attached to the original vascular tissues, and has begun to develop its own proper material, building up a new bone. If the inflammation does not proceed to the extent of inducing the formation of white, creamy matter or pus, when it subsides the normal cells in this situation begin to resume their wonted functions, and to build up bone and deposit earthy salts, and we have not a soft but a bony swelling. That is essentially the *rationale* of the building up of new bony matter in *splints, ring-bones, spavins*, etc.

When the periosteum is stripped entirely from the bone, of course the bone must die. But in other cases we have disease existing in the interior of the bone itself. This is, however, an uncommon thing in horses. Inflammation rarely extends deeply into the substance of the bone of a horse. The tendency in such a case is to the softening of the entire bone, and instances are met with where you can cut the bone with a knife. This generally comes from the loss of cohesion in the place where the inflammation exists; also by reason of the tendency to exhudation, separating the original elements of the structure. But, besides this, a bone may be increased in size all over by a deposit on its surface, as we have already seen.

Joints are what we meet with in the limbs between the different bony segments. We have, enveloping the entire joint, what is known as the capsular ligament, having delicate *synovial* membranes for secreting the joint oil. Then there are also the binding ligaments, which unite the bones and allow motion only in particular directions. In case of a joint where we have a roller-like surface received into a corresponding cavity, these binding ligament are situated mainly at the sides, and commonly in the form of bundles crossing over each other, one being stretched in one position of the joint and another in another position. They allow a free movement backward and forward. In other forms of the joints we have these binding ligaments arranged in different positions. First, the bone is covered by cartilage on the gliding surface; next, the capsule with its synovial membrane to facilitate the gliding of one bone on the other; and then binding ligaments keeping the joints together. In some joints we have other structures; for example, fibro-cartilage to receive and envelope the ends of the bones, and adapt them to each other more accurately.

In diseases of the joints we have some one of these structures involved. In the lower animals this disease is commonly of the nature of inflammation. Thus we may have the ends of the bones increased in size. In young animals this is generally dependent upon a tainted constitution, upon scrofula, but in other cases diseases of the joints will occur independently of such taint from some jar or sprain of the ligaments, from a puncture, from over exertion, or some other cause, which produces a secretion of an undue amount of synovia (or joint oil) into the cavity of the joint, the synovia altered somewhat in its character, but still a liquid. This gives rise to the form of disease known as *bog spavin*, which is simply an over-distention of the joint capsule by such abnormal deposit of the joint oil—between the bone usually called by horsemen the thigh bone, and the small bone of the hock—the place where the greatest movement takes place. *Bog spavin* is unfortunately a very indefinite term. It simply implies an excess of joint oil, and may exist in an animal which has never been lame and is never likely to go lame. It is of no consequence in itself, and will not impair the value of the animal in any degree for use. It is only an eye sore. In other cases it is due to inflammation of the joint caused by strains or other direct injuries of various kinds. Upon these joint surfaces, which are naturally in a fresh state covered by gristle, we have in such cases a modification of that clear, elastic gristle. The cartilage undergoes a change into a fibrous structure or material, so that in place of having a simple gristle covering the bone, we have a sort of velvety fibre; that is, the surface acquires a velvety appearance from the development of fibres. We have really a fibrous structure where formerly there was nothing but a clear, homogenous substance enclosing the cartilage cells. If this goes on further, we have the gristle absorbed and the surface of the bone exposed, and it may become ulcerated, forming quite a deep cavity, with ragged edges. These are, perhaps, the more common causes of bog spavin. It may be simply from distention caused by overwork, which will naturally disappear with rest in the course of a day or two, if proper attention is given to the parts. In other cases it is due to disease of the bone or cartilage, or ulceration. A new deposit of bone of a very dense character may take place upon the surface of the bone when the cartilage has been removed by disease. You will see such surfaces in joints that have been the subject of long standing disease. Because of the clearness of such deposit it has been called *procelainous* deposit, or *eburnation*.

Sinews. These are dense, fibrous cords that prolong the muscles and attach them to the bones which they are respectively intended to move. They are clear, pearly and beautifully smooth in their natural state. They have very few blood vessels and nerves and are comparatively insensible. If you cut across them in a healthy state, there would be very little indication of suffering on the part of the animal. He would suffer far more by cutting through the skin, than through the tendons or sinews. Yet, when they become the seat of a sprain, they are exceedingly painful.

As the result of a sprain, over-distention or rupture of some of the minute fibres of the tendon, we have inflammation set up and exudation around and in the substance of the cord. Just as a rope that is wet becomes shortened by the water getting between the different fibres, causing them to pass over an eminence, as it were, instead of proceeding straight; so in like manner as the tendon is thickened, by so much is it shortened.

When this sprain occurs in the back tendons, you find that the animal starts forward at the knee or fetlock and is considered to be knee-sprung or to have an upright pastern, as the case may be, simply because these tendons are shortened and the animal cannot extend the fetlock in such an acute angle as it could before; this part must be raised, since the distance between the two ends of the cord is lessened.

Treatment. There are some general principles upon which we should act in the treatment of all such cases, and which I may lay down most conveniently at this point. In a recent injury, that is at all severe, it is of the highest importance that we do not irritate it. Give it rest, apply soothing applications and perhaps a dose of physic. Among horsemen, frequently the greatest injury is done by applying blisters and stimulating agents to severe sprains or injuries attended by active inflammation, before time is allowed to reduce the activity of such inflammation. The tendency is, where active inflammation is going on in any deep seated part, if a counter inflammation is set up on the surface corresponding to this part, to increase inflammation by sympathy; and in place of benefitting the diseased part we really aggravate the disease.

This applies to almost all such cases and even to diseases of the internal organs. In severe pleurisy an active blister put upon the surface will sometimes increase the trouble within. We find the same thing illustrated in the production of disease. For example: One of us may sit in a draft, and the cold air striking on the back part of the head causes catarrh. If it strikes on the surface of the chest, we have bronchitis, pleurisy or pneumonia. This is not caused alone by the driving of the blood from the superficial part to the interior. It is due mainly to a weakening of the interior parts, which become diseased in sympathy with the weakening of the superficial parts. And so it is in our attempts to cure disease. We find active inflammation in a deep seated part in the bone, tendon or joint; a severe blister put upon the surface would really aggravate the disease. A slight *splint*, a thing which would get well itself in a week or two if we let it alone, may thus be kept up indefinitely. By this treatment we render the inflammation much more permanent than if we had left it to nature alone. The rule is to try and diminish this inflammation, and this done it will gradually get well. That is a point which should be specially enforced upon horsemen, as they are so liable to err in pursuing the opposite treatment.

In slight cases of deep seated inflammation, a blister may be applied at once and with the greatest benefit. It is only in severe cases of this kind that caution is necessary. Perhaps by opening the bowels, by applying simple, cooling lotions, such as sugar of lead, and tincture of arnica diluted with water, or some such agent, to the surface for a few days until we have reduced the inflammation somewhat, and then applying a blister, we shall find the greatest benefit. A repetition of blisters even may be demanded. There has been more importance attached to the agents used than there is any reason for. We want as a rule, to set up some counter irritation upon the surface. We want an agent that will not injure the skin or cause the hair to fall off and the part to remain permanently bare. You can graduate the strength of any agent so as to prevent this and at the same time obtain all the good results. As an ordinary application for blister in the case of a horse, Spanish fly is as good as any, using perhaps two drachms to an ounce of lard. You can vary it by using some of those agents that contain iodine, such as iodide or biniodide of mercury, which are supposed to specially stimulate the absorbants. Anything which will produce the irritant effect is all that you want.

Injuries to the back. Returning for a moment to the different injuries to an animal, I have here before me a specimen of the lumbar vertebræ, with injuries to the backbone, quite a common condition of things in old horses. We have here a sprain of the ligaments uniting the different segments of the backbone. A careful examination of these points of union above the opening for the spinal marrow will show that the articulating processes on the part of the anterior bone become dove-tailed into those of the other. If the backbone is too much depressed by an undue weight placed upon the back and injury occurs in consequence of that, the point that suffers is where these bones jam into each other.

In *injuries to the loins* we have the lesion to this upper point, not below the spinal marrow, but above, in the joints. In the region of the back where these articulating surfaces are small planes, gliding smoothly over each other, the injury is sustained usually below the bodies of the vertebræ. Horses that have had too heavy weights placed upon their backs, or have slipped on ice, are liable to such injuries, become weak in their hind limbs and sway more or less in walking. They are tender at some particular point of the back where the injury has been sustained, as you will discover by pinching along the spine. Sometimes you may see a slight depression, but that is exceptional, and usually connected with a broken back. Later, in consequence of the swelling induced by the injury pressing upon the spinal cord, paralysis of the hind limbs may ensue. In such cases there is an indisposition and an inability, as a rule, to back. If you attempt to back an animal of this kind, he will keep his hind legs beneath him as long as he can, and if he does back he will do it in a sprawling, irregular sort of way. There is also difficulty in turning within a narrow circle. The animal moves with difficulty, and by and by begins to sway a little upon his hind legs. If the case is a slight one, there may not be any very manifest symptoms of this kind; but if you place a weight upon the back, you will immediately develop them. Another point is, that such horses do not lie down, day or night, and are more expensive to keep in consequence. Sprains of the muscles beneath the loins occur sometimes from the hind legs slipping back. In such cases there is a difficulty in bringing the legs forward, but no tenderness or flinching along the loins when pressed with the hand.

Injury to the nape of the neck is of common occurrence among horses. That takes place most frequently simply from a blow. The persistent character of this injury is mainly due to the fact that we have in this region great investing layers of white, fibrous tissue, extending from the head backward over the superior and lateral parts of the neck, so that when a blow has been given here and inflammation set up between these layers, the matter formed there by the inflammation cannot readily make its way to the surface as it might through softer tissues. It burrows beneath these layers, which it cannot penetrate, backward and forward, downward and across from one side to the other. Hence, swellings appear here, there, and all over this region. The grand secret of successful treatment is to supply a free, dependent opening. In aggravated cases the disease extends actually to the bones. Inflammation of the periosteum ensues, with deposits upon the surface of the bone, and even ulceration of the bone itself takes place. In some such cases it will extend to the inner surface of the bone and affect the spinal marrow.

But in the more common forms of this affection, what is wanted is, mainly a free opening, and one very much larger than people generally suppose to be necessary. Of course, if there is no indication of the existence of matter, the inflammation may be allowed to subside under soothing treatment and quiet, and above all, feeding the animal from a high rack; the head must be kept elevated. If you let him graze, almost invariably the gravitation of the blood forward and downward towards the head will aggravate the disease, or cause it to re-appear for at least a year after the injury has occurred. In less severe cases, merely cooling applications, with perhaps a slightly stimulating liniment by and by, may suffice. But in almost every case it is necessary to open a passage, and as I said before, a very free opening. Make the incision over the most prominent point, then inserting a probe, seek the lowest point of the sack; cut down upon it freely, and put in your *seton* or cord. The incision must be kept open until no discharge comes except from the narrow channel through which your seton passes. Sometimes a strong caustic to stimulate the parts to an active healing process will be beneficial. But, as a rule, if you make a free opening and keep it free, such cases will do well.

Fistulous withers are produced in the same way, and are similar in their nature. Sometimes, however, a part of the deceased bone has to be taken away in order to secure a perfect healing of the part. Other injuries to that region are common enough. But let us go on.

The fore limbs. First, in regard to injuries of the *Shoulder*. There is one muscle in particular, a large flat one extending from the head down to the region of the neck and shoulders, which acts upon the shoulder, drawing it upward and forward. This muscle, when the head is carried high, operates upon the shoulder and secures a tolerably free, high-stepping gait. Hence the common expression, if a horse commences to stumble, "keep his head up." There is some significance in this, in connection with the action of that muscle. But when the shoulder is painful in action the animal avoids moving it, and to insure this he carries his head low. Another point is, that in avoiding as far as possible this movement of the shoulder joint, the horse drags the fore limb in a swinging, outward and forward motion, in place of directly flexing it as he would naturally do. The tendency is also to drag the toe, and if the animal is in the stable he will be likely to stand with the toe resting upon the floor. The foot, as a rule, will not be pointed in front, although that may be done in some cases. That is rather an indication of disease in the foot. Raising of the heel and flexing of the fetlock and knee without any advance of the foot indicate disease of the shoulder.

Among injuries to the shoulder, is disease of the shoulder joint itself, which is usually very difficult to locate. You have this low carriage of the head, with circumductive movement of the limbs, that is, the raising or swinging out of the limb with the knee and fetlock slightly bent. The part is so thickly enveloped by a mass of muscle that it is almost impossible to cause the animal to flinch by pinching him, or to allow of any distention of the capsule being felt. A movement of the joint will sometimes, however, induce a severe pain and flinching.

The common forms of shoulder lameness are much more easily recognized. One is, the sprain of a strong tendon that passes over the front of the upper end of the arm bone and extends down to the bone of the forearm. That sprain is generally where it passes over the bony process, directly in front of the shoulder, at the most prominent anterior point of the shoulder. Hence, in cases of this kind, besides the symptoms that I have already enumerated, we have tenderness when we press on the point of the shoulder, as compared with the other side. If you notice a material difference in the flinching of the animal when you press upon one side from that when pressure is made upon the other, it will confirm you in your conclusions.

Sweeney, a popular American designation, is a sprain of the tendon of a muscle, which lies in the cavity behind the spine, on the shoulder blade. This tendon extends over the outer side of the shoulder joint and plays over this bony eminence on the head of the arm bone, and is inserted just below. Here, again, the injury is where it glides over the bony process. In speaking of this, I would not be understood as indicating that all of the cases of so called *sweeney* are really injuries of this tendon. Strangely enough, American veterinarians deny the existence of sweeney, although the term is current all over this country among horsemen and farmers.

When an animal steps unexpectedly into a hole, in the endeavor to recover himself this muscle is sprained. The same thing sometimes happens when a young horse is attached to a plow and steps in and out of the furrow incautiously. The result is a swelling, with heat and tenderness directly on the outside of the shoulder joint. The general symptoms of shoulder lameness already enumerated, are not so prominent in cases of this kind ; but if you stand directly in front of the animal and have him walk or trot up to you, you will notice that with each step that shoulder rolls out to an undue extent, as compared with its fellow. Place your finger upon this prominence on the outer side of the shoulder joint, and you find that it is tender. A little swelling is sometimes seen, although that is rather unusual.

The next result, is shrinking and wasting of the muscles on the outer side of the shoulder blade. Whenever a limb is thrown out of use, the muscles will commence to waste away. This wasting is sometimes so extreme that you seem almost to have the bare bone exposed. It is this that usually calls specially for treatment. Of course the original injury is to be met just as sprains generally are, but the wasting is to be met by exercise ; the animal must be walked about gently a considerable time on smooth ground. He may do light work on a farm—cultivating, if you like. Blisters, setons, or anything which will produce a free flow of blood and accelerate the process of nutrition to the part, may be used. Repeated blistering is usually necessary.

Injuries to the elbow usually give rise to a peculiar type of lameness, specially manifested by a starting forward of the knee whenever the weight of the body is thrown upon the limb. Whether the injury is a fracture of this bony process, forming the point of the elbow, or a disease in the joint, it is manifested by this peculiar form of lameness. When this joint is fully extended the bones will be pressed together with much greater force than is natural, hence the pain is increased, and the animal seeks to avoid it by standing with his knee bent, as in lameness of the shoulder. As a rule, he cannot be compelled to bring the knee back. He will when he steps forward, incline to start forward at the knee. Then there is usually a tenderness or pressure over or beside the binding ligaments on the inner part of the joint.

Injuries to the knee, and to the region below, are quite common. There is, just above the knee, a strong, white fibrous band, coming from the back of the bone of the forearm and joining with the flexor or back tendons, immediately above the bend of the knee. That occasionally gets sprained, although somewhat rarely. Much more frequent is a sprain below the knee where the *metacarpal* ligament comes off. This is by far the most common of the sprains of these back sinews, for this reason, that it is a small ligament joining the large back tendon, and acting as a stay ligament, the two together forming an inelastic cord extending from the back of the knee over two pulley-like bones behind the fetlock joint, and over two other pulley-shaped surfaces on the lower bones of the digit, and inserted finally on the lower surface of the foot. This ligamentous structure supports this joint from the fetlock downward, preventing undue extension, and bearing the strain when the weight is placed upon that limb; and being comparatively insignificant is the first to suffer.

Wind-galls. Other sprains of these back sinews occur, especially just above the fetlock or behind it, and give rise to thickening of the tendon, and wind-galls. Standing in front and slightly to one side of the animal, you see a thickening at this point. They may also be sprained behind the small pastern bone, or second bone of the digit, where the injury is by no means so manifest. But in pressing the thumb deeply into the hollow of the heel, you strike directly upon the affected spot, and the animal flinches.

Coffin joint lameness, (generally so termed), is still lower down. It is what is known in this section as *founder*. The injury in reality has nothing to do with the coffin joint, but with a small bone which lies behind that joint, and which prolongs the coffin bone upward and backward so as to constitute a pulley-shaped surface over which the tendon plays. This injury is exceedingly common in the fore limbs of our American horses. It is shown by a tendency to point the foot forward with the heel slightly lifted, by heat in the foot, especially in the region of the heel, by a tenderness in the foot, more particularly on the sole and at each side of the body of the frog, and upon the hoof wall when the parts are struck with a hammer; also by a narrowing of the heel and a dimunition of the whole hoof. A gradual narrowing of the heel is very characteristic, although not peculiar to this affection. Finally, there is tenderness deep in the hollow of the heel when pressure is made there with the thumb. But we must bear in mind in subjecting an animal to this test, that we cannot reach the situation of the injury, it being lower in the heel than we can get at with the thumb. We cannot reach the point when the tendon plays over the bone, consequently the suffering is only shown by putting the tendon on the stretch. I insist upon this all the more, because veterinarians usually resort to the pressure of the thumb in order to ascertain the existence or non-existence of this disease, and I rely upon it myself to some extent. At the same time, a sprain at the point where the tendon plays over the upper part of the small pastern bone would be a cause of much more tenderness under such pressure than would be shown if this injury existed lower down where we cannot reach it. We must then have resort to such symptoms as I have enumerated; the wearing away of the toe, the short, stilty gait when the animal is first brought from the stable, but wearing off with exercise, tenderness and narrowing of the heels, and the pointing when standing in the stable.

The injury at this lower point where the tendon plays over the *navicular* bone, is an injury which once seated, is almost necessarily permanent. The bone, in the first place, has an exudation into its internal structure. It becomes more dense in the interior than in its natural state. Then the surface becomes diseased and finally ulcerates, and we have little holes on the surface of the bone itself. After such a condition of things has been brought about, recovery of course is out of the question. Such cases are exceedingly obstinate, and if of long standing are irreparable, unless we can secure a union of the tendon and bone so as to have them move in one piece. That establishes a cure so far as the animals gait is concerned, although not a restoration of the original conditions. I have secured it in some cases by passing a seton down through the frog and keeping the animal for three months, perhaps, in a soft meadow without shoes.

In milder cases and in the earliest stages, this injury is best treated by soothing measures to the hoof and blisters applied above to the front and sides of the pastern, not to the heel, because of the liability to induce cracking or weakening of the skin. If you shorten the toe so as to take the strain off the diseased point and employ the other measures, success will be likely to attend your efforts. If not successful, and the animal cannot be kept in a wet meadow, take off the shoes and keep him standing in water up to the top of the hoofs during the day for six weeks or two months, and blister as above directed repeatedly.

This disease is one in which *unnerving* is commonly resorted to, but rarely with good results, unless the greatest care can be given to the subsequent management of the feet. Cases that have been unnerved and neglected are invariably ruined by destructive changes in the foot at an early period after the operation has been performed. A foot that has been unnerved must be shod with the greatest care, picked out and cleaned on every occasion when the animal returns from work or the road, and kept moist by wet bandages whenever he is left in the stable.

Splints. I will now refer for a moment to injuries to the splint bone in the region of the shank. In a healthy state this bone is united with the shank bone by a strong intervening fibrous structure, but when the bone itself is subjected to undue concussion, blows or other injury, its periosteum becomes inflamed, and we have first a soft exudation which by and by becomes solidified into a hard, bony mass, projecting more or less from the surface and uniting the two bones into one piece. The characteristic symptom associated with this is an increased lameness when the horse goes upon hard ground, and he droops his head much more than in cases of sprain or other injury. Hence, he will sometimes go upon soft ground without lameness, whereas on a Macadamized road he goes seriously lame. In such cases a general treatment of soothing measures followed by blisters will usually succeed in effecting a cure.

One other resort will sometimes be nesessary. In a splint of considerable size, but where it does not lie in the vicinity of the main vessels, arteries or important structures, so that there is no danger of injuring them, a narrow knife blade may be inserted under the skin and carried over the swelling, so as to divide this membrane and allow it to draw itself apart. By this means, a lameness that is obstinate to other applications will sometimes be at once relieved. But if the swelling extends back behind the normal level of the bone there is danger of injuring the main artery which lies there, and hence great caution is necessary. In short, it is not an operation for everybody to attempt, although one which will sometimes succeed where all other measures have failed. But splints are generally of so little consequence and so easily overcome by allowing rest and applying soothing applications, and perhaps a blister, that there is usually no need of resorting to such treatment.

Ring Bone. In the region of the pastern the most common lesion of the bones is what is known as *ring bone.* It usually begins at the lower end of the large pastern bone at one side, at the point from which the lateral ligament of the next joint below originates, which ligament is put on the stretch when these joints are fully extended. The very fact that the disease most commonly originates there, implies that it usually results from a sprain of this ligament through undue stretching of it. Hence, imperfect shoeing which brings too much strain on the one side or the other, or undue length of toe which increases the strain behind, will oftentimes bring about this trouble. It frequently occurs from concussions in horses with upright pasterns. Of course, it is manifest that the more upright this bone of the pastern, the more severe will be the jar on these bones.

This injury you may find at any point on these pastern bones. Whether it is at the upper or lower end, at the sides, or in front, it all comes under the name of ring bone. Still, you can understand that these lesions occurring at different points differ very widely. If from simple concussion or jarring, it is as likely to be on the front as on the sides; from sprain, more particularly on the sides. I think on the whole, I have seen more permanent lameness where the injury was at the side. When it becomes so extensive as to extend over the joints, and to interfere with their motion, or to completely abolish motion, of course then there is an end to anything like soundness. The lameness in such a case is very manifest, often extreme, especially when the animal goes upon a hard road.

The treatment has usually to be very severe; but it should not be adopted in that form at the outset. The precautionary advice which I have already given is quite applicable here. We must treat this as we would diseases of the bone elsewhere, and upon the same general principles: first, soothing measures, physic perhaps, wet applications and rest, the adjustment of the shoes so that the limbs may have the proper direction, that the toes may not be too long nor one side too high, compared with the other, perfect adaption of the shoe to the hoof; then blistering is usually resorted to, but in very many cases it is insufficient, as in the case of joint disease attended by ulceration of the ends of the bones. In such cases, very severe treatment is necessary — the application of a hot iron to produce more counter irritation than the ordinary blistering. I have seen very severe cases of *bog spavin* give way at once under this treatment, after having been blistered indefinitely without success. It is best to burn in points with a pointed iron, not keeping the iron long in contact with the skin, lest the radiation of the heat should cause permanent scars. If the burning is in lines it should be across the direction of the hair, so that the blemish will be covered by its growth.

I thank you, gentlemen and ladies, for your kindness in listening to my somewhat desultory remarks.

THIRD DAY.

Discussion on Dairy Farming.

The Board met at 10 o'clock A M.

President Gilbert announced that three-quarters of an hour would be devoted to a continuation of the discussion of dairy farming; and opened the discussion by saying:

Farmers are seeking for information to aid them in the direction of better farming, and the desire is manifested by many individuals who come to these meetings, to learn as much as possible of the system of associated dairying, and its profits as compared with farm or individual dairying, and also the comparative profits of butter and cheese making. It has been stated, that cheese making offers greater benefits to the farmer through the associated system than butter making. This is quite likely to be true to some extent. We are aware that in those sections where associated cheese making has been pursued and become an established business, farmers and dairymen are prospering; their soil is getting fertile, and they are gaining in the means to carry on their operations. The change in a few years has been very marked in those communities, and it is wholly due to the introduction of this system of associated dairying. Now then, is it a fact that where this has been introduced in our State farmers are meeting with like success here? Are the prices realized for the product satisfactory: are they equal to what is received in other sections, and are they equal to what has been received heretofore from the product worked up in the families of farmers—into butter, largely? These are certainly important questions, and ones which are receiving the earnest thought of enquiring minds at the present time. So far as I have been able to learn, the system of co-operative cheese making has been entirely satisfactory, and it is daily gaining ground in the estimation of those engaged in it. It is attracting attention from those who, though living in the vicinity of cheese factories, have heretofore declined to take any part in this new movement; they are accepting it as an advantage in which they can and should reap their share.

As regards the relative profit of the products of butter and cheese, I think that we may safely say that while in individual cases dairymen may be receiving more returns from butter making in families, yet when these products are averaged, when they come into the open market and are sold at average market prices the cheese dairyman has the advantage usually in point of profit. There is another advantage which is justly claimed for the associate system, and one which perhaps outweighs all others, and that is, the relief from work in our families. In order to increase dairying in the State of Maine, it must be practiced on this system; our families must be relieved of this incessant labor. The question arises, whether this system can be employed to equal advantage in butter making. That as yet has not been determined I think, in this State, although efforts are being made to test it.

Mr. Colburn. We are all well aware, as our President has said, that dairying at the present time is the most important branch of farming, from the fact that our farms, especially in the section where I live, are run down; and if we do not do something to bring up the fertility of the soil, to keep the products of the farm on the farm, and return them to the land again, we must sell out and go away. We cannot compete with other sections in raising beef and pork, and consequently we must depend upon the dairy. We know that there has been great improvement made by association in cheese making; but I very much doubt about that being the way to make our dairies pay, especially in butter making, although the experiment has not been sufficiently tried, if tried at all in Maine. We know that in making cheese there are not so many drawbacks as there are in butter making. However, I will not undertake to discuss the question as to making butter by association, but merely state my own opinion in regard to the two methods of disposing of our labor. In the first place, we run everything for its profit. A man who has got his thousands in his pocket wants to show what he can do, merely, not to see how much profit he can make, perhaps; but I have been always so situated that I did not dare to start anything unless I saw I was going to get a living out of it. We go out in the country and visit farm buildings that cost from $30,000 to $50,000 even—more than any of us poor farmers expect to be worth—we look at them and they are all very nice and just what they should be for the rich farmer, but they are not buildings the average, practical farmer can have. It is said by good cheese makers, that the same amount of milk that will make a pound of butter will make two pounds of cheese, and I believe that is not disputed by any one who has entered into it as a business. It may vary sometimes, but as a general rule that may be reckoned on as true. We sell our butter for from 35 to 40 cents a pound, and our cheese from 13 to 16 cents; and we have the advantage in dollars and cents on the butter. I contend that no man need to sell a pound of butter short of 40 cents. It is throwing away his money to do it, for a good article will always fetch that price. "It is too hard work for the women to make butter," it is said. I know we all want to get along easy; but why is it that farmers' wives and daughters are so much better than they used to be? The hard labor of butter making in the family need not be confined to them; they ought not to carry milk down cellar and bring it up; they ought not to churn. It is too hard work when you are making twelve or fifteen pounds of butter every other day. Let the men do it. They have to do the work in the cheese factories, why not in the families? And again, skimmed milk, as admitted by our President, is worth one cent a quart, which I consider a liberal estimate. That is one advantage of butter making. Then, we must have the same amount of help to milk twenty cows if we carry the milk to the cheese factory as we do when we make it into butter. We ought to have four milkers for twenty cows, and they can do the harder work of butter making. I know of a dairy in operation in Massachusetts, owned by Waldo Adams, the Expressman, where, I have no doubt, it costs ten dollars a pound for his butter, which he sells in the Boston market at seventy-five cents. That will not do for farmers who have to get a living from their farms. What we want is practical dairying, which will yield the most profit at the least relative expense.

Mr. STARRETT, Secretary of the North Waldo County Agricultural Society. I would like to enquire of Mr. Colburn, if he has ever ascertained how many pounds of milk it takes to make a pound of butter?

Mr. COLBURN. I have become pretty well satisfied that it will take from nine to twelve quarts of milk to make a pound of butter; but there is a great deal of difference in the cows and in the season. The same amount of milk that will make a pound in June, at this time of the year will make nearly one pound and a half. I have been milking ten cows for the last fortnight, and the ten cows give four ten quart pails full a day, and we make thirty pounds of butter, besides what we use in the family. When I was getting ten pails full a day, I made about 60 or 70 pounds of butter. Some say they have got a pound of butter from five quarts of milk, but I have not got any such cows.

Mr. STARRETT. Taking the returns of our cheese factories as published, I thought it would be on an average about $9\frac{1}{2}$ pounds of milk to a pound of cheese. I compared several analyses of milk as I had seen them, and I calculated it would be about $3\frac{1}{2}$ parts of butter in a hundred parts of milk. Assuming that this is so, that would take 28 pounds of milk for a pound of butter, or about three pounds of cheese to equal one pound of butter.

President GILBERT. I will answer the gentleman's question, with your permission. A practical farmer's test is always preferable to a test upon paper with pen and ink. From the best practical sources of information in this country—a test by the scale which I advocated yesterday—it requires on an average 24 pounds of milk to make a pound of butter; that will not be far from ten quarts. A quart of milk, milk measure, weighs 41 ounces, or $2\frac{1}{2}$ pounds, rejecting small fractions. A quart of milk, wine measure, weighs 35 ounces. In exact figures a quart of milk weighs $2\frac{15}{100}$ pounds. It makes very little difference at what time of the year the milk is measured. It makes a vast difference in the butter or milk product, but the weight is about the same. The factories of the country for the season, measure 9 pounds of milk to a pound of cheese.

Mr. BRADBURY of Phillips. Was your estimate based upon the whole season through?

President GILBERT. That was the general average.

Mr. BRADBURY. I recollect there have been a number of tests of that kind. I believe in our cheese and butter making we do not get all the cheese and butter from the milk according to tests by chemical analysis. In our factory it took about ten pounds of milk on an average to make a pound of cheese. That was a year ago, and the factory was run only in the early part of the season, when the milk is not as good for cheese making as in the latter part of summer, so that we did not get a full average of the season.

President ALLEN. I would like to know whether rich milk is heavier or lighter than poor milk?

Mr. BRADBURY. I have looked over some tables in regard to this question. Rich milk and poor milk must come under two heads: milk may be rich in casiene without being rich in butter; milk rich in casiene will be heavier than milk rich in oil of butter. The weight of milk is about .2030 compared with water, and the weight of cream about .2015.

Mr. BRACKETT of Belfast. I am in favor of the associate system of dairying, and have been for several years. I see no reason for changing my opinions from the lessons of this season or the last. The reason I have been an advocate is, because in Waldo county we have been from time immemorial following a certain system of agriculture; that is, we have raised hay and potatoes, and potatoes and hay, year after year, sold them off, and they have gone out of the State. Our farms have been growing poorer and poorer. Some of our farmers cast about to see what could be done to remedy this, and the more enterprising ones decided to test the system of associate dairying. That was three years ago, and to-day we have over one-third of the working factories in the State. We had nine factories in operation during the season, and shall have three more by next spring. The result has been entirely satisfactory to the patrons of these cheese factories, and it is a significant fact that there has not been a failure in a single instance. The results of course are not direct; those which we expect will be shown by associate dairying are not to be seen in a month or a year even. But the returns this year have been good in dollars and cents, because cheese has been high—higher than we can expect every year; and those associate dairymen who are present cannot expect every year will be so satisfactory as the present. We have a County Dairyman's Association, which fixes the price at 15 cents a pound for cheese. All the factories have sold for 15 cents and over, except one, which has sold for 14 cents. I have no doubt they will receive from 16 to 18 cents during the winter. We have not figured up the receipts in any of our factories this year, so as to know where we stand exactly, but we know near enough so that we are ready to start more factories next year.

We have not cows enough in our county, although we have been buying extensively from outside. In those sections where the cheese factories are located, the addition to the stock will be next year 35 per cent., on the average, if they can find the cows. That is one direction in which we have added to the wealth of Waldo county. The very basis, the foundation of my argument in favor of associate dairying is, that every year that an associate dairy is run in my own locality, that locality must be so much richer. I mean by that, that the farms are growing better. If you keep more cows, and supply milk to the factories, you have got to feed those cows, and necessarily some of the products of the soil which have heretofore been sent away will be eaten up and go back to the soil in the shape of manure, and instead of growing poorer each year, the ground will become more fertile. The women believe in the cheese factory, for it relieves them of a great deal of labor. Then again, it does not cost us a cent more to market a ton of cheese than a ton of hay, and we get a great deal more for the one than the other. An idea prevails that whey is not worth taking away from the factory. At the last session of our county association, that question was discussed, and the result of experiment was, that the whey when fed to hogs was of but very little less value than skimmed milk. I could hardly believe that, but there were proofs that could not be controverted. There was one man who purchased all the whey from one factory and paid $11 a month for it. He kept 40 hogs during the summer, and fed a portion of them with this whey, keeping them in good growing condition. We had numerous instances reported by persons who had kept one, two, or three pigs, and had fed them one, two, or three months with whey entirely, for the sake of testing the question; and it was manifest in their minds that the value of whey was nearly equal to that of skimmed milk.

Mr. Luce of Bangor. There is one thing to be said in favor of family dairying: If I can produce an extra article at home, I can produce an extra article at home, I can get a better price than any associate dairyman can, because my material is all first rate. If there is any tainted milk your cheese is injured; if there is a particle of tainted milk your butter will be injured; no matter how much milk and how little it is tainted, the taint will be manifest in the cheese or butter. The cheese business I think is a success, but I do not believe you will ever see the day that associate butter dairying will be successfully carried on in Maine. I thought I made good butter, but the gentleman from Kennebec [Mr. Colburn] has whipped me so hard this summer that I have not a word to say. I know that a nice article of butter, if you could keep it sweet all the year round, might be sold for forty or fifty cents. Between now and next spring that price can be got for it, if it can be kept sweet and nice. But I find that through the hot, sultry months of summer it does not taste like new butter long. I do not put my milk pans down cellar, for I want the pure air of Heaven to circulate freely around my milk.

Mr. Colburn. I did try to be modest about my butter. I consider 40 cents a pound to be a moderate price for butter, and there need not be a pound of poor butter made in the State of Maine. I saw butter brought into Boston market, which sold for a dollar and a quarter a pound. It is possible that your butter may bring that if you take the same pains to fix it up as those did who carried it to Boston market. It will not cost over a cent a pound to send it there. I know there are many people in New York and Philadelphia who are willing to pay even as high as $1.50 a pound for a first class article.

President Gilbert. The time for the discussion, is now up. One of the facts illustrated, and which we should bear in mind, is, that a good article will fetch a good price, whether it be butter from Kennebec or cheese from Waldo.

At the conclusion of the discussion, a paper was read on

The Province of a Board of Agriculture.

BY HON. GEORGE B. BARROWS, MEMBER FROM OXFORD COUNTY.

Voluntary associations and self-constituted organizations, can readily define the objects of their formation without inquiring of others; they are a law unto themselves, and not governed by the wishes or rules of other persons; they carry out the precise ends for which they were created; they ask for and receive from the sovereign power, the State, authority to transact their own business in their own way, with the simple limitation that neither the State nor its citizens are to be harmed by their doings.

But when the State creates an organization in its own interest, and to promote its welfare, to rightly understand its functions it becomes necessary to inquire for what purpose the State itself was formed. Or, when it assigns some trust to a select body, if specific instructions are wanting, we must ascertain what methods are pursued in other directions by similar organizations, and arrive at our conclusions by comparison or analogical reasoning.

As the objects for which all States are formed are not dissimilar, we can from one learn all, and by reference to our own articles of agreement we find that the several prominent objects are to establish justice, insure tranquility, provide for mutual defence, promote the common welfare, and secure the blessings of liberty. As the people are not able in person to attend to the administration of these distinct objects, departments are constituted, special assignments made, and persons appointed, so that the several original ends can be obtained. From an examination of these different classes all under the eye of the State, and its different agencies over which it exercises control, whether the banks, railroads, corporations and trade in general, the criminal and insane population, schools of instruction, the Courts or Legislature, we discover that they are resolved into one thing, and come under one head, and simply mean that through these agencies the State watches over and cares for its citizens, guaranteeing all their rights, and guarding against all wrong. The guardianship exercised by the State over its inhabitants is in quality and degree largely paternal; it is careful of body, mind and estate,—life, health and morals; and our highest conception of the perfect State in its principles and details of administration, would not differ much from the actual well-ordered family.

In the special consideration of our subject, it would be safe to conclude that were a State to create a Department of Agriculture, or Agricultural Institute, or Board of Agriculture, without specifying the precise objects of its creation, they might be legitimately inferred from comparisons with other State departments, even for dissimilar objects; the analogies direct and indirect existing between the others, could be rightfully supposed to be extended to still another or others demanded by the new necessities of the same body. But where conditions and requirements are connected with the act of creation, it cannot be denied that they must shape and control the subsequent action of those whose power to act is derived from their assenting to the original conditions. With reference to the duties and responsibilities of such organizations, something may be drawn inferentially from a simple consideration of the nature of the case and the necessities of the community. There are probably hundreds of young men in every State, who, during the current year propose to adopt the cultivation of the soil as their business for life; and there will be also many men advanced in years who will retire from business and devote the remainder of their days to rural affairs; the majority of both classes inexperienced, but desiring to start aright, and anxious to receive instruction in order that they may avoid the waste of their capital, whether of time, or labor, or money, in useless experiments. In many such cases, mistakes and failures mean not merely loss of money, but also of happiness and the comforts of life; and with what is called ill-luck, are involved in self-denial, sacrifices, and increased labors of the parents and the loss of privileges and opportunities to the children; all frequently ending in a giving up of the business, or in a removal to some distant region where appearances promise more favorable returns. The statement of this single class of facts without argument, indicates the responsibility that rests upon a Board of Agriculture, who are to be judged like all responsible agents, not only for what they do, but for what they leave undone. All such persons are in truth the wards of some supervisory body, and have the right to demand instruction and protection from their properly constituted overseers; and thus, in their necessities, we may see reflected other duties.

Whatever the nature of the power may be which is committed to this body, in extent, it includes the entire State, the actual material formation of land and water within its limits; it relates not merely to certain ideas, processes and systems, abstractions as it were, but to the nature, condition, capacities and necessities of the substantial, underlying earth itself. In its range it is not confined to the cultivators of the soil, but it holds relations to all the dwellers in the forest, the air, or the waters. When the State creates a Board of Agriculture it entrusts all the varied agricultural interests of the entire State to its care; and when the several members accept their election to the office, they take it with all its responsibilities, and thus agree to assume the charge of the whole State. While thus prescribing certain definite limits within which such an organization must properly move, and beyond which it is astray, we must admit that it is not to be regarded as a finished institution, and therefore all its metes and bounds cannot be well defined. The Board of Agriculture of to-day is not to be modeled from any past or present institution; it is not a copy, but an original; and if wisely arranged, it must be endowed with sufficient power of expansion to admit of its adjustment to the new and progressive requirements of agriculture.

A primary and fundamental element in such an organization should be, a capacity and desire to arrive at conclusions—to express opinions; recommend action. The individual or association that conceives nothing, originates nothing, leads an aimless and useless life; opinions there may be, but they are unsettled and contradictory, and like a house divided against itself and denying itself, they have a negative character, and the expression of the largest charity will be, that they never did much harm. For the one, or the many, it should be both duty and privilege to live, and move, and have a being; maintaining a positive existence, being in favor of something and affirming and maintaining something. Were the Supreme Court of a State to adjourn at the close of several terms, or a single term, without giving a decision, we should not consider it a mark of wisdom.

Why should a Board of Agriculture hesitate to avail itself of all possible information within reach, on any vital or essential point in agriculture; and why should acquirements of value be hoarded; do they not rightfully belong to the people of the State, and ought they not to be promulgated? He was both a wise man and a philanthropist, who declared that nothing relating to the welfare of the human race was unworthy of his notice; and in behalf of all intelligent and conscientious Boards, we assert, that they regard all matters involving the interests of their constituents, as proper subjects for their consideration.

A fundamental idea of the relation of such a body to the State, is not only that of trust, that it represents the State in taking charge of its most important interest, but also of supervision; and so in order that an intelligent opinion may be expressed concerning the agricultural resources and necessities of the State, a full and minute knowledge of them all is required. Such bodies if true to their duty, might almost be described as inspectorsgeneral, examiners-in-chief; having the whole domain under their watchful eye. By these expressions we do not wish to utter absurdities or to ask men to exercise the powers of Omniscience, for the necessary information may be acquired without personal examination or excessive labor ; but that there may be thoroughness and completeness in the discharge of duty, it is absolutely indispensable that this body should be acquainted with the territory of which it has charge ; and this aquaintance should not be general, but minute, embracing its special characteristics, divisions of soil, natural productions, unemployed capacities, with the prevailing modes of husbandry, in order that commendation or condemnation may be rightly bestowed. In these respects, all that is expected or required of one who is appointed overseer of an estate, may be rightfully looked for from a Board of Agriculture ; for all that relates to the agriculture of the State is committed to its care ; it has the oversight of the whole, it is sole trustee, and we may go further and assert that it is the highest authority, and deserves to exercise the highest authority on such matters ; for on no other body have similar duties or obligations been imposed. Wherever we find such a body without authority and therefore without usefulness, it is because it speaks timidly, as one having no authority, and because it exercises none. Were all the methods of husbandry perfect, were there no defects, no errors to be cured, no capital idle, no opportunities neglected ; the duty of supervision would be light—mere recreation. But under exisiting circumstances, supervision means direction, suggestion, correction ; and thus an efficient Board becomes a tribunal, a place for final appeals ; it must express opinions, make positive declarations, it must hear and determine disputed questions, and in the full exercise of its legitimate functions, it may not improperly be described as the Supreme Court of Agriculture in a State.

Improved agriculture belongs almost entirely to this century, and we are in a state of constant transition to better conditions ; *plus ultra* is the motto of the advanced agriculturist, and with such surroundings, those who have the charge of agricultural interests must not be like shepherds who prevent their flocks from straying, and are content to keep them safely where they are ; but rather the advanced guard, the pioneers in an onward march, going forward themselves in order that they may lead and guide those who follow ;—or as the watchmen upon the walls, who descry the coming danger and give warning, so that preparation may be made to avoid it; and who see the golden opportunity, and are ready to take advantage of it, before others have discovered it. The great body of farmers are not to be regarded as a multitude, a mass, or a mob, and left to fail of end and aim for lack of leadership; but they are to be marshalled, to be organized in their own interest, to be inspired with the spirit and power there is in numbers, and yet at the same time to learn the utter helplessness there is in mere numbers without leaders. It therefore becomes the duty of those who have the supervision of progressive agriculture, (and all other goes backward or downward) not only to be abreast of all forward movements, but to have their eyes to the front, anticipating all demands, and furnishing supplies for the new and pressing needs which each year brings. It is their duty to warn, and to advise, whenever advice ceases to be a glittering generality, and becomes a sanative specific; and to originate and introduce measures of improvement and reform. So far as meeting the necessities of our agricultural population is concerned, we believe it to be safe and for the best, to anticipate the demand; give the man bread before his hunger compels him to demand it, and whether we are supplying food for the physical, intellectual or spiritual man, it is always well to furnish him something as good, if not better, than that he asks for.

Such an institution, when it has attained proper development, becomes a department of agricultural instruction; and to it all learners and beginners will instinctively apply for information. Who should possess more information respecting new plants and seeds, and implements, and the recent discoveries and inventions? Why should there not be under their control a public reservoir for the reception of practical agricultural knowledge, derived from any and every source, however humble or insignificant, and from which in full and refreshing streams it shall flow again over the whole State? From such a source, may naturally proceed those influences and agencies which would give tone and character to a new system of agricultural education, and bind together with successive links the common school and the College of Agriculture. If it is the deliberate conviction of those who are best informed, that some elementary text-book on the cardinal topics should be put into our schools, from whom should the suggestion more properly come, and who ought to be able more influentially to secure the result? Is the complaint well founded, that the course of study in our agricultural colleges does not fit their graduates to become practical farmers,—or that other branches are presented so attractively, and such gentle force applied, that the student finds himself insensibly drifting from an agricultural life rather than towards it,—from whom should the corrective hint come, if not from this source? Or who could more disinterestedly or effectually dispose of such a charge, should thorough investigation prove it to be an idle tale? The education of youth in our seminaries may not only be promoted, but each year the positive and reliable additions to the sum of agricultural knowledge may be separated from the mass of chaff which too frequently hides it, and given to those men on the farm who are advanced in life but still eager to supply the deficiencies of earlier years. Thus a cyclopædia of facts and results could be condensed in an annual report, and made so useful and attractive that it might be difficult to furnish a supply for the popular demand.

Legislation in the interest of agriculture should originate with, or be matured by the Board of Agriculture. Those who are familiar with the history of particular statutes of this class, or are acquainted with the introduction of similar measures into the Legislature, are aware that they frequently originate in the whim of a single individual, or it may be, his deliberate and earnest desire; that often there is no concert of action among the agriculturists who may be members of either branch, that the agricultural public may not have previously agitated the question or expressed any preference in the matter; that for lack of care and thoroughness in preparing the subject a discussion may be long drawn out, and in the end the measure may be defeated by the opposition of the votes of those who would receive the most benefit from its passage, and whose aid might have been secured had the subject been properly presented to them at some previous time. It would be remarkable if a law should be passed prescribing the use of some revised system of tactics, or modern arm, or new uniform, by the militia, without in the outset consulting the preferences of those who have these things in charge, or obtaining some information from them. Or with still stronger statement we may say, that it is not at all probable that any such law has ever been enacted which was not suggested or approved by the most interested parties themselves.

We expect that propositions relating to text books in common schools, the creation of Free High schools, the establishment of a Normal school, or kindred measures, should proceed from the

Department of Education; either originating there from the opportunity the superintendent has of surveying the whole field, and seeing its deficiences and necessities; or else suggested by the experience of teachers, and transmitted by them to their proper head that they may receive his endorsement and be suitably prepared for legislative consideration.

If we may regard these things as just and reasonable, can we deny that similar duties and responsibilities, privileges, if we prefer the term, rest upon that body to whose care the still broader interests of agriculture have been entrusted? May not many such bodies be in fault for not already indicating to the Legislatures of their States that some forward movement should be made, or some advanced position taken? May not some conspicuous lack of enterprise, or intelligence, or foresight, damaging to the reputation of the State, be attributed to their own inefficiency or neglect? No reform, and no new measure or undertaking can be carried through without previous preparation and preliminary discussion; there must be agitation, principles must be held in solution, before there is any deposit—before a final result is reached. Who should arouse the public mind, enlighten it, give it wise impulse, and point out the way to be pursued? Certainly those who are competent to do it, whose business it is to do it, and who are visited by public censure if they neglect to do it.

If, for instance, there is ever to be further progress in the matters of the planting and the preservation of the forests, the protection of fishes and birds, the better regulation of the weight of grains, roots, berries, eggs, &c., the doing away with fences, the protection of sheep against dogs, &c., ought not the beginnings of such movements to be prudently devised and shaped by the highest representative agricultural body? Suppose that the latter measure is to be submitted for legislative action, and were a Board to send circulars to the several societies, asking for the statistics of damage done to sheep within their limits; asking also for signatures to petitions for a new law of protection, and then placing all before the Legislature, supplemented by the action of similar bodies and the recommendation of authorities of weight, &c.; is it not probable that the common sense of the average Legislature would yield to such a presentation, when it might be indifferent to the same proposition unaccompanied by authoritative sanctions?

As ordinarily conducted, the productive influence of a Board of Agriculture is limited to the transactions of a single week out of the fifty-two, and by the publication of these transactions the attention of the public is chiefly gained. It hardly seems right that their usefulness should be confined within such narrow limits, and that the amount of reserved power held in possession should remain unexpended. Without largely increasing their labors, it would be practicable to give their influence wider expansion, and even diffuse it through the entire year, as well as over the whole State. From the criticisms of those who may be regarded as unfriendly, or at least severe, we might judge that the papers on special topics ordinarily read at these meetings, rarely possess the merit of originality, but are more like compilations from the columns of agricultural papers or books; while others, dignified with the name of addresses, well enough for an unoccupied hour at a cattle show, are so full of general advice, instead of minute accounts of some useful experience, as to be both for hearer and reader practically valueless; while the discussions which follow are generally practical and useful, but neither more original or profound than those which the farmer hears at home in his own social circle. The conclusion of these observers is, that such utterances hardly deserve printing at the expense of the State, merely because they are delivered before a State association; and the complete report itself largely made up of such material is unfavorably compared with the average journals of agriculture, and generally classed with Patent Office Reports, which so lumber up our houses, and so provoke the merriment of humorists. From other quarters, comparisons are made with the assemblies of religious bodies, medical associations and other organizations, and the inquiry comes, Why not meet for similar objects,—to tell what has been accomplished, what remains undone, or needs to be done, and to devise measures for the further prosecution of unfinished work, or for entering upon new fields of labor? In this connection the example of our Provincial neighbors has been commended, as the meetings of their Agricultural Boards are reported to be valuable, not on account of the amount of manufactured product there exhibited, but for the preparations and arrangements made for carrying on work elsewhere and thereafter.

While all such comments may be erroneous, yet like much error they may contain some approximation or resemblance to the truth. It is right to be taught by our enemies, and most certainly by our friends; and it is our duty to avoid even the appearance of evil, and therefore to see to it that none of these censures have a foundation of fact to rest upon. In the peaceful fields of agricultural exploration and investigation there should be no room for antagonism or ungenerous rivalry; there is need of cordial harmony and union between the several associations and the rank and file of agriculturists, and all non-essentials should be sacrificed for the accomplishment of this end; and therefore to all criticisms, however conceived, conciliatory responses should be returned, and cheerful assent given to all reasonable plans for usefulness. A Board of Agriculture should be truly representative in its character, reflecting in all its attempts and operations the wishes of its constituents; laboring to provide for their pressing needs, striving to promote their highest good.

In pursuing the inquiry as to the general duties and opportunities which come within the purview of a Board of Agriculture, we find that the field widens before us; and therefore leaving this part of our subject, we will suggest some of the specific objects which we think may legitimately come within its province.

Established by the State to protect its vital interests, we believe that it should control the direction in which all money from the State Treasury goes for the promotion of Agricultural interests. Our own State has already indicated a similar policy, especially with reference to Agricultural Societies; and when this is carried to its full extent, so that this body will have entire control of the amounts and objects of all premiums offered, then will the highest good of the State be promoted. Without any undue assumption of authority, or any attempt at dictation, but by consultation with the managers of the several societies, by listening to their suggestions and wishes, a general programme could be adopted, with special assignments to appropriate localities by which latent possibilities would be developed.

By many observing men the opinion has been expressed that the annual cattle show and fair is the best Farmers' Institute; the public school for the working farmer, where the lessons taught are in accordance with the most approved systems of object teaching, and more easily appropriated and digested than anything found within the covers of a book. Through the corrective agency of a Board of Agriculture, a winnowing process in many premium lists would gradually improve the public taste and many objectionable amusements and performances would be eliminated, and wholesome substitutes introduced; so that as educators of the minds and tastes of the multitude, such exhibitions would have a new claim for public approval.

By a carefully prepared circular sent to the several Societies, much of the information heretofore referred to could be obtained; and in addition, once at least during the season of production, very full returns respecting the condition of the crops might be easily collected. This practice, which some regard as a mere gratification of curiosity, in fact affords the only sound basis upon which the farmer's decision can rest as to the disposition of his crops. In one of the frontier States of the West, a Board of Agriculture has already adopted this policy, about which the New England States will probably continue to hesitate.

Skilful calculators undertake to compute the gain to the world by the introduction of what were very recently novelties in the realm of agriculture; as specimens from a large list we need only mention the mowing machine, super-phosphates, the Early Rose potato, the Wilson strawberry, and the Concord grape. The liberality of a single individual, and the wisdom of an impartial jury, gave at once the latter a standing which otherwise might have required many years. Let us on our part undertake to foot up the loss, by not giving such valuable gifts from God earlier recognition; and then, without doubt, we shall be ready to give our thanks to any agency that is first and foremost in testing the merits of everything new that appears, and giving it early introduction. Ought it not to be the special province of the Board of Agriculture to appoint times and places for the trial of implements, inventions and new processes, or at least to have the general direction of them through the agency of the societies? Many farmers who cannot well afford it, are carrying on these experiments at their own loss. How much better to invite the interested parties to make public exhibitions and competitive trials, for example, of mowing machines and plows, and thus giving opportunities for examination and comparison under the most favorable circumstances, and saving much unprofitable expenditure. Might it not be possible that through this agency exhibitions of the steam plow might be made, that would settle the question of its value for companies or communities?

The special companionship or partnership existing between Boards of Agriculture and Agricultural Societies, would certainly allow that special aid from the former should be given with reference to the selection and laying out the grounds for permanent locations, the style of architecture in the erection of the necessary buildings, and all other equipments,—and even the programme of exercises, so far as it relates to both profit and amusement.

If some should entertain the opinion or the desire that Boards of Agriculture and Agricultural Societies should pursue separate paths—parallel perhaps, yet still disconnected and independent—then granting this which ought not to be granted, it may be said there is still a wide field of usefulness into which it is the province of a Board to enter. There is in every State a large number of thinkers and workers, who are earnest and active in promoting and developing agricultural interests; to them as well as to the State, large benefit would result could they come under some controlling hand. Let a Board call for an enrollment of such volunteers, and then in every town you would see Village Improvement Societies organized, shade trees, sidewalks, parks, greens, flower gardens, rural cemeteries, and all those things which not only gratify the eye, but add a new value to property, would receive fresh and full consideration. To organize all such willing laborers, to assign definite limits to their investigations, to receive and condense their contributions, and to prepare for publication all valuable matter, either in an annual report or by the public press, would not be out of place for such a Board. Whenever any attempt is made in the direction indicated, we may expect to find a new interest created through our entire State,—the ardor of invention will be kindled and quickened,—implements, roads, bridges, agricultural architecture, &c., will be more and more regarded. Collections of plants, woods, seeds, and insects will be extensively made, and young men and young women may begin a new life as entomologists, ornithologists, botanists or geologists.

To those who may say, All this is well enough, but too much is proposed and therefore nothing will be accomplished, it cannot be done well, and therefore ought not to be attempted; it may be replied, that while a Board of Agriculture should not shrink from any appropriate work which they may find to do, it is their special province to take charge of and direct the labors of others;—were it called a directory, the name would indicate its appropriate objects and harmonize with our State motto, Dirigo. It may be said that the desired improvement will come in good time, the lapse of a few years may bring it; let us remember that even this waiting, dooms some to poverty, ignorance and sorrow. An increase of production means an increase of comfort, better education, more civilization and refinement, opening wider the doors for human happiness. Is it not well to inquire whether any responsibility attaches to us, whether we are hindering the onward progress of our fellow men?

Although our inquiries have been pursued within narrow limits, while a broad field lies before us unexplored, still even here there is ample room for usefulness; and whenever a Board of Agriculture enters into full possession of its own lawful province, to no other agency will the State be so much indebted for the development of its resources, the addition to its wealth, and the increase of its population.

Mr. WASSON of Hancock. As the senior member of the Board, having occupied a position here since 1857, I feel that it may properly be expected of me, if a response were required to the very able and instructive paper to which we have just been listening, that I should make that response. While heeding the suggestions in that paper, my mind has run back through the fifteen or sixteen years during which I have been a member of this Board, and I have been asking myself this question: Has the Board as an organization during that period of time accomplished any one thing, has it made a mark, has it made a point? It has made one mark—I do not say that it has not made but one—it has established a record of which it may well be proud; and that is, that it has originated associate dairying in this State, as I believe. I well remember when this subject was first mooted at the Board, that I in common with my associates, supposed it a piece of folly; it might be well enough for New York, Ohio, or almost any other State, Maine excepted—but to attempt to introduce associate dairying in Maine was consummate folly, and the originator was making a terrible mistake.

We have the record before us to day, and I suppose that the position occupied by the speaker is a correct one, and should be impressed upon us with all its force and meaning: that we have something more to do as individual members, and as an organization, than merely to come together and discuss certain questions which may be casually presented, without any preparation; that there should be a design in our meetings, an object; to use another phrase, that we should have a text and adhere closely to that text during the session; that we should cast about over the State and see what are the wants to-day, to-morrow, of the great interest which we represent; that we should look at the past as well as the future. This idea seems to be generally accepted among the living agriculturists of the State—is it a correct one? That what have heretofore been regarded as among the staple products of the State, in consequence of certain exigencies which we need not discuss, are no longer to be regarded as such, and that we have but two things from which we may make a choice. One is something new to be introduced that shall become a staple product; the other is to abandon agriculture in the State of Maine. The time is very near, when the great leading interest of Maine, lumbering, must cease, and farming must take its place or Maine be abandoned. That is one of the great questions before us. It seems to me that every member of the Board, casting his eye over the section which he represents, should try to discover its local wants, and we should come together and intelligently discuss these matters.

The question of manufacturing butter by associated effort has been referred to here; the question of growing wheat, of growing any kind of grain; the question of growing beef and pork and mutton: these are all open and undecided questions. It seems to me that it is the duty of the Board to come together at our sessions so prepared upon whatever subject it shall take up, that we shall be able to exhaust the discussion upon that point, and demonstrate to those whom we represent that we are skilled in the topics of which we treat, so that they shall come to regard us as leaders and teachers. We have failed thus far, and most signally failed, with some few exceptions, in this respect.

AFTERNOON SESSION.

The Convention assembled at 2 o'clock, President GILBERT in the chair. The first exercise was the reading of a paper

ON LABOR.

BY HON. WARREN PERCIVAL, MEMBER FROM THE STATE AGRICULTURAL SOCIETY.

I have selected for my subject the dignity of labor. In this fast age of ours, very many young, and not a few old men, have come to the conclusion that it is undignified to labor in any capacity; that somebody owes them a living, without any effort upon their part, that they can consume the hard earnings of some honest laborer without returning any equivalent. The road of their fathers to wealth and preferment is irksome to them, because attended with labor. They aspire to some course of action requiring less labor, the result of which is mere false aristocracy, licentiousness, indolence, dissipation and premature decay.

I propose considering this matter principally from an agricultural standpoint, and as agriculturists are presumed to be laborers, the question very naturally arises, "Is it dignified to labor?" I do not mean physical labor exclusively, but I refer to all legitimate exercise, mental and physical, which brings legitimate results by producing something for our existence. Now, Mr. President, how came this beautiful world of ours into existence? Was it not the result of labor, intelligent, well directed labor? Do you imagine that the Creator conceived the idea that to labor with one's own hands, and heart, and brain, was humiliating? That some one else must perform all the labor, that the Creator was inferior to the created? Did He not by this example of His, by creating a world from nought, and after He had created it, with His own hands evinced to us, in every act of His, the absolute necessity of individual effort in order to succeed in any enterprize? Why did He create us human intelligences, with His own hands, and breath into us the breath of life, and then command us to cultivate the earth for our subsistence? Now then, is it not plain that in order to succeed as agriculturists we must ourselves combine theory and practice; and by so doing imitate our Divine Master? Hence, to be or attempt to be a "gentleman farmer," and ignore the department of labor, and the training of our children in that direction, is it strange, or would it be strange if they had a distaste for those pursuits, and the farm be abandoned and deserted by the sons and daughters of farmers who should be taught by theory and practice that true, genuine greatness, independence, aristocracy, and dignity is, to be your own man, do your own work, and receive your own reward?

I contend that parents and guardians are at fault themselves, in this matter, by creating false impressions in the early education of their children. The idea has prevailed heretofore, that more intelligence was requisite for success in the other professions than in agriculture, and what would naturally follow, better acquired abilities. The most promising son is selected and educated in the requisite departments, and graduates with honor from some college, at a large cost of time and money. He goes out into the world the pride of his father, and the joy of his mother, and a valuable acquisition to the literary world, ready for labor in his sphere of action. Another son is selected for some agricultural pursuit. A common school education is regarded as sufficient for him, as he is to be only a farmer. He graduates from the old school-house, or perhaps his father's farm-yard, and commences life in his sphere of action. The time, money, and parental solicitude expended on his account is comparatively nothing. The daughters are put through very much the same course, to be helpmeets of some of the sterner sex, in the various departments in life. One daughter must be educated at the most aristocratic literary institutions, to become the partner of some brilliant literary man, where perhaps, to do her own work, cook her own food, tend her own children, visit her own pantry, inspect her own domestic affairs, or even have any knowledge of these departments, would be regarded as undignified. Another daughter is educated in and for the humble walks of life, and when you find her in after years in her domestic sphere, what a strange contrast; yet all the natural result of natural causes. But who is at fault, if there be a fault? Why this unjust discrimination in the education of our children for the various positions in life? Is your son or daughter any the less a gentleman or lady because they do their own work, raise their own food, care for their own loved ones, have a knowledge of and inspect their entire domestic arrangements with their own hands, and make their homes comfortable and happy? Would not more equality in the education of our children be productive of more genuine dignity, and remove the almost insurmountable barriers between the peasantry and the aristocracy? I am aware that many influences operate upon us to create this state of things. Some are traditionary, others act from compulsion, while others act from the force of education. With some, labor is pastime, with others it is drudgery.

We learn from the Scriptures, that God labored six days to make the world, and rested the seventh day. We learn from this that labor was of divine origin. That it is, or was, the fundamental principle of all created things. I learned in my boyhood, from the same source, that by Him were all things made, and that without Him was not anything made. Hence, I am tenacious of this principle of dignity in labor, and I am strongly inclined to regard every man who climbs up any other way as a "thief and a robber." As to how much of our time we should labor spiritually, morally and intellectually: in other words, how much for the soul and how much for the body, or mentally and physically, there are diversities of opinions. I should be extremely happy to have some direct revelation how many hours should be regarded as a physical day's work; that we might have some correct guide in this direction, while capitalists are requiring (in some instances) over work and the peasantry are striving for under work. I would be quite willing for every healthy man and woman to labor more or less every day, as our Divine Master labored. I would prefer this in order to equalize the hardships as well as the pleasures of life. I think it was the design of our Creator, that all His creatures should be partakers of His good things, and all should bear the burdens of life; and by so doing labor is dignified pastime, as it brings with it its reward, which is very unlike that from indolence, vice and dissipation in circles where to labor is regarded as undignified. Were it possible for the human mind to conceive the magnitude of the result even of human labor in the advancement and perfection of the arts and sciences, from first principles to present progress in the application of steam, electricity, air and water, in utilizing all these elements to traverse sea and land with unerring certainty, and with the rapidity of lightning communicate with other continents, and almost with other worlds—would any human intelligence contend that the labor to accomplish all this was undignified? I was once asked if conscience was always a sure guide? I replied, "No, but an educated, enlightened and refined couscience is usually a safe guide." Now, perhaps some one may inquire, is labor always dignified? I answer, Educated, intelligent and refined labor is dignified, under any circumstances. I would not have you infer for a moment, that I undervalue any of the professions; very far from it. I honor every man who honors his profession. I venerate labor in every department in life, and I contend most earnestly that we should educate all of the professions upon the great common level of humanity; especially those that depend the one upon the other; and if one is more essential to the well being of mankind, that should have the greater prominence. And while I am fully convinced that agriculture in its various branches contains more essentials, I acceed to all others equal rights and privileges. Would you select as your spiritual adviser an indolent, ignorant and vicious man? Would you tolerate as your medical adviser one entirely ignorant of your organization? Would you apply to legal counsel who was wholly ignorant of the principles of law and justice? Would you employ a mechanic whose knowledge of mechanism was next to nothing? You reply, most certainly not. Then, sir, how terribly culpable we are in relation to our own education and that of the rising generation in the agricultural department of life. But I am happy to feel that a radical change has already commenced in public sentiment in this direction.

This subject seemed impressed upon me amid the cares and labors of an agricultural life; and while I have been exceedingly annoyed with the false notions prevalent in society, as to labor, and have so often heard the expression, "Oh, he is only a laborer, or she a laborer's wife," I have often felt compelled to make my plea in private and public in behalf of labor and the laborer. Still further, as I am and have been suffering from the malady of *ignorance*, I am extremely anxious to have this stigma removed from an institution, a profession so near my heart, and of such vital interest to mankind and the world at large. Therefore, I say to all literary institutions and professions, I wish you God speed. You help to educate us in our sphere, and we will help you in your sphere, and thus build up the whole structure of intelligence, education, religion, virtue and morality, and in all the great future hail each other as our brother man with equal rights and privileges, forever ignoring the idea that labor, educated, well directed labor, is undignified.

Following the paper of Mr. Percival, an essay was presented on

Farmers' Experiments.

BY D. M. DUNHAM OF BANGOR, MEMBER AT LARGE.

In agriculture, as in other pursuits, in order to succeed a great deal of experimenting must be done; and experimenting, as a general thing the world over, is expensive and the experimentor rarely receives even a fair reward for time and money expended. From this fact governments everywhere have granted peculiar privileges to experimentors in the shape of patents for improvements; and yet, he who invents a machine with which two spears of grass may be made to grow and profitably gathered where but one grew before, rarely gets a fair remuneration. So the man who by careful study of the nature of the grasses, of the nourishment which they receive from the earth and air, and by careful study learns so to blend these as to increase their production, is quite as apt to receive a cold shoulder from us, and passed by with the remark that "the public must support him and it can be done cheaper at the poor house than any other public crib"; as he is to receive our sympathy and support, and we receive from him the information, at a fair compensation, that would so much benefit us.

In support of this, note the arguments presented in the Legislature last winter, when an appropriation was asked to furnish bread and butter to an institution that should teach the science of agriculture. They finally did dole out, very reluctantly, a few crumbs of bread, but said that butter was a luxury such an institution should in no case indulge in. While we would not have our legislators spend our money for that which is not bread, we would not have them dry up to us the fountains of knowledge from which we could receive our bread with gladness, and return us to the broken cisterns of the dark ages, compelling us to make our own experiments, as did the uncivilized nations. What we most need in this State is, an Experimental station like the one which is so nobly started at Orono, that it may take hold of needed experiments in earnest with both hands, instead of experimenting with one hand and fighting the wolf from the door with the other. We want them to take the different breeds of cattle and test them so thoroughly that they can tell us under what circumstances the one will be preferable to the other; we want them to tell us whether horses, mules, oxen or cows are the most profitable to perform the labor upon our farms. If by kind treatment, proper feeding and a little extra care, cows could be made to do the principal work upon the farm and be just as useful in the dairy. To learn this would be worth more to the State than any donation the station will receive for a long time to come. We want them to tell us the breed of hogs best adapted to our feed and climate, and how much we can place on the credit side of the hog for his labor in working over the compost heap before he goes to the butcher. We want them to tell us how to increase the value of the poultry yard, and what breeds are best adapted to supply both eggs and poultry. We want them to tell us whether by sowing winter wheat in August, and plowing it in from three to four inches deep, it will get so thoroughly rooted as to stand our cold winter; if so, what kind is best adapted to our soil and climate, and whether a better kind may not be produced than now exists. If we cannot succeed in raising winter wheat, we want to know what kind of spring wheat to sow, and what time and how to sow it, in order that in some way we may raise our own bread and not go one thousand miles to mill. We want them to tell us to what extent roots may be profitably raised for cattle, and in what manner to feed them. We want them to tell us at what time to sow grass seed, and whether it should be sowed alone or with some other crop. We want the different kinds of apples tested so thoroughly that we can tell just what conditions are requisite to a success with each of the leading varieties. We want pears, peaches, and the smaller fruits experimented with, and those chosen as Maine fruits that can be successfully cultivated here, recommended to us. In this way, a large amount could be saved that is now more than thrown away in buying fruit trees wholly unadapted to our location.

We would not have them try these experiments and keep them a secret; but we would have at least one station in each town, that should be familiar with all the workings of the general station, keep a careful record of all experiments and their results, for the benefit of the farmers in town. On the other hand, the out stations should keep a record of the experiments and results in town for the benefit of the general station; and thus working together for the interest of agriculture, it would steadily advance until it stood, as it belongs, at the head of all occupations.

Until within the last fifty years, the cultivation of the soil made little progress, and farming wore its ancient garb of weary industry and wiped the sweat from the sun-browned brow of labor, with hands made hard by constant toil. Let us go back fifty years and compare the implements then used and the mode of farming then practiced, with the tools and practices of to-day. Instead of the wooden plow, rude in manufacture, and possessing very few qualities for either turning or pulverizing the soil, we have the cast-iron and steel plow, made in so many forms that if you go to a manufacturer and tell him what kind of land you have and how you want to lay it, he will give you a plow that will do it exactly. Instead of the hand hoe made of iron, thick, heavy and clumsy, we have the steel hoe, thin, light and with a smooth edge, which in comparison with the iron hoe, is a luxury to use; but the larger part of the work that used to be done with the hand hoe is now done with the horse hoe. For instance, to cover an acre of potatoes in the old way would take from two to three days, while with the horse hoe it is now done in a better manner in as many hours. The hand flail and fan with which the farmer used to thresh and clean his grain, are now displaced by machines that thresh the grain very rapidly, and so nicely arranged that they separate the foul seed from the grain in a very nice manner; and some manufacturers go so far as to say they can separate black beans from white ones—and I think they would if there was a slight difference in the size. The young man of to-day can hardly realize the difference between a set of farm implements forty years ago and now. Then, a sickle, flail, and fan, costing less than three dollars, was all that was required to gather a crop of grain and prepare it for market; but to-day the reaper and threshing machine take their place at as many hundred dollars. While then a wheelbarrow would hold a complete set of tools to carry on a large farm, to-day it would take several ox-carts to do it. Almost everything now is or may be done with machinery, requiring considerable skill to operate; and the farmer who has not considerable skill in handling implements, can hardly be said to eat his bread with gladness.

Several small fortunes have been expended within a short time in experimenting with potatoe diggers. A friend of mine a few years ago thought that he had hit upon just the machine to dig potatoes. He had made one that worked beautifully in the sand, and wanted to build a lot of them for market. I furnished him five hundred dollars to buy stock with, and he built 250 of them at a cost of $2,500, and never sold a single digger. Not wishing to lose my $500, I went to experimenting and spent $1,000 more, and then concluded that I was willing for some one else to bring the first potatoe digger before the public. Over two hundred patents have been granted for potatoe diggers, and yet of all this number, so far as I have been able to ascertain, not one is of any practical use.

Public attention has of late been directed to the propriety of making experiments in the cultivation of wheat in wide drilling and thin seeding. The fact that millions of acres of wheat are annually over-run with weeds, and that sod lands imperfectly pulverized often yield larger crops than the same soils in a much better mechanical condition; but thoroughly seeded with weeds of rampant growth, ought to suggest the probable success of a system of cultivation for growing wheat whereby it might have an unchecked opportunity for growth. Mr. Gilpin of Pennsylvania, drilled one acre with wheat, three pecks of seed to the acre, twenty inches apart; the remainder of the field he drilled ten inches apart.

When the ground had become sufficiently dry, a small cultivator was run between the wide rows; the wheat took a rapid start and outgrew the rest of the field. As the season advanced it grew tall and strong, and no amount of wind and rain had any effect to lodge it down. When the heads formed, their greater length was apparent. It did not ripen quite as early as the rest of the field, but the single acre yielded twenty-three bushels of wheat, while the rest of the field yielded but nine to the acre; thus a single hoeing made a difference of fourteen bushels, or increased the yield 155 per cent. Such experiments should be taken with several grains of allowance for local conditions; but a large number of experiments like this, definite and particular in varied circumstances of soil, climate and conditions, would test the pecuniary advantage of horse hoeing wheat.

The matter of applying manure to crops is a matter that is just now receiving a good deal of attention among farmers, and yet, almost every one has a method of his own which his grandfather used to practice; and however different the farmer may talk, when he comes to apply his manure it is almost always the case that he goes back to the practices of his boyhood. In this State, at least, well-tested experiments of different manures and different methods of applying them, are rare indeed. William S. Rand of Kentucky, reports the trial of some experiments with manures, in which he very strongly recommends liquid manures; his experiments going to show that the Japanese method of saving and applying manures might to a certain extent be very profitably practiced here.

Some of the most simple and important questions, of the most frequent recurrence in practice, are answered differently by those engaged in dealing with them continually, and the modes of operation are directly opposite. The experience of one farmer is just the reverse of his neighbors; the result of one year's trial are frequently contradicted the next. The infinite variety of circumstances which surround the man engaged in agricultural pursuits, must ever be inseparable from a limited view of an illimitable field. It is not probable that the practical farmer will ever be able to attain the precission and certainty which characterize the chemists' work. The field of the one cannot be contracted into the laboratory of the other. Hence the importance of associated experimenting in a field which is ever bringing new interest and important questions before the community.

A Farmers' Club in Maryland decided to try, individually, the experiment of planting large potatoes whole and cutting small potatoes. Only four of the number persevered in the experiment, but the result was that the large potatoes planted whole yielded 226 bushels above the seed; small potatoes cut to two eyes, 151 bushels above the seed; and those cut to one eye, 132 bushels above the seed, per acre. But to have tested this matter with any degree of satisfaction, the cut potatoes should have been of the same size as those planted whole; yet it goes to show that experimenting on this subject, taking the various kinds of potatoes, the various sizes, with the different circumstances of soil and climate, would occupy profitably several farmers' clubs for many years.

The imperfect manner in which farm experiments are made, ought to suggest some practical considerations that must be taken into account, in order to render them reliable and to obtain the valuable fruits they should be made to yield. Of all classes of men, farmers are perhaps the most inclined to rely on the results of experience; to insist on seeing them with their own eyes, and to reject what they term theory. They and their forefathers have been at it all their lives; still it is a fact well-known to every intelligent farmer, that this way has been practiced from year to year, and from age to age, without arriving at conclusions at all proportional in value and numbers to the vastness of the field from which they are drawn.

In conclusion, I would suggest that some subject be chosen here to be experimented upon the coming year, and that every member, either himself or by some one under his direction, make a thorough experiment, noting carefully all the conditions and surroundings, and the entire results be laid before the Board at its next Fall session; and thus inaugurate a co-operative system of experimenting that shall go on till the farms of Maine shall blossom as the rose.

At the conclusion of Mr. Dunham's paper, Mr. Farrington, Superintendent of the Farm of the State College, was called upon to give some account of the experiment tried last season on the drilling of wheat.

Mr. Joseph R. Farrington. I heard but very little of the paper that was read by the gentleman from Bangor, I am sorry to say, for I had anticipated a great deal of pleasure and instruction from listening to it, knowing that he had been interested in farm experiments for a number of years, and myself having received several valuable suggestions from him. I hope that among the many things which he mentioned he did not forget to speak of the difficulty in performing experiments upon a farm, of securing conditions that will give results upon which we can rely. What little experimenting has been done under my supervision on the farm, has shown me that very clearly. Something of this sort was true in regard to the experiment that was made in drilling wheat. You all know that our spring was very late, that we were not able to get the seed into the ground as soon as was desirable.

About the 28th of May we sowed one-half acre of wheat broadcast—of the "Lost Nation" variety—at the rate of $2\frac{1}{2}$ bushels to the acre. The land was in excellent condition, having been under cultivation for two or three years before, and had been well manured. We were dependent upon a gentleman, very much interested in our welfare, who did the best he could for us in securing a machine. Although he designed getting it here in season, it did not arrive until one week after we had sown the half acre broadcast, so that had a week's start. But having obtained the machine I drilled in a half acre immediately, along side of that sown broadcast, putting one half the amount of seed on that last sown that I used on the first half acre, or one and a quarter bushels to the acre. At first, that which was sown broadcast seemed to have the advantage, but in the course of two months that sown in drills evidently was closing up the gap, and by the time the grain was headed out it was rather the better to all appearance. The grain ripened very evenly; that is to say, there was apparently no difference in the time of ripening between the two pieces. We threshed it last week, and the result was that that sown broadcast yielded at the rate of $35\frac{1}{2}$ bushels to the acre, while that sown in drills yielded 34.

Now it is for you to say, gentlemen, for I certainly cannot decide, which was the better method, judging from that experiment. You see the inequality at the commencement, you see the inequality in the amount sown, and you also see the inequality in the product. I have no question myself that most favorable results will be derived from sowing wheat in drills with a machine. We all of us know by experience that it is very difficult to sow grain evenly by hand. It is one of the tasks of Spring that I undertake the most unwillingly, especially upon the College farm, for there we are under everybody's eye, and if by misfortune or any other reason our grain comes up unevenly, we are compelled to listen to remarks. Of course people have the right to criticise us. We expect to be, and wish to be. What is experienced here in excessive criticism, I know every farmer experiences more or less upon his own land. If not subject to his neighbors' criticisms, he is subject to his own reflections. But with this machine we can sow it very evenly, and it seems to me that the results, imperfect as they are, go very far to establish the fact that it is desirable in point of profit, in point of the returns which we receive from the amount of seed sown, to sow in drills.

Mr. Percival. I would like to ask Mr. Farrington if he sowed grass seed broadcast or by machine?

Mr. Farrington. We did sow it in both ways. The result showed that that sown by machine was much more evenly sown. We all know that sowing grass seed by hand is even more difficult than sowing grain. But this was done very evenly by the machine, and as you look over the ground it seems to be of equal thickness, with one exception; for some reason or other the machine got clogged in going across the field once, and in looking over the length of one of the fields you see a strip just the width of the machine where there is nothing growing. There would be this advantage even in that case, that there would be nothing growing where there was a failure to sow seed, and the farmer would be compelled to go over the ground the next spring in order to get any grass there. Whereas, in sowing broadcast, we find a place here and there left, and very few of us find time to go and mend up. This machine sows fertilizers broadcast also. In one case we sowed slacked lime while sowing grain and grass seed. The point of the drill opens the furrow in which the grain is deposited, and as the machine passes on the earth falls back and covers the grain. This has been amply sufficient in every case we have tried it, and we have never covered it in any other way. It does not cover the grass seed at all.

We have also sowed pea-beans, yellow-eyed beans, fodder corn and sweet corn, and it sowed them very evenly and covered them sufficiently deep. It covered the corn so well that, during the wet weather which followed, it rotted. We sowed the grass seed and wheat with the machine at the same time, but not mixed together. The wheat was not cultivated after it was sown. The drills were eight or nine inches apart. In sowing corn and beans they were eighteen inches apart. The machine is so arranged that one or all of the drills can be closed, so that you can use just as many of them as you wish.

The gentleman spoke of experiments with potatoes, and of the results for one year. He also said that it required a series of experiments, running through a number of years, before any definite calculations could be reached, anything which could be relied upon; and I wish to say that all of the experimenting which we have done has very strongly shown us the truth of the statement. For instance, we are trying the experiment with some fifteen or more methods of planting potatoes. Last year we got one result and this year another diametrically opposite. Some will say that because such results are obtained the experiments are useless; but to me it seems nothing of the sort. Comparing one year with another we get very different results; but by carrying our observations out for a number of years, say ten, we obtain an average result which can be reckoned upon. There is another thing in regard to agricultural experiments: it requires a whole year to obtain a result, while in almost any other branch of business results may be obtained over and over again during the year. It may take a few days, a few weeks, or possibly a few months; but in almost any experiment you can get results in less time than a year, while in agriculture we are obliged to wait the whole twelve months, and the experiment cannot be repeated until the season returns to us again. And for this reason, most farmers think they cannot prosecute experiments efficiently. So there is an impression abroad, which I am very frequently obliged to meet, that farmers' experiments amount to nothing, merely because we cannot obtain definite results in a short time. I wish we could all have patience—and I am speaking for myself as well as farmers generally—in these matters.

People sometimes have the kindness, I might almost say boldness, to say to me "Your farming does not amount to anything. This farm has been running for six years, at large expense to the State. You show a few experiments, and have got a few results. Some of them may be worth something; but what does it all amount to, does it pay?" Looking the matter squarely in the face, can we obtain results any faster; are we not obliged from the necessity of the case, to wait until a series of experiments, running through a series of years, shall determine; and is it not desirable to wait until that general average shall be obtained? Please then, do not get impatient with us. Imperfectly as we may be doing our work, still we are doing something; slowly as the results may be coming in, they are still coming in. I have hope—and I think I am not over sanguine—that in time we shall obtain results which will be of genuine value to the farmers in the State.

Mr. GRANT There is one point I would like to ask Mr. Farrington in reference to the use of the machine. Whether or not labor is saved by its use?

Mr. FARRINGTON. I cannot state very definitely, but my decided impression is that it is. It is much easier to obtain animal labor than that of men who can sow evenly. While most any man can drive the horse and machine, and, if of ordinary experience in teaming, can drill the grain in well enough, it requires more than ordinary experience or intelligence to sow grain evenly by hand.

[In answer to an inquiry.] We have experimented four years since I have been on the farm, and Mr. Johnson, who was before me, experimented two years, and the results so far are in favor of raw feed. The feed we have given has been corn meal, and the result every time has been in favor of raw meal instead of cooked. I was very confident that Mr. Johnson had made some mistake when I went there, as I felt sure the result would be in favor of cooking. The first year I did not superintend it myself, and the test turned out the same as under Mr. Johnson. The second year I attended to this myself personally, yet the result was the same.

Mr. LUCE. What kind of animals did you make these experiments upon?

Mr. FARRINGTON. We took pigs that were about six weeks old. They were pure blooded White Chester swine. This year we are feeding pigs three-quarters Chester and one-quarter Suffolk. I do not know whether the changing of the breed will have any effect upon the experiment.

Mr. LUCE. Was the feed exact?

Mr. FARRINGTON. It was weighed with steelyards that will weigh to the ounce, and was fed very carefully. The first year I fed the pigs together; since then I have fed each one separately. We feed wet—wet with cold water—about as thin as gruel that is not too thin. A Mr. Stewart of New York, who has written a book on cooked food, intimated to me that our experiments might not be perfect on account of insufficient cooking. I told him I was brought up on a farm with ten brothers and sisters, and that I knew when hasty-pudding was well cooked; that this was as well cooked for the pigs as my mother used to cook it for us.

Mr. Luce. I think that it would require more experimenting than we have already had to convince me that it is a fixed fact that raw food is better than cooked food for hogs. I have tried it. I have given a hog a certain amount of raw meal, and he wanted more. I have cooked the same quantity, and when fed with that he was perfectly satisfied. I know he laid down more and slept more, and when he is asleep is the time an animal puts on his beef; when he is entirely quiet. I do not think that sweet food for a pig or a hog is the right kind. There is a certain process that food goes through—I will call it souring—that if fermented to a certain extent, it will be more digestable than when raw. Cooked food is better than raw, because there are certain particles of oil, and the more grinding and cooking the more these oil cells are broken, and the oil assimilates more perfectly with the system. As I understand it, the human and the swine have stomachs more alike than any other animals so much unalike.

Mr. Colburn. I do not pretend to say which is better, raw or cooked food, as I have not given the subject sufficient attention to form any reliable opinion. But a word in regard to the impatience that Mr. Farrington spoke of concerning the experiments of the College. Any constant observer for the last four years, who has had a chance to visit the College grounds once a year, ought to be satisfied with the improvement that has been made on that ground. They have to take what little the State gives to them, and they cannot undertake anything that requires the expenditure of much money. They have striven against everybody's fault-finding. Mr. Farrington spoke with considerable feeling when he begged of us to have patience; and we ought. Let us intercede with our friends to have patience. It is an institution that has helped us all, and is going to help us still more in the future; but we have in the past thought that we were going to receive a great deal more from it than we had any right to expect. I am perfectly satisfied. I have visited the College annually for the last four years, and this present visit pleases me still more than ever before, and still further convinces me that everything is being done that can be done, with the limited means at their disposal, to benefit the inhabitants of the State and bring out at last what is desired.

President Allen. One experiment I wish to allude to which I think a very hopeful one as connected with the College. I refer to the Scientific Society, whose object is to continue the work of the College outside. We intend that there shall not be simply experiments while the students are at the College, but that the College shall be the centre of experiments which those who graduate shall continue in different portions of the State. This Association has already been a year in existence, and is now commencing its real work of value. We have talked here as though the College was simply an agricultural institution. That is one part of it; but the design of the College is broader than this, to educate all workmen who are to engage in productive employments, in mechanics as well as farming, to lay the foundations of a liberal culture for the producing classes. There are those in every class who are not content without standing foremost in their profession. They must have an education for that. This Scientific Society has for its object the carrying out of experiments in the different departments. In that of agriculture, experiments are carried out very efficiently by one of our graduates, who was fortunate enough as soon as he graduated to have a farm to work upon for his own. That is an exceptional case. You are not to expect a student as soon as he graduates here to have capital enough to buy and stock a farm, and continue experimenting. Our students, with scarce an exception, are obliged to go to work and earn money, perhaps, to pay what they have hired to get them through college. Many have gone to work teaching school, and in any other employment they could get, to obtain money—those who are designing to enter an agricultural life.

Talk about patience! As we ask of our rulers the stipend necessary for our continued existence, they turn around and say "You have been in existence so many years, and where are your farmers that you have turned out from the College?" Do you suppose, sir, that they are in earnest when they ask of us that we shall take young men and make farmers of them the moment they have graduated? They have got to go to work and earn a farm. You might as well go to a literary institution, designed especially for professional men, and demand of them that as soon as their students graduate they should turn out lawyers of eminence, taking the first position at the bar, or at once occupy leading positions in one of the learned professions.

But this Society has already elicited a great deal of interest among the graduates, and some of them are interested enough to come back and attend its meetings at the College and to report the experiments they have made. We trust that this feature will add a great deal to the scientific knowledge on agricultural subjects, for we do believe that when we turn our students away they can perform experiments with some proper attention to all the conditions which are necessary to be known in order to give value to any recorded experiment.

Mr. STEWART of Newport. My experiments have been different from anything spoken of here. When I commenced farming I took an old, run-down farm, and had nothing but my hands to start with. My only object has been to raise grass; consequently my experiments have been in that direction. I succeeded very well; much better than I expected, and up to the dry season I have my farm in very good condition. The first year I succeeded very well in getting along through the drouth, and the grasshoppers passed by me with but little injury. But the second year they came down about the middle of July, and seemed to drop down on my land more than upon any other farm in that locality. Consequently they killed every blade of grass I had, you might say. My fields looked as if the fire had gone over them. I was compelled to sell off a large portion of my stock, because I had not sufficient fodder to keep them through the fall and winter. I did not care so much for the loss of my stock and serial crops as I did for my acres of grass, which I moaned over considerably. Then my object was to get my fields back again, and I had the greatest success in this way. I commenced sowing grass seed in the Fall; sowed some in September. This started well and grew well, looked nice; we had an average winter, but still it killed out in the spring. I found before this that the greatest trouble was in getting a catch—seeding my land down to grass. My idea was to experiment until I could find some way by which I would be sure of a catch every time. The result has been in favor of either harrowing my ground, if it is very mellow, in the Fall, pulverizing it very nicely; or plowing it and then harrowing it well, then putting on the roller, letting it remain until very early in the Spring,—if the snow is on the ground I do not know as it makes any difference,—and then sowing my grass seed. In this way I have always succeeded in getting, I might say, more than a catch. At first I got too much, and I found it best not to sow more than two-thirds the amount of seed usually sown with the grain in the Spring Where the ground is very uneven, I would not recommend this; but where the land is tolerably level this, it seems to me, is far the best way.

[In answer to questions.] I apply all the dressing I can get; my circumstances have been such that I have not been able to purchase a great amount, and consequently I have not used all the fodder that I cut on my place for dressing—have not put it back on the land. I calculate to mow about forty or forty-five acres; I feed out about sixty tons of hay, I think, on the average, and I am now cutting about seventy-five tons almost every year. I have dressed about twelve acres a year; after this I shall not dress more than two, on account of the high price of labor.

Until within a few years I have plowed or harrowed in my dressing, but now I use top dressing. I had a piece of land, perhaps an acre and a half, that seemed to be drowned out badly; I plowed up about two-thirds of it, planted it with beans and corn the first year; should judge I put on fifteen loads of manure to the acre; I then seeded it down with herdsgrass, clover and red-top. The other third of the piece I concluded I would not plow, and I do not think I cut over fifteen hundred weight of hay to the acre on it; but late in the fall I hauled on not more than six or eight loads of manure to the acre, left it in small heaps and spread it very early in the spring. It was very fine after being frozen through the winter, and I spread it very evenly. The first year I had about a ton to the acre; but for the last four years I am satisfied that I have cut two tons and a half to the acre on that piece, while upon the other part that I dressed with more than twice the labor and with the expense of seeding it anew, I have not received over two-thirds, if I have half, that amount of hay. I am experimenting on other pieces with about the same success. My land is principally flat and gravelly, with not much clay, but considerable muck. I have top-dressed in the fall, and I cannot see any benefit from it; I have come to the conclusion that spreading manure immediately after haying, and allowing it to dry up in the hot sun, is a useless waste of labor.

Mr. Wasson. When Dr. Allen says they are not in earnest when they ask "Where are the farmers which you have turned out from the College?" I think he is mistaken. I have found them terribly in earnest. As I was about to start to visit the College, an intelligent farmer, a neighbor of mine, asked me where I was going, and upon my replying, said "I do not see why you want to visit so arrant a humbug." That man was earnest in the remark. I said, "Have you ever visited the institution?" He answered, "No, and I do not want to. They are making nothing there but a set of lazy, arrogant fellows, who will not be willing to go back to the farm."

We have hundreds of these sort of men, and we can meet them and silence their objections only as we can show them the error of their ideas. Let me say to the gentlemen of the Board, that you have seen the College in all its working departments, and if you go away entertaining the favorable opinion expressed here to-day, then go home and bring to bear upon the people and the representatives of the Legislature, all the argument and influence which you command to change this hostile feeling to one of friendliness to an institution which is struggling so nobly against adverse circumstances; show them that the prevailing sentiment that money granted to College is worse than thrown away, is erroneous, and in a few years it will be overcome. We do not want the institution to hinge upon so narrow a chance that its life or death shall be voted up or down, as the case may be, only upon its merits.

This fall I visited the Farm house and with Mr. Farrington went over the farm, and examined carefully into these experiments. I thought I saw in them alone, setting aside everything else, that there was an investment worth to the State, we cannot calculate how much, but a very large paying interest upon all the appropriations that have been made to support the institution. We individual farmers are too poor to go into such experiments and continue them year by year, until out of them are established facts. We have not the money, the patience, or the time; ten thousand things intervene to prevent. But the College can do it. The College should do it, and it should become something more than simply a college farm. It should become an experimental station, and the farmers of the State should feel that it is their duty to see that it is amply and liberally endowed and provided for every year. If we get nothing out of it except the simple tests growing out of these experiments, both affirmative and negative, successes and failures, we are investing money that is paying us a very handsome dividend. We go to our State Fairs and see big squashes and pumpkins, fast horses, large oxen, fine cows, etc., but the dwarfs, the lean cattle, the small yields of butter, and all that sort of thing, we never see. It is of just as much consequence to the farmers of the State that an experiment which results in a failure should be known as though it resulted in success.

EVENING.

The Convention assembled at 7½ o'clock. Prof. James Law, of Cornell University, was announced as the lecturer of the evening.

On Epizoötics.

BY PROF. JAMES LAW OF CORNELL UNIVERSITY, ITHACA, N. Y.

Mr. President and Gentlemen: The nature and causes of Epizoötics and contagious diseases have been long and warmly disputed. It would be an endless task to enumerate all the agencies to which they have been successively attributed. To the simple minded heathen nations of former ages, these afflictions were the manifestation of the anger of the gods, and were to be escaped by propitiatory sacrifices at their shrines, or by armlets of magic power over the vengeful diety. Later, they were referred to the influence of evil stars, to the erratic course of comets, to the eclipse of some venerated luminary, or to the unpropitious contact of planets. In more recent times, theory has followed theory, varying in their details, but in the main charging upon some modified state of the atmosphere those ruinous visitations. At one time it has been the prevalance of simple storms and generally tempestuous weather; at another, unusual extremes of heat and cold; at another, emanations from malarious soils; at another, volcanic eruptions and irritant vapors; at another, putrid or fœtid clouds or fogs; or it would be peculiar electrical or magnetic states of the earth or air; or again, the extreme density or lightness of the atmosphere; or a modified state of some of the normal gaseous constituents of the air, as in the production of oxygen or nitrogen; or a putrid state of the air as the result of the extraordinary prevalence, destruction and decomposition of insects and other organized beings; or once more, it was the prevalence of fungi or other minute organisms in the system and its surroundings.

Much might be said for many of these theories of causation, but of late years pathologists have been gradually compelled to narrow their list of causes to the presence of some abnormal material—gaseous, liquid or solid—as the medium of transmission. The assumption of the existence of such a virulent element, sufficiently explains the communicable or contagious nature of these diseases, of which alone we know anything, but leaves the influences which

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originally developed the poison, or which first called it into existence, as completely unknown as before. The original causes of such diseases indeed have appeared to recede farther and farther from us, until the conclusion is inevitable that in regard to many of them, the morbid cause or germ is never in our day produced *de novo* in Europe or America.

As the minds of pathologists have settled down into the idea that some morbific agent enters the animal body, reproduces itself there and becomes capable of increased diffusion so as to affect others, all of these diseases have been grouped together along with maladies produced by parasitic animals and plants, under the name of *Zymotic diseases.* *Zymosis,* from which the term is derived, means literally fermentation, and the poison introduced into the animal body is supposed to grow and increase at the expense of the individual corporeal elements, after the manner of the yeast fungus in vinous or acetous fermentation. The word involves the acceptance of a theory, but if this theory is not construed too literally, it is most in accordance with our present knowledge of the subject.

In these affections we are brought face to face with a class of diseases whose importancecan not well be over-estimated. They are generally preventable, and yet they have spread widely and disastrously in all ages. From the days of Moses onward, we can trace with more or less clearness, the records of disastrous outbreaks and extensions of these maladies; now devastating a country n connection with an insalubrious season, and literally sweeping away its people, its flocks, and its herds in one common destruction; now spreading over a continent.in the track of a conquering army, and sinking the enslaved peoples in a greater and more irretrievable ruin; now smiting down the supplies of the victorious army itself, and cutting short its career of conquest and plunder; and now following in the channels of trade, and rendering the streams of a healthy and harmonizing commerce the unwilling agents in the diffusion of a freight, of loss, of misery, and of death. These diseases have contributed to the depopulation and waste of our densely peopled districts, like the pontiac marshes at Rome; they have curbed the restless ambition of a Charlemagne, and influenced the destiny of nations. Even in recent times, in a period of profound peace, an unrestricted trade in live stock has entailed on Great Britian a loss of not less than $450,000,000 in the short space of thirty years, and by but three Zymotic diseases of ruminants. During the recent prevalence of the Rinderpest in the same country for a period of under two years, stock were lost to the value of $30,000,000 to $40,000,000. Startling as such figures are, they give but an imperfect idea of the untold losses by deterioration of the surviving animals, which are often unfitted for the butcher, for the dairy, for breeding, or for work; also of the loss of fodder which it is no longer safe to give to live stock; and of the loss of crops from lack of that attention, labor, manure, &c., which should have been provided by means of the live stock.

If anything more is wanted to increase our sense of the importance of these subjects, it is to be found in the fact that many of the Zymotic diseases of the lower animals are communicable to man, and some in a deadly form. Of parasites, we derive from the lower animals those of all grades, from the fungus of the simple favus or ringworm, to the deadly echinococcus and trichina. Of specific animal poisons those of glanders, hydrophobia and malignant pustule, afford frequent examples of fatal communication to man. Under favorable conditions some of these will assume the dimensions almost, of a plague. Rawitsch reports that in 1864, not only much stock, but 1,000 human beings died of malignant pustule in five of the Russian provinces. In St. Domingo in 1770, 15,000 people died of the same affcetion in the course of six weeks, after eating of the carcases of animals sick or dead of the malignant carbuncle. The disease was at once checked by placing an interdict on the consumption of the poisonous flesh. In ancient times we have Livy's account of the speedy destruction of the cattle and half the inhabitants of Rome; Homer's account of the decimation of the Grecian army at the seige of Troy,—

> "On mules and dogs the infection first began,
> And last the vengeful arrows fixed on man;"

and Moses' statement of the plague of boils on man and beast, throughout the kingdom of the ungodly and obdurate Pharaoh.

It may be thought that in our time and country such results are unknown, but this is far from being the case. Malignant carbuncle is a common affection among our cattle in the Northern States, and much more so in the South, and isolated cases of its transference to man in the form of malignant pustule, are rather common than otherwise. Dr. Bell, of Brooklyn City Hospital, reported over fifty cases in 1862, and several cases have come under my notice during the last few years, clearly traceable to inoculation from animals dead of malignant carbuncle. Could we collect the aggregate number of such isolated cases occurring throughout the country in a single year, and add to these the cases of glanders, hydrophobia, echinococcus, trichiniasis and other zymotic diseases of animal origin, a list would be presented which might well rouse the public to the urgent need of a more thorough study of the causes and prevention of such redoubtable maladies.

This question has a special claim on the consideration of the medical profession, who can only do it justice by establishing a chair of comparative pathology in every medical school. It has a still greater claim on the attention of the agriculturist, since by a knowledge of these affections he will be enabled not only to protect himself against foreign and imported plagues, but also to eradicate from his farm those injurious local conditions which determine the development of disease fatal to his possessions and dangerous to humanity.

But it is, above all, on the Government that the importance of this class of maladies should be impressed. To the ruler the subject presents itself in its broadest bearing. It is a question of the progress of agriculture, the interests of which must always rank higher than those of manufactures, as a more inherent, fundamental and permanent source of national wealth. Live stock is one of the most essential factors in maintaining a native fertility of the soil. Hence, whatever preys on the live stock interest, or tends to hinder the production of farm animals, is directly subversive of the best interests of agriculture, and of the nation. The prevention of zymotic diseases must therefore be considered as an important branch of political economy. Nor is it less so when these affections are viewed in their relation to health and life. The impaired vitality of the human constitution, and the deaths consequent on an imperfect or deteriorated food supply, or upon infection by one of these animal poisons, is so much waste of national wealth.

What, then, shall be said of the moral aspect of the question? The conditions necessary to the development of these diseases being known and generally removable, and their nature being such that they are not confined to their place of birth, their germs being capable of preservation and indefinite diffusion, it becomes a humanitarian and christian, as well as an economic duty on the part of government and of every citizen to contribute towards the extinction of these maladies.

The germs of zymotic diseases present many points of similarity to vegetable and mineral poisons and medicines. Thus they have their special points of election, each acting on its own organ or function. As opium acts always on the brain, epsom salts on the bowels, and nitre on the kidneys, so the different forms of variola (pox) attack the skin, the lung fever the organs of respiration, and hog cholera the bowels. Then again, as poisons vary in promptitude of action, prussic acid acting at once, strychina in twenty minutes, and opium in thirty, so has each specific fever its own period of incubation,—aphthous fever, forty-eight hours; Rinderpest, four days; and lung fever, three to eight weeks. The stronger the dose the more rapid the effects with both kinds. Race and temperament, too, affect the susceptibility to both orders of poisons. Aloes act powerfully on the horse in small doses, but imperfectly on the dog in relatively larger amounts; narcotics have little or no effect on herbivorous animals, but a very potent action on carnivora; so we find the ox insusceptible to glanders, and the horse resisting poisons of Rinderpest, lung fever, and Texan fever.

Habit does much to modify the action of poisons. A person accustomed to use tobacco, opium or alcohol, may swallow with impunity an amount which would otherwise have proved fatal. So the Steppe cattle of Russia resist their indigenous Rinderpest or suffer slightly, and our own Texan herds escape the malarious fever of the Gulf States. This may be partly accounted for by the extinction of the more susceptible animals, but this only applies to a limited extent, since our Texan steers if removed to a more healthy region, and after a time returned to their native habitat, are found to have lost their power of resistance to the poison. Among other causes which favor the action of animal poisons, may be mentioned a deficiency of blood, the vacuity of the vessels favoring absorption, and impurity of the blood whether associated with plethora or anæmid. It is noticable that in both conditions of excess and deficiency of blood, that liquid is liable to be over-loaded with the products of the waste of tissues, which render it specially favorable to the action of disease poisons. An animal reduced by over work or excessive waste over nutrition, has the blood loaded with the effete products of such waste, and in plethora we have a similar excess of plastic and effete materials, so that these opposite conditions equally present the factors conducive to the free growth of the poison.

Nearly all faulty hygienic arrangements tend to bring about a similar impure state of the blood. Starvation, overfeeding, spoiled fodder, impure air or water, idleness, overwork, or the suppression of any important natural secretion, as those of the bowels, kidneys, or skin, all tend to a similar condition. Thus it is that cleanliness, not only of the body and dwelling, but of our food and water, together with moderation and regularity of life, are such important elements in warding off zymotic or contagious maladies. One other feature of the morbid poisons we are considering is, that many of them only attack the same individual once; others do not make a second attack until long after the first. The different forms of variola and Rinderpest are examples of the first class, the lung fever of the second. Animals which have passed through such a disease and fully recovered, are therefore doubly valuable and have the value of inoculation for lung fever in countries where that malady prevails generally. Some zymotic diseases, however, confer no such immunity by a first attack, and among them rank some of the most deadly, such as glanders and malignant pustule.

The *Zymotic affections* may be divided into *enzoötics* and *epizoötics*. The *enzoötics* are such as are confined to one locality where they habitually prevail, and which either die out at once or slowly disappear when carried out of this their native home. The poisons of such affections require some special unhealthy local conditions for their maintenance, and are not indefinitely sustained by the blood and tissues of live animals elsewhere. Such affections we meet in wet, marshy, malarious districts, and in the lower animals the malignant carbuncle presents an appropriate example. They may or may not be coommunicable from animal to animal; the example cited is so, and in its worst forms may spread widely as a veritable plague.

Epizoötics are diseases which spread widely over a State or Continent in connection with a wide diffusion of the poison, and it may be at times an increased susceptibility of the animal system. These are maintained by the propagation and increase of the specific disease poison within the animal body, and its diffusion to other animals in the vicinity. The prerequisites to the life and increase of the poison being found in the animal system, no special local conditions are required to maintain it, and its spread is only limited by the numbers of susceptible subjects. Therefore, it is that diseases of this kind spread widely or universally and constitute true animal plagues.

Of these destructive plagues of man and animals it may be said that we cannot demonstrate their generative *de novo* in any particular locality in the present day. Many cases of apparently spontaneous development may be cited, but of these it can only be said that we have failed to trace the malady to any pre-existing germ. It can also be demonstrated with regard to many of these specific fevers, that they have appeared in particular regions but in comparatively recent times, though they had prevailed long previously in other parts of the world, and though there are no altered conditions in the newly invaded territory to account for its final invasion.

Small pox was unknown to the physicians of ancient Greece and Rome, yet it had prevailed in India and China more than a thousand years before the Christian era. Since that time, hygienic conditions in Europe have vastly improved, yet that Continent is subjected to frequent visitations of small pox, in spite of more salubrious surroundings and protective vaccination—a scientific triumph of modern times. In our own continent the conditions of the first appearance of small pox are certainly known. In 1517, it was imported from Europe to St. Domingo. Three years later a negro covered with the pustules was landed on the coast of Mexico, and in three years thereafter it had destroyed 3,500,000 of people in that kingdom alone. It was carried to Iceland in 1707, for the first time, and swept off 16,000 persons, more than a fourth of the entire population. It was brought to Greenland as late as 1733, and gained such extension as almost to depopulate the island.

Similar to this is the history of the lung fever in cattle. This had long existed in Europe, and gained a greater or lesser prevalence at different times, as a result of the great wars and the accumulation of cattle drawn from all parts for the supply of the armies in the field. Yet it had only reached the British Isles on rare occasions. The narrow Straits of Dover proved sufficient to bar its progress from the middle of the last century up to 1840, when it was introduced by imported Dutch cattle, and has since then been kept up uninterruptedly by the continual importations. It was first imported into America in 1847, and on two occasions since, twice with English and once with Dutch cows, and we still harbor it in our larger eastern cities and their vicinity. It first reached Australia in 1858, by an imported English cow, and has since caused enormous losses in that colony. Add to this that a strict veterinary police system has secured Norway, Denmark, Oldenburg and Zurich from the plague which was constantly devastating the countries around them, and that even in plague-stricken Britian the lung fever is unknown to the present day in many exclusively breeding farms and districts, and in which nothing but native cattle are found, and we have a proof as satisfactory as in the case of small pox, of the propagation of this disease in these countries by contagion alone. No less conclusive is the history of the propagation of aphthous fever, Rinderpest, and ovine small pox. In every instance their appearance in a new country is clearly traceable to importation of the seeds of the disease.

In the face of such facts, any assertion of the spontaneous development of one of these specific fevers must be set down as merely a failure to trace its origin. The grand truth of the limitation of the area of prevalence of such diseases for many centuries by a mountain chain, a narrow sea, or a cordon of police, while circumstances were equally favorable to their prevalence on both sides of the barrier, must quench forever the doctrine of spontaneous evolution in those lands. But since the forms are produced in endless numbers in the bodies of the diseased, it is not surprising that they should be often carried by the wind, or water, on persons or solid bodies of any kind, and give rise to cases at far distant points, and of which the real origin cannot be traced.

So far as enzoötic conditions favor the propagation of these poisons, they do so only by lowering the general standard of health, or loading the blood with impurities, and thereby increasing the susceptibility and favoring the development of the poison. They are powerless to create that poison in our land, as their history well shows. They may, however, do much to secure its permanent retention when once introduced. The same remark applies to that entangible, unknown agency designated epizoötic influence. Certain unknown conditions assuredly favor the rapid development and extension of particular fevers when once introduced, but no such influence has ever been shown to generate such fevers where it was impossible for the germs to have already penetrated. Shut out the poison itself, and epizoötic influences may be safely ignored.

Our power of controlling epizoötics will depend mainly on our knowledge of their ultimate causes. If they are due to the reproduction of minute particles of organic matter of whatever kind, and not to gases, vapors, electrical conditions, and other comparatively intangible agencies, the reasonable course is to prevent the prolification of these particles and to destroy those already in existence.

These poisons, like all other organisms, depend for life and growth upon a supply of certain organic products upon which they can feed and which they can assimilate. In confined localities with much decomposing organic matter, the air is loaded with organic matter and microscopic vegetable germs in a state of active vitality and growth, and these are most abundant and active within four or five feet of the surface of ground, or on a level with the nostrils of animals. Here, then, in the air to be breathed we have the conditions most favorable to the propagation of the poison. Hence it is that cleanliness and antiseptics are of such essential value in such cases. Perfect purity of the air and the absence of all the organic and septic elements on which the poison feeds, will virtually starve it out. Thus with regard to antiseptics. These are all valuable even if they fail to destroy the poison by a direct action on its substance. Some do act in this way, decomposing the poison at once, and thus rendering it inert. These are disinfectants proper. Others which are only antiseptic, arrest decomposition in organic matter and cut off from the air the supply of organic debris and vegetable organisms already referred to. These operate like the army visiting a besieged city; they cut off the supplies, and by starving the enemy compel him to surrender at discretion. It has been said that "cleanliness is next to godliness," and there is a closer relation than most people recognize. Cleanliness in our persons, clothes, food, drink, air, &c., preserves the life that now is; godliness, that which is to come.

But cleanliness, even if ensured by the assistance of the antiseptics, is insufficient to destroy the vitality of the poison itself. It may prevent its propagation and increase, but the dry germ itself, like a vegetable seed, may lie inactive for an indefinite period, and start forth in full life and vigor when it meets the conditions necessary to its growth. It may lie dry and harmless for years in the cracks of dry wood-work, in the crevices of walls, &c.; but introduce it into the body of a susceptible animal, or surround it with a damp, impure atmosphere, and it starts into vigorous growth, showing that its long sleep has robbed it of none of its native virulence. And for a similar reason, no amount of cleanliness or antiseptics can be trusted to arrest the progress of a poison while healthy susceptible victims are allowed to mingle freely and in the most intimate relations with the diseased. No conditions are more favorable to the reproduction and increase of a poison than those met with in the system of a susceptible animal. An impure at-

atmosphere and filthy surroundings may preserve the virus unchanged, or slightly contribute to its further development; but the elements of the blood and tissues of a suitable animal host enable it to multiply by inconceivable myriads, every one of which perhaps, is capable of rousing the morbid action in another animal exposed to its influence. Separation of the sick and healthy is therefore imperative, and different diseases will demand various modes of accomplishing this.

A quarantine was formerly imposed on all human beings coming from an infected locality, and although the exigences of modern commerce have secured the restriction of this to such as arrive actually infected, there is no such valid reason for a similar relaxation in the case of animals. For lack of a sufficient control over the importation of animals, we have repeatedly imported an European bovine plague of a most insidious and deadly type, and which still prevails over no inconsiderable part of our territory. A few years ago the aphthous fever of animals was brought to our shores by some importod Shorthorn cattle, and prevailed for months in the Northeastern States, but by earnest and combined efforts it was finally arrested. These two diseases are constantly prevalent in Great Britian, with which we have constant traffic in high class stock, and have there destroyed over $400,000,000 worth of property in less than thirty years. If no sufficient control is exercised over our importations we must expect that one or the other will be introduced here at intervals. Such cattle should only be landed at certain specified ports, where they would be subjected to a thorough examination by competent veterinarians appointed by the Government, and allowed to enter only after efficient quarantine and disinfection. Such care on our part would entail a very insignificant outlay, as we are in no sense dependent on foreign countries for our food supplies. In Europe we find nations resorting to a military cordon and veterinary staff stationed on the frontier, to protect themselves against the live stock maladies of their neighbors. In this way have Austria and Prussia protected their herds for long against the terrible scourge of the Russian Steppes, and in this way have Denmark, Oldenburg and other States, shut out the lung plague which proves so disastrous to their neighbors.

We have few indigenous plagues, and our people are slow to rouse themselves to threatened plagues of an exotic origin. But if they would save the fair fields of this mighty Continent from the disasters which have overtaken the greater part of Continental

Europe, Great Britian, and Australia, they must take action ere it is too late, not only to shut out plagues which may be imported from abroad, but to crush out that which has gained a footing in their midst. If the comparative neglect of these maladies has cost a small country like Great Britian $450,000,000 in the course of a few years, what may it not cost us, when the grand prairies of the West are teaming with flocks and herds for the supply of the vast American population of the future? We have taken a snake into our bosom, and he is growing silently but surely, his power of developing poison is steadily increasing, and though few at present suspect his existence, we will yet suffer from his slimy and destructive folds if we do not take action while it may be effectual.

To crush an epizoötic already existing in a country, the poison must be extinguished. But the mode will differ according to the nature and fatality of the malady. If a disease is deadly, like the Rinderpest, the lung fever, or sheep-pox, the victims should be destroyed at once and without mercy, buried deeply in the earth, and all that has come in contact with them thoroughly disinfected. This is a matter for the Executive, since the loser must be remunerated out of the public purse. He sacrifices his property for the sake of the nation, and the nation must help him to bear the loss. This opens a door for misappropriation, it is true, but when the work is under the control of a competent and honorable veterinarian, and where a heavy penalty is imposed on all who shall fail to give notice to the authorities on the first appearance of disease, there need be no fear of such a result.

For the less fatal affections, such as aphthous fever, slaughter would be an unnecessary waste. The sick must be secluded in distant parks or buildings, under control of the authorities, with a heavy penalty per head for removal. They must be subjected to suitable remedial treatment, and the building, together with their excretions and all necessary utensils, kept constantly and thoroughly disinfected. No man, beast, nor bird, excepting the necessary attendants, should be admitted to the stock, and after recovery a thorough disinfection of all buildings and stable accessories, and even of the hides of the convalescent animals is imperative. Infected parks should be left unoccupied over a winter, or grazed only by animals which have no susceptibility for the disease in question.

It will even be necessary in many cases to shut up roads, to disinfect quays and loading banks, ships and railroad cars, wagons used for the conveyance of sick or dead animals and other possible sources of contamination. Measures indeed may be demanded of an extreme nature. Rotten and worm-eaten woodwork may require to be pulled down and burned, for in it the dried virus may retain its virulent qualities for years. Floors, walls, roofs, gutters, drains, dungheaps, buckets, combs, brushes, forks, shovels, harness, clothing, grain, fodder, roots, &c., will all require close attention, and no nook nor cranny must be overlooked, lest the seemingly privy, but really most potent enemy, should lurk unseen to re-appear at a later date and laugh all our boasted care to scorn. Disinfection, in its details, are best carried out under professional supervision. Nevertheless, the following remarks on some of the agents may not be unsuited to my present audience.

Heat will destroy the vitality of all organisms or organic matter, and put an end to the virulence of all animal poisons. But it must be at or above 212° Fah., and more than a mere momentary application must be made. Saturated solutions of caustic alkalies and caustic salts equally alter organic matter and destroy animal poisons by abstracting their water, or otherwise forming a chemical union with their elements. Hence, solutions of caustic soda and potass are employed very successfully in the cleansing and disinfection of wood-work. But unless the heat is high and prolonged, or the caustic solutions saturated, they are worse than useless, since they give a sense of security without the reality. Such agents are therefore not generally applicable.

We are thus thrown back upon disinfectants proper as our main reliance. These may act by reason of their affinity for some elements of organic matter, by the abstraction of which the poison is destroyed. This is the case with chlorine, which may be set free by adding sulphuric acid to a mixture of common salt and black oxide of manganese. Or they may act by giving up oxygen to the organic matter, and thus changing its composition and nature. This is the case with the permanganates of potass, &c. Or they may act by uniting with the elements of the virulent organic matter and forming a comparatively stable innocuous compound, as is the case with carbolic and cresylic acids. Some agents, such as chloride of lime, chloride of zinc, carbolic acid, sulphite of soda, and the permanganate of potass are especially adapted to the disinfection of solids and liquids. Others, such as chlorine, sulphurous acid, and hyponitrous acid, are better fitted for the disinfection of the air.

In concluding, I would reiterate my sense of the vast importance of this subject. The fruits of a generous soil cannot be left to go to waste with impunity. This fundamental source of all national prosperity may be left to sink under preventable evils, but this cannot end here; our commerce and manufactures must be drawn with it in its ruinous descent. I have spoken of the money loss to England from these plagues. Let me now add that the *Farmers' Benevolent Society* show that nearly all the ruined farmers seeking its help, owed their bankruptcy to *losses in live stock*. Now, it is well known that we are harboring in our midst one of the most redoubtable animal plagues, and although it is yet confined to a comparatively limited area, where the high prices of dairy produce and beef serve to counterbalance the loss, yet it is slowly extending, and when the wide and fruitful West falls under its infection its rapid spread over the entire Continent is inevitable. At present it has to fight its way against the current of cattle traffic, yet it is slowly gaining; and when our western herds are infected, this track, which is now its most efficient barrier, will become the effectual means of its speedy diffusion. We shall then see the panic of 1868 repeated, but with a much more legitimate cause. We shall have to meet and contend with a disease which spreads more slowly, it is true, but which is on that account all the more dangerous; its long period of incubation allowing of the germs being carried for a month in the body of the unsuspected animal, which may thus be conveyed, in an apparently healthy state, from one side of the Continent to the other. We shall have to fight with a disease which no change of season will materially affect, and no frost extinguish, a pestilence which walketh in darkness and infects unseen.

To seek to control such a malady by the common appliances of individual effort, is consummate folly. Our world is not yet so morally perfect that all men will sacrifice their property for the benefit of their neighbors, and perhaps no disease offers a more tempting opportunity, than does our lung fever of cattle for the disposal of infected but apparently healthy stock. This matter is pregnant with mighty results to the future of the nation. It is possible to clear out this noxious exotic, and save our country from its devastations. And it is equally in our choice to neglect the opportunity of to-day, only to find ourselves ere long in a position comparable to that of England or Holland, where one-tenth of the horned stock often fall victims to pestilence in a single year.

Following this lecture a paper was read by Hon. Samuel Wasson, member of the Board for Hancock county, on "Specialties in Farming—The Production of Mutton;" the publication of which is, at the request of the author, at present withheld. After the passing of the usual complimentary votes of thanks, the Board adjourned *without day.*

ERRATA.

The reader is requested to make the following corrections:

Page 159,	line 20,	for Polypetatous,	read Polypetalous.
" 167,	" 1,	" Baeberry,	" Barberry.
" 168,	" 14,	" berberdis,	" berberidis.
" 171,	" 14,	" born,	" borne.
" 173,	" 6,	" glanca,	" glauca.
" 176,	" 11,	" Cisti,	" Cistus.
" 178,	" 7,	" Dosera,	" Drosera.
" 188,	" 36,	" Sclandria,	" Selandria.
" 188,	" 39,	" Interrogationis,	" interrogationis.
" 189,	" 7,	" ussitatissimum,	" usitatissimum.
" 191,	" 1,	" Celadine,	" Celandine.
" 197,	" 30,	" Celestraceæ,	" Celastracæ.
" 211,	" 32,	" Gleditsclua,	" Gleditschia.
" 213,	" 18,	" Coloneaster,	" Cotoneaster.
" 214,	" 36,	" Buprestes,	" Buprestis.
" 223,	" 38,	" Drutzia,	" Deutzia.
" 224,	" 23,	" Mirtre-wort,	" Mitre-wort.
" 226,	" 14,	" Epilobia,	" Epilobium.
" 226,	" 22,	" augustifolium,	" angustifolium.
" 227,	" 20,	" Umbelliforæ,	" Umbelliferæ.
" 227,	" 31,	" trifolium,	" trifolia.
" 229,	" 39,	" sericia,	" sericea.
" 230,	" 11,	" Wanggenheim,	" Wangenheim.
" 231,	" 26,	" Corealis,	" borealis.

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